2 AIR QUALITY MANAGEMENT FRAMEWORK

2.1 Introduction

The issue of managing cumulative effects associated with air emissions is of particular concern to Fort McKay as the community's location, and the current and planned developments within its Traditional Territories, have resulted in, and will continue to result in, air emission related cumulative impact issues. Fort McKay experiences regular poor air quality events, and has seen its air quality deteriorate significantly as a result of oil sands development. This deterioration in air quality has had a significant adverse effect on the quality of life of Fort McKay community members. The reluctance to be exposed to air of poor quality, with strong odours, and with significant particulate matter, impacts community members' abilities to pursue activities protected by their Constitutional rights. It especially affects the right to enjoy reserve lands.

Air quality impacts are a major environmental and health and wellbeing issue associated with oil sands development and a major concern for Fort McKay. The *Royal Society of Canada Expert Panel Report* (2010) [1] noted that:

> *"…the environmental footprint of bitumen production activities is considerable with major, air water and land dimensions. Air emissions are large both absolutely and in comparison to those associated with conventional crude oil production in the province and other industrial activities."*

and that:

> *"Fort McKay is the First Nations settlement located amidst several major oil sands developments and is the community most vulnerable to air quality impacts from current oil sands development."*

The importance of air quality in terms of quality of life is well recognized. The Federal Government [2] identifies air quality as one of the indicators of well-being in Canada and notes that:

> *"Air pollution has significant negative effects on human health, on the natural environment and, consequently, on economic performance."*

The World Health Organization (2000) [3] indicates that:

> *"Clean air is considered to be a basic requirement for human health and wellbeing."*

The issue of the impact of air quality on traditional land uses was addressed by the Joint Review Panel Report [4] for the Shell Jackpine Mine Expansion which noted that:

> *"While the Panel is satisfied that the Project will likely not contribute in a significant way to health issues related to air contaminants, the Panel believes*

that perceived bad air quality and unpleasant odours could foster the avoidance of traditional use."

The issue of air quality and health and wellbeing was also addressed in *The Royal Society of Canada Expert Panel Report* (2010) [1] which indicated that:

> *"…the air monitoring station in the nearby community of Fort McKay has not detected these occurrences of guidelines being exceeded, but odour is certainly recognized as a problem for this community. Although odour has often been considered a nuisance rather than a health effect, chronic odour problems become a burden on community well-being which ultimately leads to stress with the possibility of associated health effects. Resolution of the odour problems being caused by oil sands developments is clearly necessary."*

Odours, and associated airborne compounds originating from industrial operations, continue to be a major air quality issue in Fort McKay.

The Lower Athabasca Regional Air Quality Management Framework (LAR-AQMF) represents a small and very limited, but nevertheless important, first step towards addressing some of Fort McKay's air quality issues associated regional oil sands development.

The intent of this position paper is to outline the limitations of the current LAR-AQMF in terms of protecting Fort McKay's Constitutional rights, and in terms of managing air emissions and air quality, and to make recommendations has to how the LAR-AQMF could be expanded and improved in terms of addressing both Fort McKay's and the region's air quality and odour management issues.

2.2 Framework Analysis

2.2.1 The Current Framework and its Application as a Management Tool

The Lower Athabasca Regional Plan (LARP) Air Quality Management Framework (AQMF) is a regulatory tool intended to assist in the proactive management of the ambient air quality levels of NO_2 and SO_2 in the LARP. The goal is to ensure that the provincial objectives for these substances are never exceeded and that in general air quality is maintained well below objectives and limits. The AQMF indicates that it "…provides an additional component for the region in the overall air quality management system. This includes setting ambient air quality triggers and limits for nitrogen dioxide (NO_2) and sulphur dioxide (SO_2) with guidance for long-term decision making and management." It also states that it is"…intended to add to and complement, not replace, existing policies, legislation, regulations and management tools."

In terms of scope, the selection of NO_2 and SO_2 as initial parameters for management is appropriate as these two substances are emitted in large quantities by oil sands development and therefore represent a good starting point. Emissions of these substances also have a significant impact on regional air quality. The AQMF is structured such that current annual Alberta Ambient Air Quality Objectives (AAAQOs) for NO_2 and SO_2 are used as limits for annual average concentrations and two trigger levels below the limit are set at 1/3 (trigger level 2) and 2/3 (trigger level 3) of this annual

limit. An hourly metric of the 99th percentile of annual hourly NO_2 and SO_2 readings is also part of the Framework, and it has the same structure: a limit and two lower trigger levels which also set at 1/3 (trigger level 2) and 2/3 (trigger level 3) of the 99th percentile limits. The intent of the trigger levels is to ensure air quality management actions are taken before air quality exceeds the AAAQOs.

