

# **Roles, Responsibilities and Relationships in Alberta's Air Quality Management System**

**A Discussion Paper for the  
CASA and AAC  
Joint Standing Committee**

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## Table of Contents

<b>PURPOSE OF THIS PAPER.....</b>	<b>1</b>
Report Content.....	2
List of Acronyms .....	2
<b>OVERVIEW OF ALBERTA’S AQMS.....</b>	<b>3</b>
Alberta’s Industrial Air Quality Regulatory System.....	3
Alberta’s Regional Air Quality Management System .....	5
<b>ROLES AND RESPONSIBILITIES IN AAQMS.....</b>	<b>10</b>
The Players .....	10
<i>Alberta Environment and Sustainable Resource Development (AESRD)</i> .....	10
<i>Clean Air Strategic Alliance (CASA)</i> .....	10
<i>Alberta Airshed Council (AAC)</i> .....	11
<i>Airshed Zones (Consolidated)</i> .....	11
<i>Environment Canada (EC)</i> .....	12
<i>Canadian Council of Ministers of Environment (CCME)</i> .....	12
<i>Other Alberta Government Agencies</i> .....	13
<i>Municipal Governments and Associations</i> .....	13
<i>Industry/Business Associations</i> .....	14
<i>Emitters</i> .....	14
<i>Non-Government Organizations (NGOs)</i> .....	15
Differences among Airshed Zones.....	15
Allocation of Functional Responsibilities.....	16
Relationships Among Players.....	18
System Accountabilities and Responsibilities .....	19
<b>GOVERNMENT INITIATIVES AND THE AAQMS.....</b>	<b>20</b>
National Air Quality Management System (NAQMS) .....	20
Land Use Framework (LUF) .....	20
Cumulative Effects Management System (CEMS).....	21
Integrated Monitoring, Evaluation and Reporting (IMER).....	22
Clean Air Strategy for Alberta (CAS) .....	22
Regulatory Enhancement Project .....	23
Monitoring Working Group .....	23
Linkages Among Government Air Quality Initiatives.....	24
Summary of Implications of Current Government Initiatives.....	25
<b>OBSERVATIONS AND CONCLUSIONS.....</b>	<b>26</b>
Strengths of the Current System.....	26
Uncertainties and Gaps.....	27
System Challenges.....	28
1. <i>Mandates, Authorities and Accountabilities</i> .....	28
2. <i>Sustainable Funding</i> .....	29
3. <i>Operational Effectiveness</i> .....	30
4. <i>Evolving the Alberta AQMS</i> .....	30

## JSC Discussion Paper

APPENDIX A – GLOSSARY OF TERMS.....	32
APPENDIX B – AIR QUALITY MANAGEMENT SYSTEM FUNCTIONS AND RESPONSIBILITIES .....	38
APPENDIX C – RELATIONSHIPS AMONG THE PLAYERS IN AAQMS .....	44
APPENDIX D – SOME CHARACTERISTICS OF AIRSHED ZONES .....	47
BIBLIOGRAPHY.....	48

### List of Figures

Figure 1: Alberta industrial air quality regulatory system.....	4
Figure 2: Alberta’s regional air quality management system.....	6
Figure 3: Pictorial view of relationships among players in Alberta’s AQMS.....	18
Figure 4: Linkages among government air quality initiatives .....	24

### List of Tables

Table 1: Summary of functional responsibilities in the Alberta AQMS.....	17
Table 2: Accountability relationships.....	19

## **Roles and Responsibilities in Alberta's AQMS**

### **A Report to the CASA and AAC Joint Standing Committee**

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#### **PURPOSE OF THIS PAPER**

The *CASA and AAC Joint Standing Committee* (JSC or the Committee) works to strengthen the relationship between the Clean Air Strategic Alliance (CASA), the Alberta Airsheds Council (AAC) and the individual Airshed Zones (AZs), all of which are incorporated under the *Alberta Societies Act*. The JSC provides a forum for discussing and addressing strategic issues related to effective air quality management in Alberta

CASA and Airshed Zones play key roles in Alberta's Air Quality Management System (AAQMS), and their work is increasingly linked. Airshed monitoring supports the policy development and planning at CASA, while CASA project teams make recommendations that may affect the work of AZs. These organizations are also linked, directly or indirectly, to other players in air quality management including government agencies, licensed emitters and various non-government organizations. With Alberta's growing emphasis on place-based environmental management, CASA, AZs and the AAC have a common interest in addressing strategic issues and challenges.

An early priority for the JSC is to examine and clarify the roles, responsibilities and relationships among CASA, AAC and AZs, and how they relate to other organizations and stakeholders in air quality management. This is a first step in understanding how working relationships might be improved, and also necessary to assess the implications of several government initiatives that, as implementation proceeds, could affect AAQMS functions and responsibilities.

This *Discussion Paper* has been prepared to help inform the JSC's deliberations about roles, responsibilities and relationships, now and in the near future. It provides information about:

- functional components of Alberta's Air Quality Management System,
- roles and responsibilities of the organizations delivering aspects of the system;
- relationships among organizations;
- government initiatives with implications for delivery of air quality management; and
- issues or inconsistencies that the JSC may wish to address.

### Report Content

The Discussion Paper is laid out in the following way:

1. **Description of Alberta's Air Quality Management System**, which provides the basis upon which roles and responsibilities are defined.
2. **Description of the organizations involved in delivering Alberta's AQMS**, their respective roles and responsibilities, and the relationships between them.
3. **Description of government initiatives** that could potentially affect the way in which air quality management is structured and the roles of the players.
4. **Observations and Conclusions** about system attributes, as well as gaps or uncertainties.
5. **Challenges** that the Joint Standing Committee may wish to address.

For reference, a **Glossary of Terms** used in this paper can be found in the *Appendix A*.

#### List of Acronyms

AAC	Alberta Airshed Council
AAQMS	Alberta Air Quality Management System
AESRD	Alberta Environment and Sustainable Resource Development
AMD	Air Monitoring Directive
AQ	Air Quality
AZ	Airshed Zone (Society or Association)
BLIER	Base Level Industrial Emission Requirement
CAAQS	Canadian Ambient Air Quality Standards
CASA	Clean Air Strategic Alliance
CCME	Canadian Council of Ministers of Environment
CEMS	Cumulative Effects Management System
EC	Environment Canada
EPEA	Environmental Protection and Enhancement Act (Alberta)
GoA	Government of Alberta
IMER	Integrated Monitoring, Evaluation and Reporting
JSC	CASA and Alberta Airsheds Council Joint Standing Committee
LUF	Land Use Framework
NAQMS	National Air Quality Management System (formerly CAMS)
NGO	Non-Government Organization
PM 2.5	Particulate Matter less than 2.5 µm in diameter

## OVERVIEW OF ALBERTA'S AQMS

Alberta's Air Quality Management System (AAQMS) consists of two main subsystems, namely, an Industrial Air Quality Regulatory System and a Regional Air Quality Management System, both informed by strategic planning through CASA and CCME.<sup>1</sup> The components of these systems all relate to the releases of pollutants into the atmosphere, the subsequent transport and dispersion of these pollutants within the atmosphere, and the final removal of these pollutants from the atmosphere by environmental receptors. Both systems, as with environmental management systems in general, follow an adaptive management or PDCA cycle.<sup>2</sup>

A number of supporting services are needed for the successful operations of both of these systems. There must be communications among all of the participants and coordination of the actions of the various players. Skilled personnel must be available for carrying out the technical work required in each component. Few educational institutions provide such specific training; most qualified individuals have learned their craft under the tutelage of experienced practitioners. Sufficient research and development must have been done to provide appropriate control technologies, understand the potential effects of air pollution, be able to model the concentrations resulting from emissions and have appropriate equipment for monitoring air quality.

### Alberta's Industrial Air Quality Regulatory System

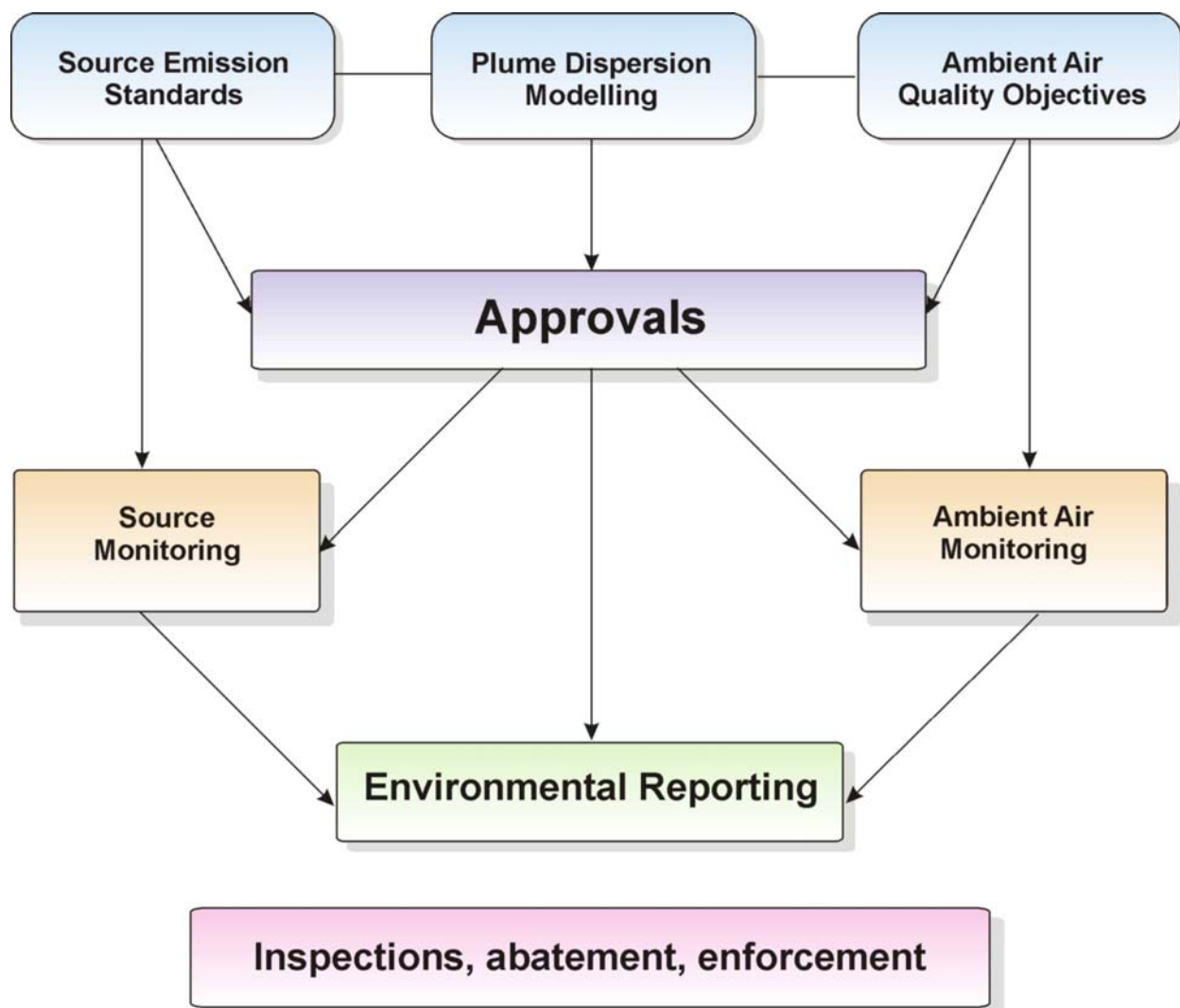
Under the *Environmental Protection and Enhancement Act* (EPEA or Act), air quality management is directed at industrial emission sources through environmental impact assessment, approvals, and compliance. Regulations under the Act place limits on the release of some specific substances, impose reporting requirements and specify administrative procedures. Other regulatory requirements appear in ambient air quality objectives, source performance standards, plume dispersion modeling guidelines, ambient air monitoring directives, and approval clauses requiring source sampling, ambient air quality monitoring, and environmental reporting. Government compliance and enforcement ensures that the rules are followed by industrial operators (licensed emitters). The industrial air quality regulatory system is shown in *Figure 1*.

