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GUIDELINE FOR THE IMPLEMENTATION OF AIR STANDARDS IN ONTARIO (GIASO)

Version 2.0

Guidance to Support the Ministry of the Environment's Risk Framework for Requests for Altered Air Standards and Upper Risk Thresholds under

Ontario Regulation 419/05
Air Pollution – Local Air Quality (as amended)

made under the Environmental Protection Act

PIBS # 5166e02

Protecting Our Environment Ontario

FOREWORD

This "Guideline for the Implementation of Air Standards in Ontario" (GIASO) outlines Ontario's risk-based decision making process for dealing with implementation issues related to updating air standards and air dispersion models. Originally published in July 2005, GIASO was updated in 2009 to reflect amendments that were made to Ontario Regulation 419/05: Air Pollution – Local Air Quality on August 31, 2007.

GIASO provides guidance on the information required to be submitted in support of a request for an altered air standard and sets out the Ministry of the Environment's Risk Framework for Air Standards. This document should be used along with the Procedure for Preparing an Emission Summary and Dispersion Modelling Report (the "ESDM Procedure Document") (PIBs #3614e03) as amended; the Air Dispersion Modelling Guideline for Ontario (ADMGO) (PIBs #5165e02) as amended; and the Guide for Requesting an Alternative Air Standard (GRAAS or the "Guide") (PIBs #6322) as amended.

This Guideline is a technical document meant to ensure the fair and consistent implementation of the minimum requirements set out in Ontario Regulation 419/05: Air Pollution - Local Air Quality. This Regulation revoked and replaced Ontario Regulation 346: General - Air Pollution.

The Ministry of the Environment (MOE) may periodically publish a list of questions and answers to assist in the interpretation of this and other documents. The contents of this document may also be up-dated from time to time based upon public consultation consistent with the Ontario Environmental Bill of Rights legislation. All web site addresses referred to in this document were current at the time of release.

While every effort has been made to ensure the accuracy of the information contained in this Guideline it should not be construed as legal advice. In the event of conflict with requirements identified in Ontario Regulation 419/05: Air Pollution – Local Air Quality, then the regulatory requirements shall determine the appropriate approach. For any addenda or revisions to this guide please visit the MOE website at: http://www.ene.gov.on.ca or contact:

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1.0 INTRODUCTION

1.1 Background and Objectives

The Ontario Ministry of the Environment (MOE) sets contaminant-specific Point of Impingement (POI) standards[1] to manage air pollution from non-mobile sources (e.g. industrial and commercial sources). Air standards are generally derived from Ambient Air Quality Criteria (AAQC). Ontario's air standards are based on the best scientific information available and are set at levels that safeguard the natural environment and protect sensitive populations such as children and the elderly. Ontario Regulation 419/05: Air Pollution – Local Air Quality (hereafter referred to as"the Regulation") is the primary regulatory tool used for the assessment and implementation of air standards to protect local air quality in our communities. Other general provisions of the Environmental Protection Act (EPA) are also used including the prevention of adverse effects.

The setting of provincial air quality standards undergoes a separate stakeholder consultation process as set out in the MOE's Standards Plan: Setting Environmental Quality Standards in Ontario (as amended) (the "MOE Standards Plan"). The goal is to set effects-based air standards that protect local communities from air pollution impacts. Effects-based air quality standards are developed based on our understanding and interpretation of health and environmental effects – as opposed to standards that are set with consideration of technical or economic issues. The majority of air standards are based on chronic effects although some consider acute impacts as well.

Mathematical tools, referred to as air dispersion models, are the primary tools used to assess compliance with air quality standards: monitoring is also used. The Regulation phases out the existing air dispersion models (referred to as Appendix A of Regulation 346) and replaces them with updated models from the United States Environmental Protection Agency (US EPA models).

The MOE made a commitment to stakeholders to deal with technical, economic or time-related issues that result from the updating of air quality standards and air dispersion models. In 2005, the MOE introduced a regulatory process to obtain an alteration of standards to deal with these issues. This process is set out in section 32 of the Regulation and this *Guideline for the Implementation of Air Standards* (GIASO) (hereafter referred to as this "Guideline" or GIASO) which complements and supplements the MOE's standard setting process.

[1] In the context of this document, the term "standard" normally refers to legal limits as outlined in the Regulation. For the application of this document to other MOE POI guidelines and recommended levels for chemicals with no standard or guideline, please refer to Chapter 1.4.