The Framework is "measurement based." This approach to air quality management was first applied in the province under the CASA PM and Ozone Management Framework2 for the Canada-wide standards (CWS) for PM and Ozone which was adopted as a Provincial air quality management policy (CASA, 2003)[5]. Recently the approach was adopted nationally for the new Canadian Ambient Air Quality Standards (CAAQS) for PM and Ozone [6].

The approach used in the AQMF is therefore well established and widely accepted by government, industry and non-government stakeholders. However, unless modelling predictions are also used to identify when, where and why trigger limits or limits might be exceeded, and appropriate proactive emission and development decision actions taken, the Framework is a "reactive" tool even if it has early warning trigger levels. The issue being that: if reliable modelling shows that additional development will likely result in exceedance of a level 3 trigger, should you wait for that level 3 trigger to be exceeded before taking action? The other issue is that monitoring cannot occur everywhere and therefore there might be trigger level or limit exceedances in a region that the air monitoring system doesn't detect.

The AQMF is cited as a tool to proactively manage the cumulative effects of emissions on air and yet it doesn't address the potential multi-pollutant effects of NO_2 in combination with O_3 and $PM_{2.5}$. For example at the current AQMF level 3 99% hourly trigger for NO_2 (62 ppb) combined with background regional levels for O_3 (20 ppb) and $PM_{2.5}$ (5 ug/m3) translates to an Alberta Air Quality Health Index level of approximately 7 which is "high risk". The single pollutant by pollutant used in the AQMF therefore does not address the cumulative impacts of air pollutants and even the level 3 trigger for NO_2 alone is not protective of health when even background levels of other air contaminants are considered.

While the AQMF is very limited in scope and application, it is based on sound principles and can be a useful tool in the management of ambient concentrations of NO_2 and SO_2 with the appropriate supporting monitoring but is in general reactive and therefore has significant limitations as a cumulative effects and proactive development planning and emissions management instrument.

2.3 The AQMF in the Context of a Comprehensive Air Quality Management System

Air quality standards and objectives, and air related environmental effects management frameworks, generally set environmental thresholds and targets, and outline how and where the thresholds/targets are to be applied and measured as well as the management actions to be taken if and when thresholds/triggers are exceeded. Thresholds/triggers can be based on measurement, modelling or both. Such frameworks are generally intended to address cumulative effect issues associated with multiple developments/stressors on a long temporal and large spatial scale.

The AQMF outlines the elements of a cumulative effects management framework, which are:

- indicator selection
- triggers and limits for the indicator
- monitoring and/or modelling of indicator
- action if necessary based on triggers and measured/model results.

Fort McKay was consulted during the development of the LARP AQMF and provided detailed reviews of drafts of the Framework. In general, Fort McKay supported the management approach, and with some caveats, the triggers/limits used in the Framework. However, Fort McKay's recommendations regarding parameters for measurement were not reflected in the final draft.

The principle concern with the AQMF is that it is too limited in scope and lacks many of the elements necessary to be an effective air quality management tool. These concerns can be categorized as those relating to:

1. Application relative to other regulatory tools
2. Adequacy of current limits and triggers
3. Management responses
4. Aboriginal engagement

2.3.1 Application of the AQMF Relative to Other Regulatory Tools

As noted above, the AQMF indicates that it is: "…intended to add to and complement, not replace, existing policies, legislation, regulations and management tools." In its review of, and input into, drafts of the AQMF, Fort McKay also supported this context for the AQMF i.e. that it is not a stand-alone instrument for managing the potential cumulative effects associated with NO_2 and SO_2 emissions. Despite the fact that it is a "measurement" based tool, it is still occasionally being interpreted by the AER and proponents as a substitute for predictive tools and the principles of keeping clean areas clean and pollution prevention. It is therefore a concern of Fort McKay's that the AQMF is now being given a larger policy role than was originally intended. For example the Joint Review Panel Report [4] for the Shell Jackpine Mine Expansion stated that:

> *"The Panel stresses the importance of the air quality framework as being key to limiting the cumulative effects on the region's airshed."*

and

> *"The Panel believes that the LARP air quality management framework provides an appropriate mechanism for managing emissions to avoid exceedances and associated health effects. "*

This perspective is contrary to the AQMF itself which affirms the provincial environmental principles of:

- *pollution prevention through the application of best available technology economically achievable*
- *emission minimization through best management and control practices, and*
- *continuous improvement and keeping clean areas clean,*

which are the primary tools for managing emissions and preventing or minimizing significant cumulative impacts. In addition to these principles ESRD (2013) [7] outlines how emission modelling and AAAQOs are to be used in project approval and cumulative effects assessments.