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<sup>1</sup> *Air Management in Alberta*. 2009, Alberta Environment. Edmonton.

<sup>2</sup> PDCA is the iterative four-phase Shewhart or Deming cycle, commonly known as Plan-Do-Check-Act (PDCA). *Plan* is about analyzing a problem and developing a solution. *Do* is about implementing the plan. *Check* is about measuring the effectiveness of the solution. *Act* is about correcting for significant differences between actual and planned results and revising the plan as necessary.

Figure 1: Alberta industrial air quality regulatory system



Source: Air Management in Alberta, Alberta Environment, 2009.

Elements of the industrial air quality regulatory system are defined below for purposes of this report.

- *Environmental impact assessments* identify possible adverse environmental effects, propose measures to mitigate these effects, and provide an opportunity for those who may be affected by the industrial operation to provide input and advice.
- *Source emission standards* (also known as source performance standards) place general limits on the amount of waste that can be released to the atmosphere, based primarily on technology.



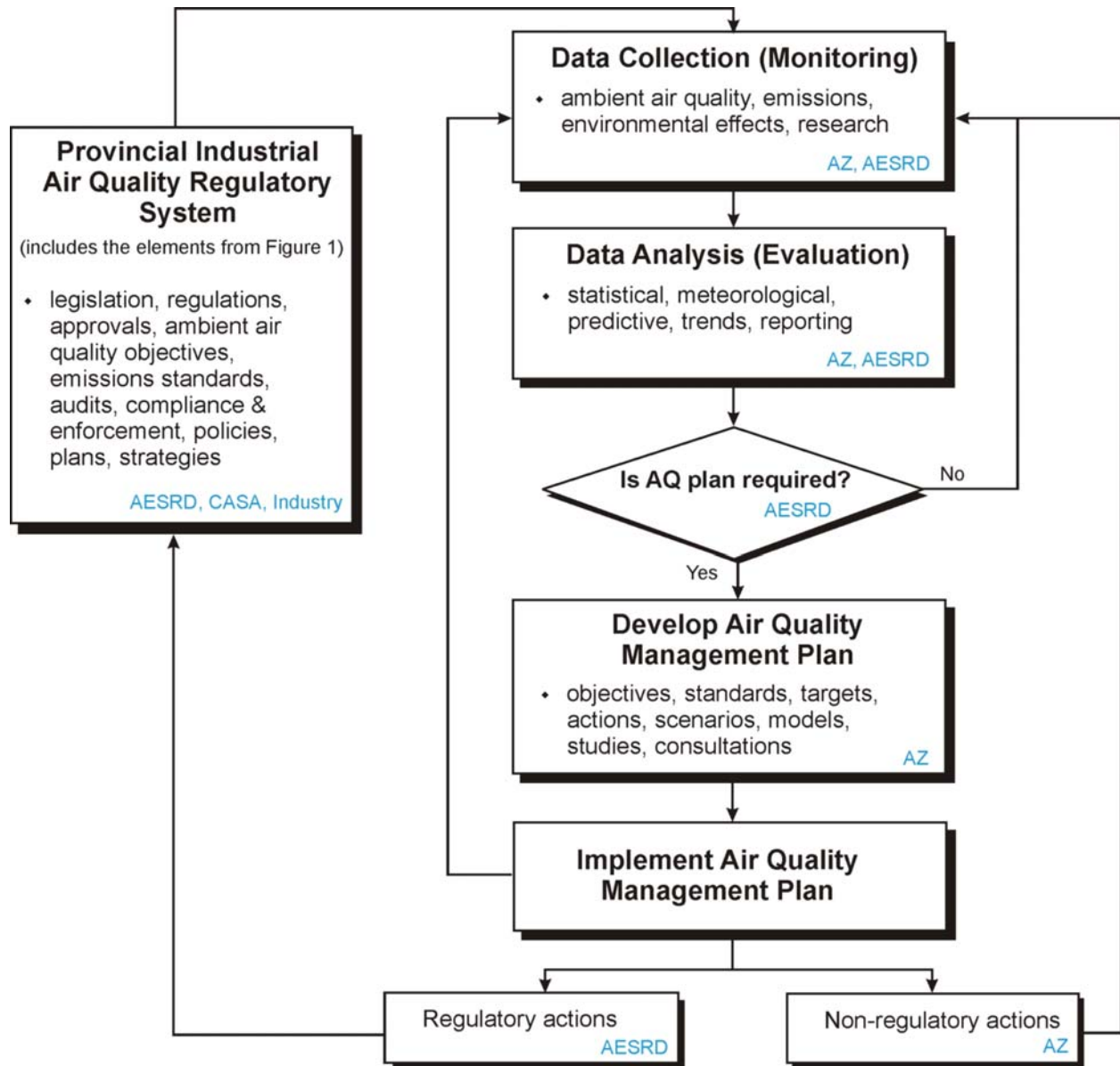
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- ▶ *Plume dispersion modelling determines* the adequacy of stack to disperse residual emissions to concentrations below the ambient air quality objectives. *Ambient air quality objectives* specify the upper limit of acceptable air quality in Alberta (not “pollute up-to” values).
- ▶ *Approvals* specify source emission limits, the required equipment/technologies, the allowable emission sources, certain operational procedures and monitoring and reporting requirements.
- ▶ *Ambient air quality monitoring* measures air quality in the vicinity of industrial operations to ensure that the ambient air quality objectives are being met. *Source monitoring* measures the amounts released from industrial sources to ensure compliance with emission standards or the emission limits in Approvals.
- ▶ *Environmental Reporting* means that an industrial operator submits periodic reports (annual and sometimes monthly) summarizing performance and monitoring data (ambient and source).
- ▶ Through the government’s *inspections and abatement program*, operator performance is reviewed, monitoring reports are followed up if there appears to be a problem, monitoring is audited, and independent testing carried out. If necessary, *enforcement* action might occur using tools such as warning letters, administrative penalties, protection orders, prosecutions in court, court orders or cancellation of approvals.

### Alberta’s Regional Air Quality Management System

Different parts of the Province often face different air quality issues. Airshed Zones were created to address these local concerns primarily through local monitoring of air quality. If monitoring identifies a problem, then an air management plan may be developed and implemented. Monitoring then serves as the “check” function of PDCA to determine whether air outcomes are being achieved. *Figure 2* shows the regional air quality management system.

Figure 2: Alberta's regional air quality management system.



The blue letters in the lower right hand corner of each box identify the main players involved in that function.

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**Data Collection (Monitoring)** is mainly for ambient air quality but also includes emissions, and environmental effects. The collection of reliable *ambient air quality data* is a complex undertaking with many tasks:

- Define clear and realistic monitoring objectives.
- Set appropriate data quality objectives (for accuracy, precision, representativeness, geographical coverage, comparability, consistency and data capture) to meet the monitoring objectives.
- Choose the specific pollutants that will be measured, the time-scales for measurement, the equipment that will be used, the number of sites and their locations. If real-time, minute-by-minute data are needed, then continuous analyzers will be used. If longer time averages are adequate, then integrated samplers can be selected. If 'snapshots' in time will meet the objectives, then intermittent sampling can be used, either randomly or systematically (e.g., every six days). The number and location of monitoring sites must be chosen in light of budgets and other constraints such as public safety, visual intrusiveness, risk of vandalism, access to utilities, zoning permission, and aerodynamic disturbance by nearby obstacles. Supporting meteorological and other measurements must be decided, and suitable equipment installed.
- Develop a quality system. Quality Assurance addresses the pre-measurement phase and is concerned with the processes of making the measurements. Quality control addresses the measurement-related activities and is concerned with the output.
- Check equipment to ensure that it is operating within specifications. Operational procedures must be established for equipment maintenance during regular site visits. Calibrate equipment against standards at regular intervals.
- Audit the stations by arranging with someone other than the site operator to review the entire operation so that data will be comparable with other networks.
- Validate data by having operators screen the measurements for any obvious problems before the data is submitted to a database.
- Ratify the data by periodic review (often quarterly) in conjunction with other stations, other pollutants, instrument histories, meteorological conditions, season, terrain and other factors. This prevents long-term errors from propagating in the database.
- Maintain a database to store the measurements for subsequent retrieval and analysis both by the station owners and others.
- Analyze the data for statistical characteristics, for relationships with meteorological conditions and for comparison with ambient air quality objectives or trigger levels.
- Report the results of monitoring to interested parties on websites and/or in formal publications.
- Review the monitoring program periodically to ensure its ongoing relevance.

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*Emissions inventories* are collections of data on releases to the atmosphere. There are a number of steps.

- List sources and pollutants emitted.
- Obtain available measurements of emissions. For large industrial sources and common pollutants, measurements are usually available, either continuously or from periodic sampling of the stack gases. Obtaining the data along with the supporting information is often done through questionnaires, although there is mandatory reporting to government agencies in many instances.
- Estimate emissions for other sources. Generally, there are no measurements for small sources, transportation sources, or natural sources. From available studies, emission factors are derived and then used to estimate the emissions. A great deal of work is needed to calculate these emissions and there is much uncertainty.
- Maintain a database of pollutant releases for subsequent retrieval and analysis.
- Analyze emissions data in various ways, for example, looking at trends, running dispersion models to predict the resulting ambient air quality, or making forecasts about future emission possibly using economic models.
- Report the emissions data regularly so that air quality managers and the public understand the pressures being placed on an airshed.

*Environmental effects* information is generally derived from various types of health and ecological studies. Biomonitoring programs are long-term and reporting may be infrequent. There are many variables that affect plants and animals, making it difficult to attribute definitively any observed effects to air quality.

The need for an *air quality management plan* has generally been determined by AESRD based on trigger levels in various air quality management frameworks.<sup>3</sup> Such plans detail what needs to be done, the timelines, how it will be achieved and who will do it. The planning will be informed by a variety of inputs. Generally the steps would be:

- Establish objectives for solving the problem and any related issues.
- Explore future scenarios, looking at industrial and urban growth and expected developments over various time frames.
- Formulate alternative actions that would change the air quality expected in the future from the “business as usual” case.