The risk-based process for altered standards is intended to formalize an open and transparent process to address situations where the implementation of new (which include updated) air standards or the use of the updated models may result in barriers to compliance. These barriers include the need for more time, or consideration of technical issues; economic barriers may also be brought forward for consideration. The intent of this risk-based decision making process is to provide effective, equitable and timely implementation of air quality standards and models while providing a mechanism to address technical, economic and time-related barriers to implementation on a case-by-case basis. Sector-based approaches are also discussed in this Guideline.

Barriers to complying with air standards may mean there is a need for establishing interim site specific, technology-based standards for a specified period of time, with the goal of continuous improvement towards achieving the effects-based standard. These are referred to as “Altered Standards”.

Upper Risk Thresholds (URTs) have been established to ensure that the incremental risks to members of the community associated with altering a standard, remain within a range of acceptable risk thresholds. URTs also have other requirements as per section 30 of the Regulation.

This Guideline provides information and guidance to assist facilities who are requesting an alteration to a standard. It also sets out factors that should be considered when assessing requests and evaluating interim solutions. Information on URT exceedences are also provided in this Guideline. For information on how to assess compliance with air standards (and MOE POI Limits[2]), please refer to the most recent versions of the “Procedure for Preparing an Emission Summary and Dispersion Modelling Report”, (hereinafter referred to as the ESDM Procedure Document); the “Air Dispersion Modelling Guideline for Ontario”, (hereinafter referred to as the ADMGO); and the Guide for Requesting an Alternative Air Standard (hereinafter referred to as GRAAS or the Guide). Where a conflict or ambiguity exists between this Guideline, or other MOE documents, and the requirements of the Regulation – the Regulation will take precedence.

Ontario air quality standards (sometimes referred to as POI standards) are used to assess emissions from all non-mobile sources of air pollution in the province. This Guideline sets out the process for requesting an altered standard where barriers to compliance have been identified. Approval of these altered standards is different than a Certificate of Approval under section 9 of the EPA. With certain exceptions, a

[2] The MOE uses a combination of air quality standards in the schedules to the Regulation and a broader list of POI guidelines available on the MOE website at www.ene.gov.on.ca(PIBs # 2424e02). The generic term "MOE POI limits" used in the context of this Guideline means any numerical concentration limit set by the MOE including standards in the schedules of the Regulation, guidelines and recommended levels for chemicals with no standard or guideline.

Certificate of Approval is required for new sources of air emissions or proposed alterations to existing sources. For more information on the section 9 Certificate of Approval (C of A) process, please refer to the MOE document: "Guide to Applying for Approval (Air and Noise)" (as amended).

Chapter 1 of this Guideline provides background information on the overall risk-based framework and summarizes who may be eligible to request an alteration to a standard. Chapter 2 provides information on risk concepts; sets out a process to benchmark technical solutions to reduce contaminant concentrations; outlines how economics can be considered (optional); and provides guidance on the stakeholder involvement process. Chapter 3 sets out the basis for setting the URTs and describes the actions required by a facility if it suspects that its emissions may result in an exceedence of a URT. Chapter 4 sets out factors that the MOE will consider when assessing the magnitude and frequency of exceedences and the need for timely action.