The following excerpts from ESRD (2013)[7] are provided to support this position:

> *"Alberta Environment and Sustainable Resource Development has a number of key policies that guide the management of industrial emissions to the atmosphere, as follows:*
>
> - *industrial facilities must be designed and operated to prevent pollution;*
> - *each industrial source must use technology that allows for a high level of control of emissions as outlined in an applicable source emission standards document or approval;*
> - *residual emissions must be dispersed through a stack designed to keep ambient concentrations below ambient air quality objectives;*
> - *cumulative impacts from multiple sources must be assessed and remain below the assimilative capacity of the airshed as defined by ambient air quality objectives;*
> - *industrial operators are generally responsible for monitoring source emissions and the resulting ambient concentrations around their facilities as specified in their approvals, to demonstrate compliance with emission limits and ambient air quality objectives, and*
> - *industrial operators must report, or cause to be reported in cooperation with others as part of an air quality monitoring zone, the monitoring results to the regulatory agency.*

and

> ***"Dispersion Modelling***
>
> *Dispersion models are tools that link residual source emissions (after pollutant minimization) to ambient air concentrations in a given area. Once an emission limit, based on technology capability as outlined in an approval, has been proposed for a particular source, computer models are used to determine the required stack height or source release conditions to disperse residual substances such that the concentrations resulting from all cumulative emissions in the area remain below the Alberta Ambient Air Quality Objectives. Dispersion modelling is also used in the siting of ambient air monitoring stations in the vicinity of industrial facilities, and takes into account the cumulative impact of all other sources emitting similar substances in the area."*

These principles and policies clearly indicate that emission minimization and modelling are the initial tools to be used in assessing project and cumulative effect air emission effects and in making project development approval decisions.

The current AQMF is therefore the "*after approval*" tool used to assess whether or not development decisions and related anticipated/predicted air impacts are what was expected with respect to impacts on ambient NO_2 and/or SO_2 levels.

2.3.2 Air Quality Limits/Triggers

The use of the AAAQOs as the basis for the NO_2 and SO_2 limits and management triggers is a concern since ESRD (2013) [7] acknowledges that "[a]s the ambient air quality objectives are in many cases not entirely protective of human health and the environment, efforts are made to improve air quality in order to stay well below ambient air quality objectives and if the circumstances warrant, to lower the ambient air quality objectives over time." This is true of the AAAQOs for NO_2 and SO_2 which are generally well above WHO (2000, 2005) [3, 8] health based ambient air quality guidelines which might themselves not even be fully protective of health. Table 2-1 compares the AAAQOs for NO_2 and SO_2 to the WHO 2000 and 2005 Guidelines. Based on the WHO guidelines adverse effects would be expected at the level 3 trigger levels and in some cases between the level 2 and level 3 trigger levels. As noted above in the comments under "Current Framework" the level 3 trigger for NO_2 is a "high risk" level in terms of the Air Quality Health Index.

Therefore while the approach for managing air quality in the AQMF has merit, the limits and trigger levels in AQMF are such that actions are being triggered after air quality levels are at adverse effect levels rather than before these levels are reached which is not protecting human health or the environment.

Table 2-1: A Comparison of the AAQOs and WHO Guidelines for NO_2 and SO_2

Parameter	Averaging Period	AAAQO (µg/m³)	WHO (µg/m³)
Nitrogen Dioxide (NO_2)	1 hour [1]	300	200
	Annual	45	40
Sulphur Dioxide (SO_2)	10 minute	No limit (1 hour limit translates to approximately 750)[2]	500
	1 hour[1]	450	No Limit (10 min limit translates to approx. 300)[2]
	24 hour	125	20
	Monthly	30	No limit
	Annual	20[3]	10[3]