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<sup>3</sup> Historically the Clean Air Strategic Alliance developed a number of provincial frameworks such as the Acid Deposition Management Framework, Particulate Matter and Ozone Management Framework, and Electricity Sector Emission Management Framework. More recently the Alberta Government has published the Lower Athabasca Regional Air Quality Management Framework for NO<sub>2</sub>/SO<sub>2</sub> and is developing a Capital Region Air Quality Management Framework. The NAQMS also provides a tiered management framework based on CAAQS.

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- ▶ Evaluate alternatives. Air quality models may be used to provide estimates of ambient air quality resulting from projected future emissions under various sets of actions. Research may be accessed or initiated to answer questions about such things as natural emissions, thresholds for vegetation effects, chemical composition of emissions from various sources, and leading edge control technologies. Social, technical and economic analysis may be used to compare costs, benefits, and other implications of the alternatives being considered for the plan.
- ▶ Consult with the public to get input from those whose activities will invariably be affected either directly or indirectly by the planned actions.
- ▶ Set targets for the suite of actions that are chosen after the evaluation and public review. Such plans generally require coordinated actions by government, business, industry, and the public.

*Regulatory actions* fall to the government agencies to implement. They can be reflected in any of the regulatory instruments that the government has at its disposal.

*Non regulatory actions* may be taken by any of the players. Such actions include informational outreach to educate, convince and motivate (also referred to as social marketing), partnerships, agreements, voluntary undertakings, monetary incentives, and recognition programs.

*Monitoring* continues to assess the results of the actions taken under the air quality management plan. The results are used to make course corrections and update the plan so that the desired outcomes are achieved.

## ROLES AND RESPONSIBILITIES IN AAQMS

### The Players

Following is a summary description of the current set of players engaged in delivering aspects of Alberta's air quality management system.

#### **Alberta Environment and Sustainable Resource Development (AESRD)**

##### **Functions**

Alberta ESRD sanctions, directs, coordinates and implements air quality management at the provincial level, and represents Alberta at air quality management discussions with neighbouring jurisdictions and at the national level.

##### **Deliverables**

Maintenance and oversight of the provincial policy and regulatory regime for air quality management. Implementation of NAQMS in Alberta. Development and implementation of Alberta Government initiatives with implications for Alberta's AQMS:

- Cumulative Effects Management System (CEMS)
- Integrated Monitoring, Evaluation and Reporting (IMER)
- Air Quality Management Frameworks under the Land Use Framework (LUF)
- Clean Air Strategy (CAS)
- Monitoring Working Group.

##### **Authority/Accountability**

*Alberta Environmental Protection and Enhancement Act (EPEA)* and regulations.

##### **Structure/Funding**

Provincial government ministry responsible for the AQMS, operating with an annual budget voted by the members of the Alberta Legislature.

#### **Clean Air Strategic Alliance (CASA)**

##### **Functions**

CASA is a multi-stakeholder association composed of representatives selected by industry, government and non-government organizations to provide strategies to assess and improve air quality for Albertans, using a collaborative consensus process.

##### **Deliverables**

Gathers representatives from industry, government and NGOs in order to provide strategic (policy) advice on air quality management to the GoA. Multi-stakeholder teams produce recommendations concerning agreed air quality issues, directed at government, industry and NGOs for implementation.

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### **Authority/Accountability**

Established by ministerial order in 1994, CASA reports to Ministers responsible for Energy, Environment, and Health. CASA has grant reporting requirements to GoA, including financial audits, and reporting and other requirements under the *Alberta Societies Act*.

### **Structure/Funding**

Incorporated as an association under the *Alberta Societies Act*, CASA has a multi-stakeholder membership (governments, industries, and NGOs). Each member sits on the Board of Directors; chaired by members of an Executive Committee representing the range of stakeholders. CASA is funded through annual grants from Alberta Energy.

## **Alberta Airshed Council (AAC)**

### **Function**

Provides a forum to identify and advocate for the common interests of the nine established airshed zones.

AAC is registered as a non-profit.

### **Deliverables**

Holds meetings to enhance communication between Airshed Zones; organizes periodic Airshed Zones' conferences; liaises on behalf of the Airshed Zones with other bodies (e.g., CASA, GoA).

### **Authority/Accountability**

Following from earlier recognition that there was a need for a forum for Airshed Zones to discuss common issues, formation of the Alberta Airsheds Council was recognized in a recommendation from CASA's "In the Zone Conference" held in October 2005. The AAC's first meeting was held in May 2006. The AAC is responsible to its member Airshed Zones. It also has the reporting and other requirements imposed by the *Alberta Societies Act*.

### **Structure/Funding**

Council of representatives of participating Airshed Zones, constituted under the *Societies Act* and operating by donations.

## **Airshed Zones (Consolidated)**

### **Functions**

Multi-stakeholder groups consisting of individuals, industries, environmental organizations, municipalities and other levels of government, all dedicated to clean air and healthy communities.

### **Deliverables**

Monitoring and reporting air quality data; local education and outreach with respect to air quality management; preparation of PM and ozone management plans if required.

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### **Authority/Accountability**

Accountable to their Boards and members. Contractual obligations to industrial licensed emitters and AESRD for monitoring and reporting. Also must comply with the reporting and other requirements of the Alberta *Societies Act*.

### **Structure/Funding**

Multi-stakeholder organizations incorporated under the *Societies Act* and managed by Boards of Directors and paid staff. Funding is primarily by industrial licensed emitters in the geographical area (averaging 95% of revenues). Many AZs have contracts with AESRD for operation of provincial stations. From time to time AZs can also access grant funds from AESRD. GoA financial contributions to AZ operations are generally small compared to industry contributions. The fraction can range from as little as 1% to as much as 36% of annual AZ revenue (from data in Urban Systems<sup>4</sup> report).

## **Environment Canada (EC)**

### **Functions**

Preserve and enhance the quality of the natural environment, including water, air, soil, flora and fauna. Conserve Canada's renewable resources. Forecast daily weather conditions and provide detailed meteorological information to all of Canada. Coordinate national environmental policies and programs for the federal government.

### **Deliverables**

Federal policy on air quality management National AQMS.

### **Authority/Accountability**

*Canadian Environmental Protection Act (CEPA)*.

### **Structure/Funding**

Federal government ministry responsible for the National AQMS at the federal level, operating with an annual budget voted by the members of the Parliament of Canada.

## **Canadian Council of Ministers of Environment (CCME)**

### **Functions**

Minister-led intergovernmental forum (provincial-federal-territorial) for collective action on environmental issues of provincial, national and international concern.

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<sup>4</sup> Urban Systems and University of Alberta School of Business (2011); *Review of Value and Funding Options for Airshed Zones and Watershed Planning & Advisory Councils to Support Cumulative Effects Management*. Alberta Environment March 31, 2011.



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### **Deliverables**

Achieve positive environmental results, focusing on issues that are national in scope and that require collective attention by a number of governments.

Direct development of national strategies, norms, and guidelines that each environment ministry across the country can use; the National Air Quality Management System (National AQMS) is a CCME initiative.

### **Authority/Accountability**

Sanction for ministerial participation by respective jurisdictions.

### **Structure/Funding**

Contributions by participating governments.

## **Other Alberta Government Agencies**

### **Functions**

A number of provincial government agencies have air-related policies and duties, including: Energy; Agriculture and Rural Development; Health and Wellness; and Municipal Affairs. Policies are integrated and coordinated through the provincial government's Policy Coordination Office.

### **Deliverables**

Air quality relevant activities within their mandates.

### **Authority/Accountability**

Respective ministry mandate legislation and associated acts and regulations.

### **Structure/Funding**

Operate within an annual budget voted by the members of the Alberta Legislature.

## **Municipal Governments and Associations**

### **Functions**

Municipal governments provide essential services (e.g. road, water, sewage, garbage collection), local community programs and local land use planning. The Alberta Association of Municipal Districts and Counties (AAMDC) helps rural municipalities through advocacy and aggregated business services. The Alberta Urban Municipalities Association (AUMA) helps urban municipalities develop strategies and resources for the future.

### **Deliverables**

Municipal governments produce bylaws, land use bylaws, municipal development plans, area structure plans (framework for subsequent subdivision and development of land), area redevelopment plans, and programs for residents. Municipal government associations coordinate and assist member municipalities.

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### **Authority/Accountability**

As prescribed by the *Municipal Government Act*; officials are accountable to elected councils; elected councils are accountable to the electorate. Associations are accountable to their member municipalities.

### **Structure/Funding**

Municipalities are funded through local taxes, grants and fees. Municipal associations are funded by member governments and service charges.

## **Industry/Business Associations**

### **Functions**

Corporations working together for the welfare of a particular economic sector.

### **Deliverables**

Various aspects of public relations, advertising, education, lobbying, publishing, corporate collaboration and industry standardization. Provide input to policy and regulatory regime adjustments.

### **Authority/Accountability**

Accountable to association members.

### **Structure/Funding**

Contributions by way of memberships.

## **Licensed Emitters<sup>5</sup>**

### **Functions**

Economic enterprises producing goods for market.

### **Deliverables**

Produce products for the economy, and emissions in the process.

### **Authority/Accountability**

Designated industrial activities require an Approval under the *Alberta Environmental Protection and Enhancement Act* (EPEA) Industrial corporations participate on Airshed Zones as part of their regulatory approval or on a voluntary basis. Corporations report to Boards of Directors (and shareholders) and to AESRD with respect to regulatory obligations.

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<sup>5</sup> The current regulatory system under *EPEA* is directed at designated emitters who must obtain a regulatory approval to operate. (licensed emitters). The regional AQMS includes licensed emitters, as well as other emitters (e.g., agriculture, transportation).

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### **Structure/Funding:**

Provide funding to Airshed Zones in return for Airshed Zone monitoring and reporting on regulated emissions in a manner that fulfills regulatory requirements.

## **Non-Government Organizations (NGOs)**

### **Functions**

Individual citizens sharing a common interest, and in the case of environmental NGOs, promoting sustainable development and environmental health.

### **Deliverables**

Input/advice to air management policy and processes.

### **Authority/Accountability**

Flows from respective organizational membership.

### **Structure/Funding**

May be volunteer operated or with a paid staff. Funding received through paid memberships and donations.

## **Differences among Airshed Zones**

As might be expected with grass-roots organizations established to address local issues, each of Alberta's nine Airshed Zones has unique features. They differ in their main air quality issues, the area within their boundaries, populations served, numbers and interests of members, budgets, committee structures, and administrative procedures. Some characteristics of AZs are summarized in *Appendix D*.

AZs have different numbers of continuous monitoring stations, measure different parameters, make different supporting meteorological measurements, and have differing numbers of passive monitoring sites. A few AZs do environmental effects monitoring, and several have undertaken ozone planning. Many AZs are heavily engaged in outreach and public education, especially in conjunction with implementing an ozone management plan, although all have different and separate websites.

There are also differences in the membership makeup and methods of funding. Industrial members may be invoiced on the basis of respective emissions, or by way of a more complicated formula related to various aspects of operation. In some AZs, an industry association provides block funding and the apportionment among its members is internal to that organization.