1.2 Framework for Risk Evaluation

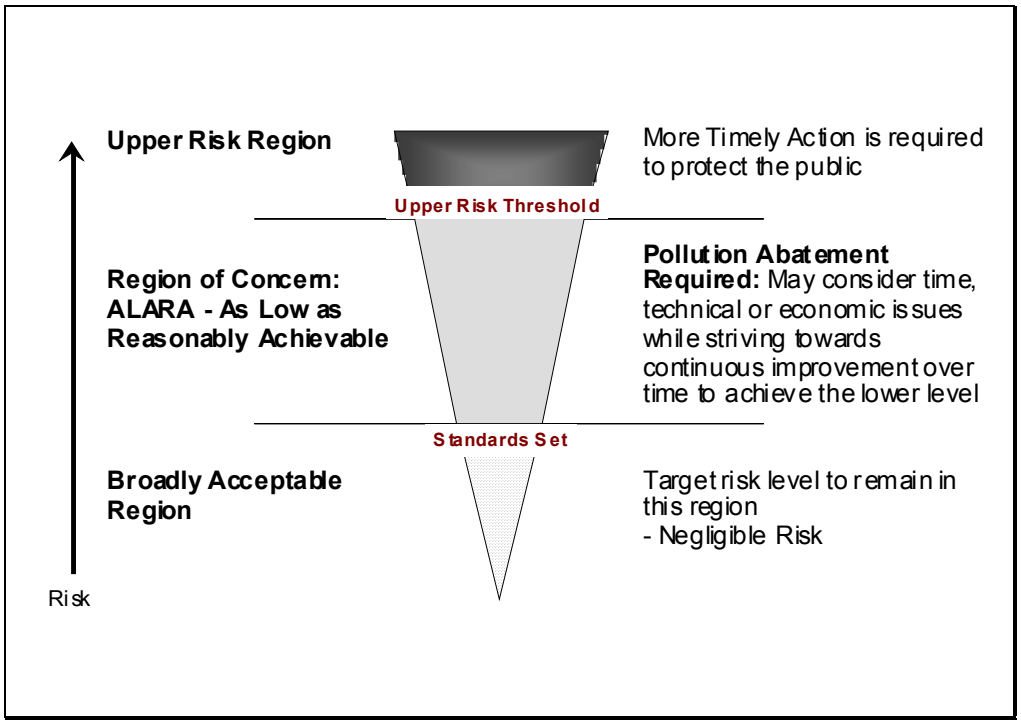
Ontario's risk-based framework for air quality standards is presented in Figure 1: MOE's Risk Evaluation Framework for Air Standards. The MOE's objective is to set provincial air quality standards based on values that protect against health and environmental effects – as opposed to setting provincial standards that consider technical or economic issues. These effects-based air standards are represented by the lower level line - below which risks are considered generally acceptable ("Broadly Acceptable Region"). The criteria used to set the majority of air quality standards in Ontario is set out in Chapter 1.3 of this Guideline. POI concentrations above the lower level are considered to be in non-compliance with the MOE standard (or MOE POI Limit) (see sections 18, 19 and 20 of the Regulation) once the standards are phased in.

The framework also defines an "Upper Risk Region" (URTs are shown as the upper level line). Concentrations in this region require timely action to assess and if necessary, to reduce contaminant concentrations. If there is reason to believe that a URT may be exceeded, based on any relevant information, this requires immediate notification to the MOE in writing, and an Emission Summary and Dispersion Modelling Report (ESDM) report to be submitted within 3 months. For more information, please refer to Chapter 3 of this Guideline and to section 30 of the Regulation.

POI concentrations between the upper and lower levels are in the "Region of Concern". Facilities operating in this region are required to take all reasonable steps to get into compliance with the effects-based standard. Since the MOE strives to set provincial air quality standards based on health and environmental effects, there may be times when certain facilities or sectors are operating in the Region of Concern because they face barriers to achieving compliance with the standard due to

technical, economic or time-related issues. For these facilities, the goal is to strive for the principle of reducing risk as far as possible or "As Low As Reasonably Achievable" (ALARA). It is in this middle zone or the "ALARA Region" that requests for altered standards are considered and concern about risk among different stakeholders requires a more detailed and transparent analysis of technical solutions, possible costs and incremental risks. The alteration of standards process set out in section 32 of the Regulation allows for the setting of site specific altered standards in this region for certain eligible facilities (see Chapter 1.5 of this Guideline) provided certain requirements are met. For more information on requests for an altered standard(s), refer to Chapter 2 of this Guideline and to section 32 of the Regulation.

Figure 1: MOE's Risk Evaluation Framework for Air Standards



Approval of an altered standard is different from a C of A, although under subsection 32(4) of the Regulation, a facility may submit both an application for a CofA and a request for an alteration of a standard at the same time – this is recommended. Chapter 2 of this Guideline outlines the process for the alteration of standards in the Region of Concern (ALARA) region. Chapter 4 describes other factors that the MOE should consider, such as frequency and magnitude of the exceedences, in determining the need for more timely action for concentrations in the ALARA region.

In updating/developing air standards, there are factors that are considered in order to deal with uncertainty. In evaluating incremental risks, it is important to consider the

uncertainty of risks posed by exposure to the contaminant; the benefits of an activity that discharges the contaminant; the costs related to reducing the POI concentration of the contaminant and the principle of precaution. A lack of full scientific certainty of the risks posed by exposure to a contaminant should not be used as a reason for postponing cost-effective measures to prevent incremental health and environmental effects. It is recommended that the principle of precaution be considered in establishing risk acceptability, in identifying and analyzing risks, and in selecting risk treatment options.