[1] The hourly values are used in the AQMF to calculate the 99th percentile of hourly data limits and level 2 and 3 triggers.
[2] Based on averaging period conversion approach recommended by: Ontario Ministry of Environment. (2009). Air Dispersion Modelling Guideline for Ontario - Guidance for Demonstrating Compliance with The Air Dispersion Modelling Requirements set out in Ontario Regulation 419/05: Air Pollution – Local Air Quality.
[3] These values are based on vegetation protection

2.3.3 Management Response/Actions

The AQMF lists a number of steps that will be followed when limits or trigger levels are exceeded. These are:

- verification,

- preliminary assessment,
- investigation,
- mitigative management actions,
- oversight/delivery of management actions,
- evaluation, and
- communication

The AQMF also lists a number of possible management actions for each of the different exceedance levels i.e. limit (level 4), level 3 trigger and level 2 trigger.

While these steps and the possible management actions listed in the AQMF are appropriate there is an issue of timelines and development logistics. For example the exceedance of a limit or trigger level could take over a year to verify and then the development of an action plan another year or two. In the intervening 2 to 3 years a number of new projects could have commenced operation and other projects could have been approved which complicates management planning and presents challenges for companies in terms of environmental planning. The only way to address this issue is to use emission minimization and modelling predictions to guide project approval decision in order to minimize the potential that trigger levels are exceeded.

2.3.4 Aboriginal Engagement

The AQMF has provision for First Nations and Métis engagement at a number of stages in the assessment of trigger level or limit exceedances and the development of associate management actions. These include:

> *"Investigations of industry stations that exceed ambient air quality triggers (annual average or 99th percentile of hourly data) could involve the identified facilities and might involve forecasting trends and understanding future operational and development plans. Where such stations are on First Nations or Métis traditional lands, the appropriate communities would also be notified."*
>
> *"When community monitoring stations are influenced by industrial sources … In such cases, all relevant stakeholders, and First Nations and Métis peoples would be involved."*
>
> *"Level 2 – Alberta Environment and Sustainable Resource Development will define implementation timelines, tools and parties including First Nations and Métis peoples to be involved in management actions by considering the ambient air quality levels and magnitude of trends as well as the type, location and number of air monitoring stations measuring those trends."*
>
> *"Level 3 - Identify Pressures and Measures Required to Prevent Reaching Air Quality Limits*
>
> - *Identify stakeholders, First Nations and Métis roles and inclusion*

- *Identify urgency of and need for measures*
- *Identify, if required, measures and appropriate tools for managing ambient air quality*
- *Implement identified action*
- *Communicate to the public, stakeholders, First Nations and Métis peoples"*

> *"Level 4 - Alberta Environment and Sustainable Resource Development retains the responsibility to implement an emissions-reduction plan for the affected area. This will include identifying the parties including First Nations and Métis peoples to be involved in the plan as well as the timelines required to achieve the reductions necessary to get below the air quality limits."*

Regarding the management actions required when a trigger/limit is exceeded and AQMF states that it:

> *"…includes the Government of Alberta management response and describes the management tools from which regulators, in collaboration with stakeholders, First Nations and Métis peoples where applicable, can select appropriate place-based management actions to address specific circumstances."*

The AQMF notes that management responses under the Framework do not replace other responses that might be taken as part of ensuring compliance under the environmental regulatory system. The AQMF therefore contains commitments to engage with First Nations and Métis peoples in the assessment and management actions phases of the Framework which is a strength of the AQMF. The implementation and adequacy of these commitments should be evaluated with First Nations as the AQMF starts to be implemented based on 2012 and 2013 regional monitoring results.

2.4 Proposed Changes

The existing AQMF needs to be expanded significantly if it is to be an effective and comprehensive cumulative effects management tool for air emission and air quality management purposes.

Possible improvements and additions to the AQMF include:

1. **Context:** Additional clarification needs to be provided on when and how the AQMF is to be used in individual project and cumulative development effect assessments and in project approval decisions and regional development planning. There is currently considerable confusion on the role of the AQMF in project and cumulative development effects assessments and application decision making.
2. **Measurement and Modelling**: In addition to "*measurement based*" management criteria the AQMF need to include "*modelling based*" triggers/limits and associated modelling based management responses. Without this addition the AQMF cannot be fully used as a development planning and project approval decision tool or a cumulative effects assessment tool.
3. **Air Quality Parameters Covered**: The list of air quality parameters needs to be expanded considerably if the AQMF is to be an effective air quality management tool. Additional

parameters include: PM; O_3; TRS/H_2S; CO; THC; BTEX; and other selected VOC as well as some PAHs e.g. naphthalene. (Note: the AQMF (page 5) provides a listing of many of these same compounds).