Municipalities may participate fully, sporadically, or not at all. Some AZs charge flat amounts to towns, villages, and counties/districts. Others have a population-based formula for municipal contributions.

Most AZs contract out their monitoring operations, but two have recently decided to operate with own staff. Laboratory analysis is always contracted out.

### Allocation of Functional Responsibilities

Seven broad air quality management system functions have been used for purposes of explaining the Alberta AQMS, as outlined in Figure 2 and its accompanying text:

- Air quality monitoring and reporting;
- Emissions Inventory;
- Environmental effects information;
- Air quality plan development;
- Air quality plan implementation;
- Provincial policy and regulatory control; and
- Provision of supporting services.

In the preceding section, the roles and responsibilities of the organizations involved in delivering the AAQMS are described. The roles and responsibilities of those involved in air quality management must be explained in relation to the management system functions to be performed. To do this, the system functions have been mapped against the key players with responsibilities for delivery of aspects of the system. *Table 1: Summary of Functional Responsibilities in the Alberta AQMS* illustrates these relationships.

Table 1 lays out the functions of the system using the conventional groupings, listed above, and maps these against the general roles of the main delivery agents for the overall system (AESRD, Environment Canada, AZs, AAC, CASA and Licensed Emitters). For each function, the Table notes which organization is 'Responsible' and which is 'Contributing', either directly providing supporting information/analysis, or providing consultative advice. The 'Commentary' provides an explanation of important considerations relative to these roles and responsibilities.

Looking across Table 1 rows, it is apparent that at this high level, most functions have several players responsible for different aspects of the function as outlined in the commentary. Looking down the columns in Table 1, it can be seen that some players are more heavily involved in the system than others. The relative number of R's and C's speaks to the nature of the involvement.

It is important to note that the system functions listed in Table 1 are really categories within which a number of functional activities occur in practice. A breakdown of these detailed functions and associated responsibilities can be found in *Appendix B, Air Quality Management System Functions and Responsibilities*.

The *Glossary of Terms* in *Appendix A* defines air-related terminology, including definitions for the functional components listed in *Appendix B*.

## JSC Discussion Paper

**Table 1: Summary of functional responsibilities in the Alberta AQMS**

**R = Responsible:** The body responsible and/or accountable for this function/part of the system. Commentary defines distinctions.

**C = Contributing:** Those who provide consultative advice or supporting information/analysis. Commentary clarifies differences.

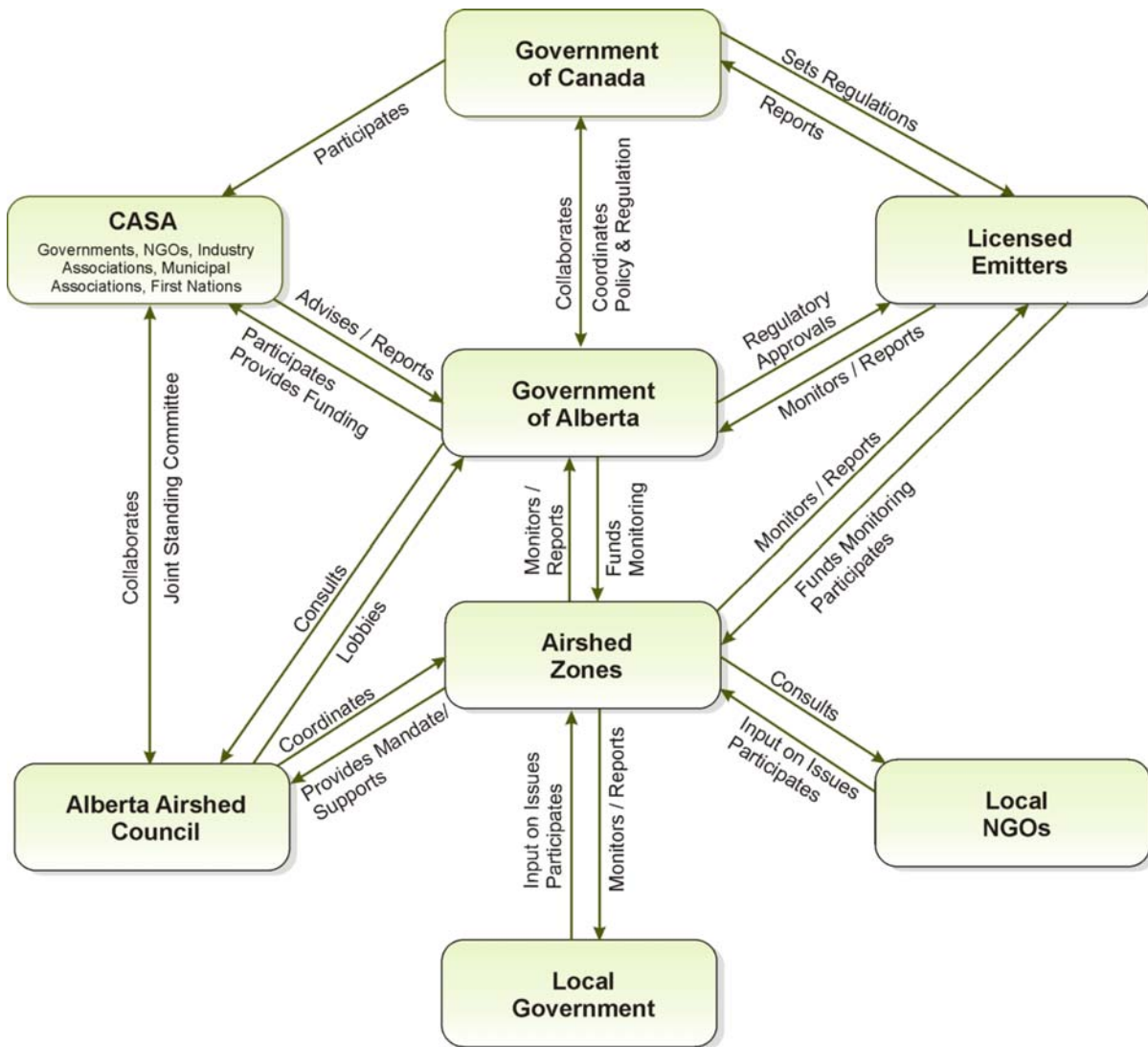
	AESRD/ GoA	CASA	AAC	AZ	Licensed Emitters	EC	Municipal Gov't.	Commentary
<b>1.0 Air quality monitoring and reporting</b>	R	C		R	C	R	C	AZs do the vast majority of monitoring; AESRD operates some stations, funds the operation of other stations, and supports the CASA Data Warehouse. EC supports National Air Pollution Surveillance stations.
<b>2.0 Emissions inventory</b>	R			R	R	R	C	EC requires industrial licensed emitters to submit data to National Pollutant Release Inventory. AESRD compiles data for provincial planning. Some AZs use emission data for polluter pay billings. Municipal governments may have data on traffic and some area sources.
<b>3.0 Environmental effects information</b>	R	C		R	C	C		Three AZs do environmental effects monitoring. The Casa Data Warehouse contains descriptions of bio-monitoring projects.
<b>4.0 Air quality plan development</b>	R	C		R	C		C	Frameworks from CASA, AESRD or EC can trigger the need for planning by individual AZs.
<b>5.0 Air quality plan implementation</b>	R			R	R		R	AZs undertake non-regulatory actions as budgets permit. Municipal governments act within their authority.
<b>6.0 Government regulatory systems</b>	R	C		C	C	R	R	Legislation by elected representatives enables federal and provincial regulatory regimes (for industry) to which the other players may provide input. Municipal government bylaws control land-use and other local activities.
<b>7.0 Supporting services</b>	R	R	R	R	R	R	R	All players coordinate and communicate. Training, other than on-the-job, is outside of current players, as is Research & Development.

## Relationships Among Players

The players relate to one another in a variety of ways. *Figure 3* below illustrates the major connections central to the functioning of the system, and labelled arrows indicate the services/support that one player provides to another. These connections do not preclude any of the players from providing input to AAQMS policy development and implementation through interactions other than those shown.

Where single arrows link players (CASA-AAC, Alberta-Canada), a reciprocal relationship exists. Some linkages are directly related to regulatory requirements for monitoring, reporting and oversight, while a number are supportive or discretionary. Other connections exist, but are not central to the functioning of the system. The Table in *Appendix C* provides a summary of the primary relationships relative to the AAQMS, in chart form.

**Figure 3: Pictorial view of relationships among players in Alberta's AQMS**



## System Accountabilities and Responsibilities

Table 2 below provides a summary of the key functional responsibilities of each of the players in the AAQMS, and to whom they are accountable. Although some system delivery responsibilities are more direct than others, the juxtaposition of responsibilities and accountabilities helps illustrate the diffuse nature of the current system.

The most notable role is that of the Airshed Zones which have an unusual set of responsibilities and accountabilities. While being the primary agent for conducting air quality monitoring, AZs have no 'system accountabilities' back to government, other than by way of contractual obligations with AESRD for operating a few monitoring stations or for the preparation of air management plans when those have been necessary. The only link for AZs to the air quality regulatory system is through an implicit contract with licensed emitters that AZ monitoring fulfills an emitter's regulatory monitoring obligations as set out in approvals.

**Table 2: Accountability relationships**

<b>Players</b>	<b>Responsible For</b>	<b>Accountable To</b>
<b>AESRD / GoA</b>	Provincial policy, planning, regulation, enforcement	Minister/Cabinet/Legislature
<b>CASA</b>	Multi-stakeholder advice to GoA on air management policy matters; mandate under Ministerial Order	Alberta Ministers of Energy, Environment, and Health
<b>Airshed Zones</b>	Monitoring air quality and reporting data under informal arrangements with Licensed Emitters; operating provincial monitoring stations within the zone; conducting air quality outreach and public education	Licensed Emitters in relation to expectations for air monitoring; AESRD under operating contracts where these exist; AZ members
<b>AAC</b>	Coordinating discussions among Airshed Zones	Members AZs through respective designated AAC representatives
<b>Municipal Governments and Associations</b>	Providing the services specified in the <i>Municipal Government Act</i> ; associations for the welfare of member governments	Minister of Municipal Affairs and to electors; associations to their member municipal governments
<b>Industry Associations</b>	Welfare of economic sector	Association Members
<b>NGOs</b>	Advancement of stated objectives	NGO Members
<b>Licensed Emitters</b>	Regulatory compliance	Regulator; corporate shareholders

## **GOVERNMENT INITIATIVES AND THE AAQMS**

Following is a summary description of the current set of government initiatives related to Alberta's air quality management system.

### **National Air Quality Management System (NAQMS)**

#### **Purpose**

An initiative of the Canadian Council of Ministers of the Environment (CCME), the NAQMS is a collaboration between federal, provincial and territorial governments, with stakeholder involvement, to develop and implement a new system for air management in Canada. It features new Canadian Ambient Air Quality Standards (CAAQS) for place-based air quality management (led by provinces and territories), base-level requirements for major industrial sectors regardless of air quality where facilities are located, six national airsheds that cross provincial and territorial borders to address trans-boundary pollution, and a national working group on monitoring and reporting. Alberta, Ontario and Environment Canada are the champions for this initiative, to be considered by CCME for approval in the fall of 2012.