1.3 Ontario's Air Standard Setting Process

The MOE's standards are set in the "Broadly Acceptable Region" of Figure 1. The MOE's Standards Plan (as amended) identifies high-priority contaminants for review based on a consideration of their volume of release in Ontario as well as toxicological and other information. Each standard undergoes its own stakeholder consultation process before it is included in the Regulation.

In setting effects-based air standards, the MOE considers the available toxicological information as well as other environmental information to determine the potential effects of exposure to a contaminant. Although there may be a variety of studies that identify a range of effects, and a range of uncertainties associated with the information, the standard will be proposed based on the limiting or critical effect(s) of that contaminant. The limiting effect(s) could be based on health or environmental considerations. In general, health-based considerations can be classified in two categories: carcinogenic and non-carcinogenic effects.

The health risk for carcinogens is normally expressed as a "probability of occurrence". For example, the scale of risks may range from a 1 in 10,000 risk (also expressed as 10^{-4}) (i.e. the risk of one individual in a population of 10,000 exposed developing some form of cancer) to a 1 in 1,000,000 risk (also expressed as 10^{-6}) (i.e. 1 risk of cancer in a population of 1 million). The consultation process for standard setting will determine the value for each individual substance. With few exceptions, the MOE air standards objective for carcinogens is to set the standard at an incremental risk of 1 in a million (or 10^{-6}). In addition, the MOE generally sets URTs at a risk level of 10^{-4} risk level for carcinogens. Please note that subsection 32(22) sets out that an altered standard shall not exceed a URT at receptors listed in subsection 30(8) of the Regulation. The concept of the URT is illustrated as the upper level line in Figure 1 (see also Chapter 3 of this Guideline and section 32(22) of the Regulation).

Health risks for non-carcinogens are evaluated based on a different set of toxicological information. Air standards for non-carcinogens are derived from a *Reference Concentration* (normally based on a 24 hour average concentration, but averaging times can vary) that considers available peer reviewed toxicological information and chooses key studies with associated limiting or critical effect (s).

Generally, the ratio of the MOE air standard to the *Reference Concentration* (RfC) is 1, depending upon the underlying scientific studies that are the basis for the RfC. This ratio is called a Hazard Quotient (HQ) and is calculated as follows:

$$HQ = \frac{C}{\text{RfC (}\sim\text{ MOE Standard)}}$$

Where:

C = concentration of the contaminant in $\mu g/m^3$

MOE Standard = MOE air standard for a non-carcinogen contaminant in $\mu g/m^3$ ~ RfC

The consultation process for standard setting will determine the value for each individual substance. As mentioned above, the MOE generally sets standards such that the HQ is equal to one (1). In addition, the MOE generally sets URTs at a HQ of 10 for non-carcinogens. Note again that subsection 32(22) sets out that an altered standard shall not exceed a URT at receptors listed in section 30(8) of the Regulation. The concept of the URT is illustrated as the upper level line in Figure 1 (see also Chapter 3 of this Guideline and section 32(22) of the Regulation).

Air standards established to address environmental effects are normally based on an averaging period for that contaminant based on the anticipated effect. Examples of environmental concerns include:

- Biomagnification and direct toxicity of persistent organic compounds in fish and fish-eating wildlife resulting from transformation and/or bioaccumulation of these contaminants in aquatic ecosystems.
- Contamination of soil, terrestrial vegetation, and surface water from releases of particulate metals and effects to aquatic or terrestrial biota that are exposed to these elevated metal concentrations.
- Soiling and corrosion of property, effects on vegetation and on visibility and odour.

Exceedences of standards that are based on environmental effects need to be carefully considered to ensure that health effects do not occur as well. In general, URTs for these compounds may be set using the same toxicology principles for carcinogens and non-carcinogens above or on environmental effects.

1.4 The Purpose of the Risk-based Framework

The introduction of new or updated provincial effects-based air quality standards means that not all facilities will be able to achieve compliance immediately due to technology limitations, economic realities or simply the need for more time to assess, plan, and if necessary, finance and install new equipment or processes to reduce concentrations of contaminants at POIs. The introduction of more advanced air dispersion models for affected facilities could also lead to challenges in achieving compliance with the air standards (and/or MOE POI Limits).