4. **Air Contaminant Deposition Effect Issues**: The AQMF lists a number of regional and provincial frameworks that are effects based, i.e.

   a) Acid Deposition Management Framework (Alberta Environment, 2008),
   b) CEMA Acid Deposition Management Framework (CEMA, 2004),
   c) CEMA Ozone Management Framework (CEMA, 2006), and
   d) CEMA Interim Nitrogen (Eutrophication) Management Recommendations and Work Plan (CEMA, 2008).

   These types of Frameworks/Plans need to be incorporated into the AQMF if the AQMF is to be a comprehensive regional cumulative effects management Framework.

5. **Air Quality Triggers/Limits:** The AQMF bases its triggers and limits on the AAAQOs. As noted above these are not fully protective of health and/or the environment. Fort McKay is in the process of establishing, through by-law, Fort McKay Ambient Air Quality Permissible Levels (AAQPLs) that will apply to its Reserve Lands. Fort McKay would expect that these AAQPLs will be incorporated into future versions of the AQMF with the triggers and limits for air quality on Fort McKay's Reserve Lands based on the AAQPLs.
6. **Odours:** Odours are a major air quality issue in the Regional Municipality of Wood Buffalo and to Fort McKay. This could be a cumulative effects issue covered by the AQMF. If not then a separate stand-alone odour management framework needs to be developed.
7. **Stakeholder/Community Engagement**: There has to be a formalized process for First Nation engagement in the ongoing development and expansion of the LARP AQMF. Since it is Fort McKay residents that live with the air quality and air quality related environmental effects associated with oil sands development, it is essential that Fort McKay have a meaningful role in both selection of the issues managed through the AQMF and the actual triggers/limits and approaches used to manage those issues.
8. **Constitutional Rights**: The Framework needs to specifically acknowledge First Nation rights to the use and enjoyment of Reserve and Traditional Lands and to outline how the AQMF is considering and addressing potential air emission related impacts on these rights.

It is suggested that a multi-stakeholder forum like CEMA be used to set priorities for additions to the AQMF and that CEMA, or a CEMA like process, be used to actually develop the triggers, limits and the associated management approaches. This is a proven process that has produced excellent frameworks e.g. the CEMA Acid Deposition Management and Ozone Management Frameworks.

2.5 References

[1] Royal Society of Canada Expert Panel. 2010. Environmental and Health Impacts of Canada's Oil Sands Industry- Report. December 2010 http://www.rsc.ca/documents/expert/RSC%20report%20complete%20secured%209Mb.pdf

[2] Employment and Social Development Canada. Indicators of Well-Being in Canada. http://www4.hrsdc.gc.ca/.3ndic.1t.4r@-eng.jsp?iid=62 (visited July 10, 2014)

[3] WHO Air Quality Guidelines for Europe (2nd edition, 2000) (http://www.euro.who.int/document/e71922.pdf)

[4] Report of the Joint Review Panel Established by the Federal Minister of the Environment and the Energy Resources Conservation Board Decision 2013 ABAER 011: Shell Canada Energy, Jackpine Mine Expansion Project, Application to Amend Approval 9756, Fort McMurray Area, July 9, 2013. Catalogue No. En106-119/2013E-PDF, ISBN 978-1-100-22455-8. http://www.ceaa-acee.gc.ca/050/documents/p59540/90873E.pdf

[5] CASA. (2003). PM and Ozone Management Framework. The Clean Air Strategic Alliance. http://casahome.org/PastProjectsAwards/PMOzoneManagementFramework.aspx

[6] CCME. Air Quality Management System. http://www.ccme.ca/ourwork/air.html?category_id=146

[7] ESRD. (2013). Using Ambient Air Quality Objectives in Industrial Dispersion Modelling and Individual Industrial Site Monitoring. Alberta Environment and Sustainable Resource Development. October 1, 2013. http://esrd.alberta.ca/air/objectives-directives-policies-and-standards/documents/8114.pdf

[8] WHO Air Quality Guidelines. Global update 2005. Particulate matter, ozone, nitrogen dioxide and sulfur dioxide. http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/publications/pre2009/air-quality-guidelines.-global-update-2005.-particulate-matter,-ozone,-nitrogen-dioxide-and-sulfur.