#### **Products/Deliverables**

Six national air sheds across the country and guidance for delineation of regional airsheds; defined base level industrial emission requirements (BLIERS); CAAQS set initially for PM 2.5 and ozone (with other substances to follow); implementation roles agreed upon by governments; and a national framework for air quality management and reporting.

#### **Possible Implications for AAQMS**

Each province and territory is responsible for integrating national air quality standards into regulatory systems, delineating air zones that cover their entire jurisdiction, and collaborating between jurisdictions to address trans-boundary pollution where national air zones are shared responsibilities. Under the NAQMS provinces and territories will be responsible for managing air quality against the CAAQS, using a national framework of management levels and actions if air quality deteriorates, and reporting on air quality and management actions by airshed. The NAQMS, as proposed, appears well-aligned with Alberta's AQMS and with air frameworks contemplated for Land Use Framework regional plans.

### **Land Use Framework (LUF)**

#### **Purpose**

An initiative of Alberta ESRD to manage growth by balancing environmental, economic and social values and objectives, and translating provincial-level policy direction on land use for local land use decision-making.



### **Products/Deliverables**

Land use plans at regional and sub-regional scales, and issue-specific plans, containing legally defined objectives pursuant to the *Alberta Land Stewardship Act*. A draft of the Lower Athabasca Regional Air Quality Management Framework for NO<sub>2</sub>/SO<sub>2</sub> has been published and work is underway on a Capital Region Air Quality Management Framework.

### **Possible Implications for AAQMS**

Regional plans are intended to encompass air quality management objectives which will in turn require monitoring air quality indicators in relation to approved objectives. Legal objectives bring obligations for sustainable and consistent monitoring and reporting. It is not yet clear how regional objectives for air quality will be set or monitored differently than is currently the case. Future roles for CASA or for Airshed Zones have not been defined within either the Land Use Framework or the Cumulative Effects Management System.

## **Cumulative Effects Management System (CEMS)**

### **Purpose**

Dovetailed with the Land Use Framework, the Cumulative Effects Management System is an approach that establishes outcomes for an area by balancing environmental, economic and social considerations and implementing appropriate plans and tools to ensure those outcomes are met. Cumulative effects management clearly defines the desired end-state (outcomes-based), meets the differing needs of regions within the province (place-based), uses adaptive approaches to ensure results are measured and achieved (performance-management-based), builds on a culture of shared stewardship (collaborative), and uses both regulator and non-regulatory approaches (comprehensive).

### **Products/Deliverables**

Cumulative Effects Management Frameworks will bring all contributing parties together in a particular area into solution development for issues at an early stage. They may be focused on air, land, water and/or bio-diversity issues, will incorporate social and economic considerations, and must align with other scales of planning (provincial to site-specific).

A draft of the Lower Athabasca Regional Air Quality Management Framework for NO<sub>2</sub>/SO<sub>2</sub> has been published and work is underway on a Capital Region Air Quality Management Framework.

### **Possible Implications for AAQMS**

The same “plan-do-check-act” approach will be used in setting, meeting and evaluating place-based outcomes. The foundation of a functioning system is knowledge and performance management, and having the best information possible to set outcomes, continuously assess them, and determine when management actions are required. CEMS represents a shift in scale from managing air quality on a provincial basis to managing air quality on a regional basis. It also places great emphasis on information. Future roles for CASA or for Airshed Zones have not been defined within either the Land Use Framework or the CEMS (refer also to Figure 3).

## **Integrated Monitoring, Evaluation and Reporting (IMER)**

### **Purpose**

An initiative of Alberta ESRD to integrate monitoring, evaluation and reporting for air, land, water and biodiversity, in support of CEMS.

### **Products/Deliverables**

Enhanced data acquisition and reporting, and support for environmental management at a variety of spatial scales.

### **Possible Implications for AAQMS**

Potential exists for greater reliance on data from the CASA Data Warehouse (CDW) or replacement of the CDW by a new government database. There has been no suggestion as to how monitoring air quality within realistically defined airsheds fits spatially or in a scalable way with other media (e.g., water).

## **Clean Air Strategy for Alberta**

### **Purpose**

An initiative of Alberta ESRD to renew the 1991 Clean Air Strategy, including the impact of non-point source emissions.

### **Products/Deliverables**

Strategy and Action Plan with three outcomes and four key directions: (1) management of non-point sources and airshed planning, (2) shared responsibility and partnerships, (3) integrated monitoring, evaluation and reporting, and (4) knowledge enhancement.

### **Possible Implications for AAQMS**

The GoA has signalled the following general intent:

- ▶ integrating planning within and across provincial, regional and sub-regional boundaries, and developing management frameworks to identify and address air quality issues;
- ▶ developing educational programs and best management practices to ensure all parties are equipped to contribute to collective goals; clarifying and articulating the roles of cross-government and cross-ministry stakeholders and partners in air quality management; and coordinating policy development and integration across environmental media and government;
- ▶ rationalizing monitoring programs in the province; enhancing the data management system; developing monitoring and performance indicators to assess the state of Alberta's air and the effectiveness of policies; and ensuring the transparency and accessibility of data; and
- ▶ increasing public knowledge related to air quality; pursuing and prioritizing research and development activities; encouraging continuous improvement in technology development and management approaches; and improving knowledge of emission sources through emissions inventories.

## Regulatory Enhancement Project

### Purpose

An initiative of Alberta Energy to ensure Alberta's regulatory system for energy development is efficient; supports the province's competitiveness; and effectively supports the achievement of Alberta's public safety, environmental management, and resource conservation objectives and respects the rights of landowners.

### Products/Deliverables

A single regulator with responsibility for the regulatory functions required to issue approvals, and to monitor compliance with approvals, for all upstream oil and gas activities.

### Possible Implications for AAQMS

The single regulator for the energy sector will take over the regulatory functions of AESRD and the ERCB.

## Monitoring Working Group

### Purpose

Provide expert advice, viable options and recommendations on the future governance and funding of a new provincial monitoring, evaluation and reporting system. This advice is to include the mandate, scope, and roles and responsibilities of the various parties who could be involved in the provincial system.

### Products/Deliverables

A report that outlines and assesses governance options ranging from an arms-length public agency to a structure internal to the Government of Alberta. For each option identified, the report will describe: the proposed structure, its intended responsibilities, products and deliverables, and its relationships of authority, consultation, advice or accountability; how the option provides for effective management of the monitoring system; how the option contributes as part of the broader system of natural resource and environmental management; options, recommendations and implications of sustainable funding mechanisms and budgetary accountability; how and by whom decisions relating to allocating scarce resources will be made; transitional steps required to implement the option.

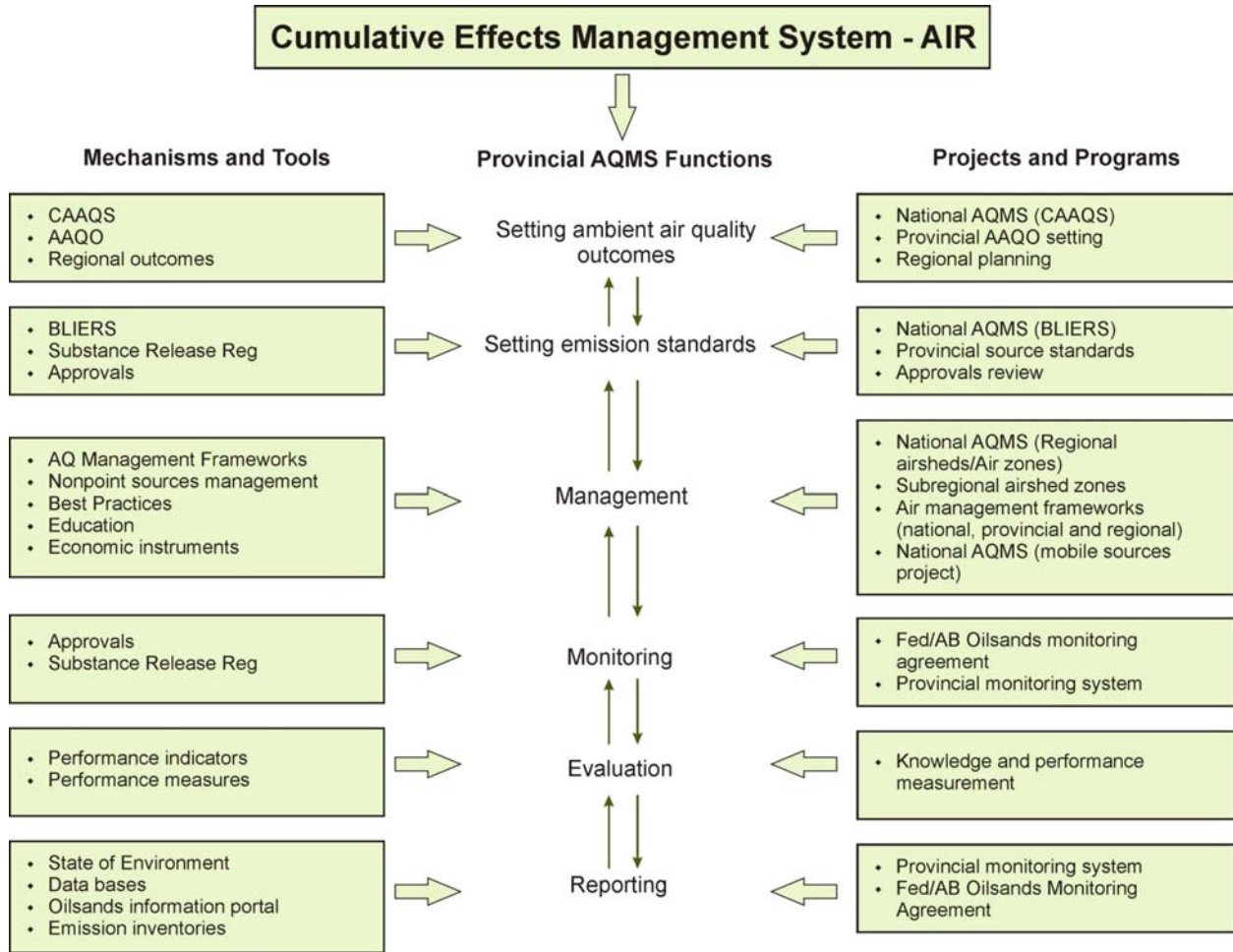
### Possible Implications for AAQMS

If the government accepts a recommended option, then some of the current uncertainties around monitoring may be resolved.

## Linkages Among Government Air Quality Initiatives

The GoA has summarized its initiatives in relation to Cumulative Effects Management as the delivery mechanism, as shown in *Figure 4*.

**Figure 4: Linkages among government air quality initiatives**



Source: *Air Quality Management in Alberta: How the Pieces Fit Together*. Stephanie Clarke, CASA Coordination Workshop, 29 May 2012.

## Summary of Implications of Current Government Initiatives

The **National AQMS** will bring new emissions standards and ambient air quality objectives that will require adjustments by the Alberta government. The trigger levels, if more stringent, will replace those in existing provincial or CASA frameworks. Air zones are to be created for the entire province to manage air quality, if required. This could lead to a change in the boundaries of existing Airshed Zones, if they are to assume this role.

**CEMS and Land Use Framework** regional plans are also likely to create sets of trigger levels similar to those set out for the Lower Athabasca Regional Plan in its Air Quality Management Framework. AZs may be asked to take on additional tasks related to increased education and promotion of clean air practices. This would require continuity in funding to be effective.

**Integrated Monitoring, Evaluation and Reporting** suggests that air quality data may be combined with other environmental data, perhaps replacing the CASA Data Warehouse. This may result in a different set of reporting formats and standards for Airshed Zones.

The **Clean Air Strategy for Alberta** will set out actions that AESRD and GoA will take with respect to managing air quality in the future. It may change the roles that various players will have as the strategy is implemented.

The **Regulatory Enhancement Project** could make a new single regulator for the energy sector a more significant player at both AZs and CASA.

The **Monitoring Working Group** is tasked with developing an implementation plan for recommendations from the Alberta Environmental Monitoring Panel, including the development of an arms-length monitoring agency. Such an agency with sustainable funding for monitoring could significantly change the current funding sources and rules for AZs. It could resolve the long-standing problem AZs have had with respect to emitters who do not presently contribute to AZ monitoring activities. If AZs continue to be responsible for zonal monitoring, then there will likely be a stronger reporting relationship to this new entity. If funding originates within the central monitoring agency, then AZs may become accountable to that agency and this in turn could affect their local autonomy.

## OBSERVATIONS AND CONCLUSIONS

### Strengths of the Current System

Since the mid 1990s Alberta has encouraged and assisted in the funding of a “distributed” air quality management model; one that engages stakeholders in:

- planning regional air quality networks;
- managing the deployment and operation of monitoring equipment;
- collecting air quality data;
- reporting data to a central repository;
- participating in data quality discussions with government staff; and
- communicating with local residents on locally relevant air quality issues.

This high level of stakeholder engagement in the business of air quality management extends through the whole of the air quality management system, up to and including the development of policy advice to Government of Alberta Ministers on major air quality issues important to Albertans.

While it may be difficult to quantify all of the benefits associated with this high level of stakeholder engagement, there is no doubt that it has resulted in very committed groups of knowledgeable stakeholders that enjoy the broad support of their communities. Alberta’s unique experience with local stakeholder engagement in air quality monitoring may well be reflected in emerging national AQMS guidance regarding the establishment of AZMTs within provinces.

The ability of regionally-based airshed zone management teams to communicate with local interests and to respond quickly and effectively to emerging air quality issues is critical to the effective delivery of a trusted and credible air quality management system. The challenge then is to determine the best means to build on Alberta’s enviable track record at the regional level (e.g. other jurisdictions are now looking to emulate Alberta’s provision for local stakeholder inclusion), while making improvements upon the air quality management system overall, including scientific rigor, standards and sustainable resourcing.

Maintaining the widespread interest and support of regional stakeholders who are already heavily engaged in, and committed to, the development of a high quality air quality management system will be central to the success of planned system improvements.

### Uncertainties and Gaps

Any discussion about the design and delivery of the AAQMS should be prefaced with the understanding that, on the whole, roles and responsibilities within the air quality management system are reasonably well understood and the current system functions reasonably well.

There are however a number of uncertainties or gaps worth noting.

- ▶ The plethora of current government initiatives has led to considerable uncertainty about the future with respect to: airshed boundaries, the extent of monitoring that may be required, the extent of air quality planning that may be required, the amount of outreach and education expected, the resources to undertake expanded tasks, reporting relationships, and potential loss of local autonomy. Uncertainty stems from the fact that initiatives are incomplete and implications not clarified, and from disruption due to government restructuring.
- ▶ Airshed Zones already experience a number of pressures, such as participation by NGOs and the public being voluntary, small emitters not contributing funding, not all emitters participating, and timeliness of data delivery.
- ▶ Some perceive a gap in that not all areas of the province are covered by AZs and hence are lacking in air quality monitoring.
- ▶ AZs have no formal reporting relationship with government except through contracts for operating a limited number of provincial monitoring stations. Historically CASA has 'endorsed' AZs, but the significance of that endorsement, beyond ensuring that a prospective AZ has met certain start-up requirements, has been questioned.
- ▶ From time to time AZs are called upon to justify the value of their work, and it has been suggested that a reporting tool should be created to demonstrate the ongoing value of AZs. Local perspectives and local input are valued within their respective communities and there is a concern that government initiatives will introduce a more top-down approach, at the expense of that local focus.
- ▶ The link between regulatory requirements of industry and AZ activities is somewhat tenuous. For AZs that base funding on emissions, there are struggles to obtain recent emissions data, get consistent emissions estimates for all sources, and keep ownership (and addresses) up-to-date. While licensed emitters pay to support monitoring that fulfills their regulatory obligations, they do not pay for the development of air management plans.
- ▶ Human resource capacity is an issue; experienced personnel are difficult to recruit and retain. Formal training for personnel in most parts of the air quality management system is hard to find; most practitioners learn on-the-job.
- ▶ Research and development specific to air quality is diffuse and difficult to track and apply.
- ▶ Environmental effects monitoring is sporadic and no standardized reporting systems exist in Alberta.

### System Challenges

In this discussion paper, the structure of the Alberta Air Quality Management System has been described, along with the organizations that are involved, how they relate to one another, and issues these organizations currently face. Recent government initiatives have led to uncertainty about the future of these organizations and their relationships. The Alberta Air Quality Management System as a whole faces four main challenges related to mandates, funding, effectiveness and evolution. Each of the challenges described below has 2-3 key questions that need to be answered. The Joint Standing Committee may choose to answer some of the questions directly, provide analysis to assist the government in answering the question, or leave the deliberations entirely to government.

#### 1. Mandates, Authorities and Accountabilities

Currently AZs exist as not-for-profit corporations under the Alberta *Societies Act* for the purpose of conducting regional air quality monitoring in lieu of compliance monitoring for industrial facilities holding *EPEA* approvals. They also operate a few provincial stations under contract to AESRD, and undertake public education on air quality. Designated AZs have developed ozone management plans under contract to AESRD.

Government has not authorized or delegated to AZs a formal regulatory role, beyond the indirect reporting of air quality data on behalf of licensed emitters. Similarly, the AAC has no formal system mandate beyond that provided by its AZ sponsors.

The possibility of greater discipline in the system with respect to governance and funding (i.e., as a result or pending recommendations from the Interim Monitoring Working Group), may need to be rationalized against the historic local autonomy that AZs enjoy, and a greater degree of accountability that comes with sustainable public funding or delegated authority as an agent of government (e.g., a 'delegated organization').

Key questions for consideration:

- 1.1 Where do AZs get their mandate? Should AZs receive a formal mandate for the functions they deliver? What degree of accountability and reporting is appropriate for delivery of important parts of the Alberta AQMS?
- 1.2 Should AZs be more closely integrated with the regulatory regime? Should there be a formal reporting relationship to AESRD? How would formal authority mesh with the local autonomy of AZs? Would local issues be addressed appropriately in a more closely integrated and managed governance structure?



## JSC Discussion Paper

- At what point does the role of AZs become more onerous than the existing volunteer system can handle? Can the AAQMS operate effectively into the future given its discretionary nature? How can the current network of volunteers be held responsible for monitoring linked to industrial approvals?

1.3 What is the purpose and fit for the Alberta Airsheds Council in the AAQMS? What functional gaps can it fill?

- Can AAC and CASA roles be made complementary?
- Should CASA play a greater role in aligning or supporting AZ roles and responsibilities?

## 2. Sustainable Resourcing

For the Alberta AQMS to function effectively, all parts of the system must be sustainable – financially, technically, and from a human resource perspective. The capacity of government and its partners in the AAQMS is often strained and over-taxed. Formal training is limited and there is little targeted research and development in air quality. Government scientific and technical capacity has also been strained in recent years.

Airshed Zones, which collect the bulk of ambient air monitoring data in the province and to date have done most of the regional air quality planning, do not have any assurances about the level of financial support they will receive from year-to-year. AZs also operate with volunteers on their Boards of Directors. NGO and public participation on AZs can be difficult to secure because those members also donate their time. Although personnel in industry and government are paid for their time, staff turnover often means that new representatives have little knowledge about the operations of the AZs or the AAQMS.

Key questions for consideration:

2.1 How can the AQMS be assured of a more consistent and sustainable resourcing stream to allow for multi-year planning and delivery?

- Whose job is it to pay for supporting sub-regional air monitoring activities? Should education and planning activities be funded entirely by polluters, by government, or both?
- What is a fair and equitable means of determining financial contributions? Should all emitters be brought to the table? By what means would diffuse emitters like transportation and agriculture make the appropriate contribution?
- What would funding guarantees mean in terms of accountability or the need for consistency and structure across AZs?
- What level of management/technical/science capacity needs to be maintained across the system to support credible levels of air quality management for Albertans?

### 3. Operational Effectiveness

Although AZs share many common features, they also differ greatly in many ways. There are advantages in terms of flexibility to address local issues, but also disadvantages in terms of efficiencies.

The AAQMS currently relies on an informal set of connections to communicate with constituencies with interests in air quality monitoring and management. Much depends on the volunteer efforts of those constituency representatives who are at the table. The result is reliance on an informal and inconsistent network to carry important air management guidance to and from affected interests.

There is the potential to develop tools, templates and common messages to enhance air quality communications and public awareness. This could happen in a variety of ways, but might best be handled through some sharing mechanism where AZs, AAC, CASA, AESRD all contribute to some form of open source resource (e.g., an interactive community of practice section on a website). All parties would like to do more, but resources are limited.

Key questions for consideration:

- 3.1 How much standardization is desirable? Should there be consistent sets of core parameters (ambient air quality, environmental effects) or basic data analysis? Should there be a common toolbox?
- 3.2 To what extent should AZ business models and operating practices be aligned? Can operational effectiveness be improved across the system? Are efficiency gains possible through realignment, pooling of resources, common administration or other operational changes?

- Are there economies of scale (e.g. laboratory analysis or data review)? Are there common functions that can be shared (e.g. administration, websites, emissions inventorying, databases, methodologies, training)? What things lend themselves to coordinated action (e.g. messaging, communications tools, information sources)?

### 4. Evolving the Alberta AQMS

The many recent government initiatives have raised questions about the future roles of AAQMS players in delivering the operational functions of the system. There are opportunities to prescribe what gets monitored, how it gets monitored, and to what standards.

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The AESRD has developed a new air monitoring directive that may cover much of this requirement and which may, in any case, be assigned to a new independent monitoring body (e.g, commission or delegated authority). The future role of stakeholders in offering advice with respect to the accessibility, transparency, and utility of data, and other matters of interest to stakeholders, is not addressed in any guidance.

Key questions for consideration:

4.1 How can air quality management be “integrated” with water, land and biodiversity? What does “integrated” mean in the monitoring world and what are the implications for deliverers? Who is the consolidator/integrator?

- What will be expected of AZs in the future? Who will do local air quality monitoring, evaluation and planning in parts of the province where airsheds have not been designated? Would Airsheds Zones need to change their make-up in some way?
- Is a more homogenous approach to air management planning needed given the direction being taken by LUF and CEMS? What will constitute an air management plan under the new planning and monitoring framework? Is there a template that can be used and how will it be administered? How can CASA, the AAC or AZs assist in developing regional plans?

4.2 What adjustments would make sense in order to effectively implement the new National AQMS? Could AZ boundaries be re-aligned? What new members would be brought onboard? What new monitoring might be required?

4.3 How will continuous improvement be assured? How do we improve our understanding of the air quality system?

- Is the level of dependence on voluntary engagement delivering expected science-based outcomes?

## APPENDIX A – GLOSSARY OF TERMS

The following defines terms as they are used in this report.

Air Management Framework	approach to air quality management in Alberta's regional land-use plans using indicators of air quality, with triggers and limits to define management responses to the cumulative effects of development.
Air quality dispersion modelling	applying a mathematical representation of atmospheric processes to determine the behaviour of airborne pollutants, and the resulting ambient air quality concentrations.
Air quality monitoring	periodic or continuous measurements to determine the concentrations of substances in the atmosphere.
Alberta Association of Municipal Districts and Counties (AAMDC)	an independent association comprised of Alberta's 69 counties and municipal districts, which provides advocacy and aggregated business services to assist rural municipalities achieve effective local government.
Alberta Urban Municipalities Associations (AUMA)	an independent association comprised of Alberta's 277 urban municipalities including cities, towns, villages, summer villages, specialized municipalities, and affiliated members, which represents and advocates the interests of all members to the provincial and federal governments, and provincial and federal organizations.
Ambient air	outside air; air not confined by walls and a roof.
Ambient air quality	relative amounts (concentrations) of gases, liquids or solids in the atmosphere, especially those substances that are not normal constituents.
Ambient air quality objective (AAQO)	numerical level of concentration or deposition that provides protection for human health and the environment, and provides the basis for air quality management plans.
Ambient objectives determination	process of developing ambient air quality objectives.
Applied Research and Development	investigations directed at the discovery of new knowledge, having specific practical objectives with respect to products, processes, or services. Development is the systematic utilization of the knowledge or understanding toward the production of useful materials, devices, systems, or methods, including design and development of prototypes and processes.

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Clean Air Strategy	general plan for maintaining or improving air quality. It expresses context and direction, major goals and broad courses of action, responsibilities and processes, priorities and resource allocations.
Communication	two-way process of reaching mutual understanding in which participants exchange information and create and share meaning.
Compliance	conforming to all air quality rules.
Consultation	communication between stakeholders and a sponsor through which both become better informed. Consultation provides participants with the opportunity to influence decision making.
Coordination	organization of the different elements of a complex activity so as to enable them to work together effectively.
Database	comprehensive collection of related quantitative or qualitative information organized for convenient access, generally in a computer.
Data management	administrative processes by which air quality measurements are acquired, validated, stored, protected, and processed, and by which accessibility, reliability and timeliness are ensured to satisfy the needs of users.
Data Quality Objectives	criteria for acceptable measurements.
Data ratification	periodic review perhaps quarterly or half-yearly, to assess long-term instrument performance. It is the final stage of data acceptance based on judgment and experience, using a wide variety of inputs. It is generally carried out by someone who is not part of the routine operations.
Data validation	rapid screening of measured values to catch errors and problems before the data enters permanently into a database. It is generally carried out by the network operator.
Dispersion	process of moving, breaking up and scattering substances released into the atmosphere.
Dispersion model	set of mathematical relationships, based on scientific principles, that relate emission rates of an air contaminant to the resulting ambient concentrations.
Education	learning process that increases knowledge and awareness about air quality and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action.

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Emission standard	quantitative or qualitative specifications of what may be released into the atmosphere; also known as source performance standards, technology standards, or equipment design standards. Quantitative standards specify numerical maximum values for properties, such as intensity (mass per unit production), concentration in a fuel or effluent (for example in mg/kg), or opacity (darkness of the emitted plume). Qualitative standards specify the type of equipment that may be used, the control devices that must be installed, or the type of the fuel that may be burned.
Emission target	total quantity of releases, or the reduction in releases, to the atmosphere by a source or group of sources, to be achieved at some specified date in the future.
Emissions inventory	database listing, by source, estimates of the quantity of specified air pollutants discharged into the atmosphere from within a defined area during a given time period (typically a specified year).
Emitter	an activity or operation that releases pollutants to the atmosphere.
Environmental effects monitoring	process of measuring the changes in a receptor over time, that may be attributable to air pollution.
Equipment calibration	multipoint checks of instrument output when known concentrations are introduced. For continuous air quality analyzers, this generally consists of zero verification and a minimum of three upscale points across the operating range of the analyzer.
Equipment check	regular visit to a monitoring station to verify proper operation. Activities typically include: zero/span verification, adjustments when outside of control acceptability, filter changes, replacement of consumables, cleaning of manifold lines, repairing any malfunctioning components.
Equipment maintenance	actions necessary to keep a monitoring instrument operating within its performance specifications.
Integration with economic activities	linking air quality management plans with other provincial plans for energy, transportation, agriculture, industry and municipal development.
Laboratory accreditation	assurance from a third party that a chemical analytical service has the capability and competence to perform the required analysis within the quality specifications.
Laboratory analysis	determining the chemical content of a sample in a facility containing specialized scientific equipment dedicated to making the required measurements.

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Licensed emitter	operation (normally industrial) holding an <i>EPEA</i> approval to release pollutants into the atmosphere, with requirements to monitor ambient air quality.
Meteorological analysis of data	search for relationships between atmospheric conditions and measured pollutant concentrations.
Monitoring Objective	goal or purpose of collecting ambient air quality data, such as addressing a problem, answering a specific question, determining trends, or checking for achievement of an outcome.
Non-regulatory actions	Activities aimed at changing attitudes and behaviors. Such actions include informational outreach to educate, convince and motivate (also known as social marketing), partnerships, agreements, voluntary codes of conduct, monetary incentives, and recognition programs.
Outreach	process of engagement with individuals and organizations, with the primary purpose of serving as a resource. Outreach is driven by two-way communication, and is focused on creating and sustaining mutually beneficial relationships, rather than on immediate outcomes. In contrast, sales and marketing are mechanisms for one-way messaging intended to achieve immediate actions for the benefit of the selling or marketing organization.
Parameter	measurable factor forming one of a set that defines a system or sets the conditions of its operation.
Program Review	assessment of an ongoing set of activities with respect to some combination of: cost and efficiency, outcome or impact, implementation according to plan, design and logic/theory, need.
Quality assurance (QA)	planned and systematic activities to ensure that data quality objectives are met.
Quality Control (QC)	techniques to prevent the generation of unacceptable data and take corrective action when data is determined to be unacceptable.
Quality system	organizational structure, procedures, processes and resources needed to ensure the acceptability of the output.
Reporting	submitting specified data to the regulatory agency or making data and information about air quality and emissions available to the general public, as the case may be.

## JSC Discussion Paper

Regulatory instruments	legal means by which governments implement air quality management plans. These consist of: (a) legislation (by elected representatives), (b) statutory regulations (under legislation) and (c) requirements such as standards, guidelines, permits, approvals, and mandatory codes of practice issued by government departments under authority of an Act or Regulation.
Research	systematic and methodical process of inquiry and investigation that increases knowledge and/or solves a particular problem.
Scenario exploration	consideration of alternative future industrial and urban development, and the implications for air quality.
Socio-economic analysis	evaluation of the costs and benefits an action will create for society by comparing what will happen if this action is implemented as compared to the situation where the action is not implemented. The analysis typically attempts to include also the effects that are indirect or incompletely reflected by market transactions. The analysis can be used to better understand how the various costs and benefits are distributed over the various affected parties in society.
Source	any activity that causes pollutants to be emitted into the atmosphere.
Source emission conditions	limits placed on releases to the atmosphere from a specific piece of equipment or facility. For a smokestack, this might include temperature, exhaust speed, quantity of pollutant, and methods for measuring the releases.
Source standard-setting	process of establishing emissions standards.
Station audit (Technical System Audit)	on-site review and inspection, conducted by an outside party, of an ambient air monitoring station to assess its compliance with established standards and practices governing the collection, validation, and reporting of ambient air quality data.
Statistical analysis of data	examining, summarizing, manipulating and interpreting air quality measurements to discover underlying patterns, relationships and trends.
Strategy	course of action selected from among alternatives as a means of achieving a goal or objective (or interest). The definition of a strategy is broad. A strategy may be general or specific in nature, and may describe a pattern, management standard, guideline, action, procedure or policy. Strategies express how, where and when to commit resources to achieve objectives.
Target	mark to shoot for; an aspiration or desirable goal.



## JSC Discussion Paper

Technology Transfer	movement of new technology from its creator or researcher to a user.
Training	acquisition of specific skills and competencies to be able to carry out some technical activity related to air management, for example, operating monitoring equipment, analyzing monitoring data or running dispersion models.
Trend	general direction in which something tends to move.
Trend prediction	extrapolating into the future an underlying pattern of changes in emissions or ambient air quality.

## APPENDIX B – AIR QUALITY MANAGEMENT SYSTEM FUNCTIONS AND RESPONSIBILITIES

**R = Responsible:** The body responsible this function/part of the system. Commentary defines distinctions.

**C = Contributing:** Those who provide consultative advice or supporting information/analysis. Commentary defines the role.

	AESRD/ GoA	CASA	AAC	AZ	Licensed Emitters	EC	Municipal Gov't.	Commentary
<b>1.0 Air quality monitoring</b>								
1.1 Define monitoring objectives	C	C		R	C		C	AZs set their own objectives to address local issues, guided by the CASA Air Monitoring Strategic Plan and AESRD guidance. AESRD and Industry are represented on AZ design teams.
1.2 Set data quality objectives	C	C		R	C			AESRD requires a quality system under the AMD.
1.3 Choose parameters, equipment & locations	C	C		R	C		C	The CASA Air Monitoring Strategic Plan, AESRD approvals and AESRD directives provide guidance.
1.4 Develop quality system	C			R	C	C		Includes assurance that accredited laboratories are used (AESRD policy) and may include checks in the form of spiked samples, replicate samples, or blank samples.
1.5 Check equipment				R				AZs generally out, except WCA and WBEA who operate with own staff.
1.6 Calibrate equipment				R				Completed by operators.
1.7 Audit stations	R					R		AESRD audits AZ stations; EC audits NAPS stations.
1.8 Validate data				R				Operators check the data before submitting it.

## JSC Discussion Paper

	AESRD/ GoA	CASA	AAC	AZ	Licensed Emitters	EC	Municipal Gov't.	Commentary
1.9 Ratify data	C	R		C		R		Usually a quarterly activity reviewing the data in conjunction with a variety of other information inputs. AESRD ratifies data for the CASA Data Warehouse. EC ratifies data for NAPS stations. AZs may also do further checking on their data.
1.10 Maintain database	C	C		R		R		AZs keep their own data and submit to CASA Data Warehouse, operated by AESRD. EC stores NAPS data.
1.11 Analyze ambient data (statistical, meteorological)	R	C		R	C	R	C	AZs interpret their data against their objectives and other requirements; AESRD, against provincial frameworks; EC, against federal requirements.
1.12 Report ambient air quality data	C	R		R	C	R		AZs report on their own websites and in various publications. CASA offers user-generated reports from the CASA Data Warehouse and produces annual performance measures. EC publishes periodic reports. The AZs report data on behalf of their member companies to fulfill legal requirements of approval holders.
1.13 Review program	C	R		R	C	R	C	Periodically CASA does a strategic plan for province. AZs also do periodic reviews of their monitoring networks. EC's program is overseen by a federal-provincial committee.
<b>2.0 Emissions inventory</b>								
2.1 List sources and pollutants emitted	R			R	R	R	C	EC requires emitters above a certain size to report to the National Pollutant Release Inventory. AESRD uses these data and questionnaires to compile inventories for provincial planning. AZs use information to determine who could be members and who should be billed.

## JSC Discussion Paper

	AESRD/ GoA	CASA	AAC	AZ	Licensed Emitters	EC	Municipal Gov't.	Commentary
2.2 Obtain available measurements of emissions	R			R	R	R		Industry submits data to the Energy Resources Conservation Board, AESRD, and Environment Canada. AZs obtain the data for their zones.
2.3 Estimate emissions for sources without measurements, including natural sources	R			C	C	R	C	Urban, transportation, area and natural source emissions need to be estimated from emission factors and models.
2.4 Maintain database	R			R		R		EC has the National Pollutant Release Inventory which is publicly accessible. AESRD has a database which is currently not publicly accessible. AZs keep their data in spreadsheets.
2.5 Analyze emissions data (trends, forecasts, dispersion)	R				C	R	C	Changes over time, forecasts into the future, and predicted ambient air concentrations using dispersion models are used to interpret the data.
2.6 Report emissions data	R				C	R		EC produces annual reports. AESRD reports periodically.
<b>3.0 Environmental effects information</b>								
3.1 Environmental effects information (ecosystem, health)	R	C		R	C	C	C	The Wood Buffalo Environmental Association has extensive terrestrial environmental effects program. The West Central Airshed Society and the Lakeland Industry and Community Association both do some ecological monitoring. The CASA Data Warehouse contains descriptions of various ecological monitoring projects in Alberta.

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	AESRD/ GoA	CASA	AAC	AZ	Licensed Emitters	EC	Municipal Gov't.	Commentary
<b>4.0 Air quality plan development</b>								
4.1 Establish objectives	R	C		R	C	R	C	The framework (from NAQMS or AESRD) triggering the need for the plan provides the primary objective. AZs can add related objectives.
4.2 Explore scenarios	C			R	C	C	C	AESRD and EC may provide technical assistance to AZs.
4.3 Formulate alternatives	C			R	C	C	C	AESRD and EC may provide technical assistance to AZs.
4.4 Evaluate alternatives (dispersion models, social, technical & economic analysis)	C			R	C	C	C	AESRD and EC may provide technical assistance to AZs.
4.5 Consult with public	C	C		R	C		C	CASA and AESRD may assist the AZ with public consultations.
4.6 Set targets	C			R	C		C	Emission targets can be global or sector-specific.
<b>5.0 Air quality plan Implementation</b>								
5.1 Regulatory actions	R	C			R	R	R	EC and AESRD would implement regulatory actions, industry would respond to the regulatory requirements. EC and AESRD would address any interprovincial or international aspects.
5.2 Non-regulatory actions	R	C	C	R	R	R	R	EC and AESRD may also use non-regulatory tools. AZs take non-regulatory actions commensurate with their resources. Industry may also volunteer to do more than is legally required.

## JSC Discussion Paper

	AESRD/ GoA	CASA	AAC	AZ	Licensed Emitters	EC	Municipal Gov't.	Commentary	
<b>6.0 Government Regulatory Systems</b>									
6.1	Develop legislation	R	C			C	R	R	AESRD has <i>EPEA</i> ; EC has the <i>Canadian Environmental Protection Act</i> ; Municipalities have Bylaws.
6.2	Develop regulatory instruments	R	C	C		C	R		Under the relevant Acts, includes codes of practice, directives, objectives, and guidelines.
6.3	Issue Approvals	R				C			Contain emission limits and monitoring requirements, both source and ambient.
6.4	Develop Regional Air Quality Management Frameworks	R	C	C	C	C		C	Developed under the Regional Land Use Plans and Cumulative Effects Management System.
6.5	Develop Provincial Strategies	R	C	C	C	C	C	C	The Clean Air Strategy for Alberta, developed with input from CASA, will be the main air strategy. Both the Energy Strategy and the Climate Change Strategy have linkages to air quality.
6.6	Develop provincial air quality policies	R	C	C	C	C		C	CASA provides advice on selected policies. AZs are consulted on policies related to monitoring.
6.7	Establish ambient air quality objectives	R	C			C	R		CASA holds a periodic workshop for AESRD to set priorities for developing ambient air quality objectives; EC plans to establish Canadian Ambient Air Quality Standards (CAAQS).
6.8	Establish emission standards	R	C			C	R		CASA has assisted AESRD in setting standards for the Electricity Sector, and the Energy Resources Conservation Board, for Flaring and Venting. EC plans to set new standards (BLIERS) for a number of industrial sectors.
6.9	Ensure compliance	R				R	R		Industry must meet its legal obligations, assurance provided by EC nationally and AESRD provincially.

## JSC Discussion Paper

	AESRD/ GoA	CASA	AAC	AZ	Licensed Emitters	EC	Municipal Gov't.	Commentary
<b>7.0 Supporting Services</b>								
7.1 Communication	R	R	R	R	R	R	R	Includes education to inform and induce behavior change, outreach to build relationships, and marketing to promote programs. Every organization undertakes such activities.
7.2 Coordination	R	R	R	R	C	C	R	AESRD coordinates the government of Alberta. CASA coordinates government, industry and NGOs for provincial air policies. AAC coordinates AZs and provides a link with CASA. AZs coordinate air activities among their members.
7.3 Training								Skills in ambient monitoring, modelling, emissions measurement, data analysis etc. are mostly learned on-the-job; educational institutions provide only general background; some short-term training programs are available sporadically through the US Environmental Protection Agency, the Air & Waste Management Association and private firms.
7.4 Research & Development								Control technology is often undertaken by Industry Associations. Alberta Innovates has some programs as does the federal government. Measurement technology improvements reside with instrument manufacturers. Pollutant effects are studied sporadically by academics with grants from various sources. EC investigates atmospheric processes. Model development for use in planning relies on the United States Environmental Protection Agency.

## APPENDIX C – RELATIONSHIPS AMONG THE PLAYERS IN AAQMS

Reading from left to right, the party in the left hand column performs the action indicated for the party in the respective column across the page. A dash means that any connection is indirect.

### Relationships among the players in AAQMS

	AESRD/GoA	CASA	AZs	AAC	Municipal Governments	Industry Associations	NGOs	Licensed Emitters	EC/GC
AESRD/GoA		Provides core funding; contracts for Data Warehouse through CASA; funds specific projects	Enables Licensed Emitter participation through Approval clauses; contracts for operation of a few provincial monitoring stations; contracts for development of AQ plans; provides some grant money for general activities	–	Coordinates with Municipal Affairs; ensures monitoring data available for major cities	Consults on policies, rules, and regulations	Consults on policies, rules, and regulations	Sets out the rules for operation; issues approvals; requires monitoring	Provides provincial viewpoint; coordinates on national activities; fulfills requirements under NAQMS
CASA	Provides Multi-stakeholder advice; arranges CDW operation		Provides process support and start-up assistance	Coordinates through a Joint Standing Committee	Provides forum for discussion of air issues	Provides forum for discussion of air issues	Provides forum for discussion of air issues	–	Provides window into provincial air quality activities



## JSC Discussion Paper

	AESRD/GoA	CASA	AZs	AAC	Municipal Governments	Industry Associations	NGOs	Licensed Emitters	EC/GC
<b>AZs</b>	Operate a few provincial monitoring stations under contract; may develop local air quality management plans	Provides data to CASA Data Warehouse		Bring common issues for discussion	Provides monitoring data and educational campaigns	–	Provide forum for local air quality issues	Provide forum for community relations	–
<b>AAC</b>	Lobbies on behalf of AZs	Coordinates through JSC	Determines common interests and lobbies on behalf		–	–	–	–	–
<b>Municipal Governments and Associations</b>	Associations provide input	Associations participate	Participate	–		–	–	Approve land use	–
<b>Industry Associations</b>	Provide input on policy proposals	Participate	–	–	–		–	Represent common interests	Provide response to policy proposals
<b>NGOs</b>	Provide input on policy proposals	Participate	Participate locally	–	Provide input locally	–		Critique new projects and performance of existing operations	Provide response to policy proposals
<b>Licensed Emitters</b>	Operate within rules; report on performance-emissions and ambient	–	–	–	Comply with bylaws	Bring common issues for discussion	Respond to critiques		Operate within rules

### JSC Discussion Paper

	AESRD/GoA	CASA	AZs	AAC	Municipal Governments	Industry Associations	NGOs	Licensed Emitters	EC/GC
EC/GC	Consults and coordinates on national air quality management	Participates on Board of Directors	May provide some technical support	-	-	Consults on policy and regulations	Consults on policy and regulations	Establishes federal operating requirements	

## APPENDIX D – SOME CHARACTERISTICS OF AIRSHED ZONES

Based on 2009 data

Airshed Zones	Airshed Area km <sup>2</sup>	Airshed Population	Continuous Monitoring	Passive Monitoring	Bio-Monitoring	Ozone Mgmt Plans	Members	Budget
Alberta Capital Airshed Alliance	4,500	960,000	0	0	0	Y	18	134,000*
Calgary Regional Airshed Zone	29,900	1,124,300	3	0	0	Y	34	321,000
Fort Air Partnership	4,500	76,800	8	57	0	Y	33	749,000
Lakeland Industry and Community Association	18,000	30,000	4	25	1	N	12	344,000
Palliser Airshed Society	40,000	100,000	2	20	0	N	61	203,000
Parkland Airshed Management Association	42,000	260,000	4	34	0	Y	60	746,000*
Peace Airshed Zone Association	38,500	85,000	6	48	0	N	66	580,000
West Central Airshed Society	46,000	113,000	13	14	7	Y	64	840,000
Wood Buffalo Environmental Association	68,500	104,300	15	40	20	N	27	8,389,000

\* 2008 data only

Source: Zirnhelt, N., Suzuki, N., Angle, R., Bates-Frymel, L., Gilbert, M. and Melancon, S. (2012); "Airshed Planning: Involving Communities". In: Taylor, E. and McMillan, A. (editors) *Air Quality Management - Canadian Perspectives on a Global Issue*. Springer (in press).

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