For most facilities, a phase-in period provides enough time to assess, plan, budget and implement technical solutions to ensure compliance with the air standards. The recommended phase-in period for new or updated air standards would normally be 3 to 5 years unless otherwise prescribed by the Regulation. If a facility can identify feasible technical solutions that can be implemented within the phase-in period to achieve compliance, then it should proceed to do so (subject to the necessary C of A requirements).

For other facilities, a phase-in period might not provide enough time to achieve compliance with air standard(s). If the technical solutions are not readily available to allow a facility to achieve compliance before the end of the phase-in period for new standards or new models, then these facilities may consider requesting an alteration to a standard. By approving an alteration to a standard, the Director establishes an interim site-specific standard with the goal of continuous improvement toward achieving the effects-based standard over time. This process is further discussed in Chapter 2 of this Guideline.

The Regulation sets out who is eligible to request an altered standard. This is summarized in Table 1 of Chapter 1.5 of this Guideline. If approval of an altered standard is granted, this decision would be periodically reviewed to ensure that the technical (or economic (optional)) issues considered at the time are still relevant for that particular facility. Under subsection 32(29) of the Regulation, re-requests are possible but the Director may consider the number of times that previous requests for alteration of that standard have been made. This will be considered on a case-by-case basis.

This Guideline describes the risk-based decision making process which will be used as a basis for deciding whether or not to alter a standard. The requirements of the risk-based decision making framework for altered standards are set out in the section 32 of the Regulation and were developed with regard to the following:

- Provincial air quality standards should be set to protect against health and environmental effects – but site-specific altered standards (based on the ALARA principle) may be considered provided certain criteria are met including continuous improvement.

- Companies must demonstrate that they are doing the best they can reasonably do today to reduce their concentrations in order to comply with the standard;

- Local stakeholders must be given an opportunity to be made aware of the compliance issue and potential incremental health and/or environmental risks associated with altering a standard for a facility;

- Local stakeholders must be given an opportunity to understand the options that were considered including the nature of the technical (and optionally, the economic) challenges reviewed;

- The company must develop and implement an action plan (subject to Director's approval) that represents an improvement of concentrations over time;

- The action plan must be revisited within a set period of time in order to ensure continual improvement and a re-evaluation of technical (or economic) considerations which evolve over time;

- Approval cannot be granted (and some minimum level of risk reduction should be pursued in a timely manner) if emissions result in a concentration of a contaminant that not only exceeds a standard, but also exceeds a prescribed URT at a specified human receptor (see Chapter 3 of this Guideline and section 32(22) of the Regulation).

This Guideline does not replace the practices set out in the MOE's Compliance Policy Applying Abatement and Enforcement Tools (Compliance Policy) (as amended). Nor is this Guideline intended to apply to facilities not affected by changes in models/standards that are in non-compliance with existing air standards using an approved air dispersion model. The MOE's Compliance Policy documents the MOE's approach to dealing with compliance issues and provides guidance to staff for achieving and maintaining province-wide compliance with its legislation and regulations for the protection and improvement of the environment. If compliance issues are identified after the phase-in period, then the facility may be subject to abatement/enforcement measures. When non-compliance is identified, in addition to the specific requirements included in the Regulation, the MOE follows the Compliance Policy and can request that a facility develop a plan to address identified issues and achieve compliance. Where appropriate, this would involve the issuance or amendment of control documents such as orders or authorizing documents such as Certificates of Approval. The MOE Compliance Policy considers the purposes of the Environmental Bill of Rights (EBR) and sets out the means by which the MOE provides public notification and consultation respecting its abatement and enforcement.

Note: Elements of the process outlined in this Guideline may be considered in the development of an action plan for facilities dealing with exceedences of standards,

guidelines or other possible adverse effects caused by the discharge of contaminants with no guidelines or standards. Participation in this process does not negate any additional responsibilities and actions that a facility may be subject to under applicable Acts and Regulations.

1.5 Who is eligible to Request an Altered Standard?

The Regulation introduces phase-in periods for new or updated air standards and the air dispersion models listed in paragraphs 1 to 4 of subsection 6(1) of the Regulation which currently includes the United States Environmental Protection Agency (US EPA) models: SCREEN3, ISCPRIME, ASHRAE and AERMOD. Section 7 of the Regulation also allows other models to be specified as appropriate (see ADMGO).

Under this risk-based decision making framework, facilities affected by a change in the standard, or a change in the requirements to use an approved US EPA or alternative air dispersion model are eligible to submit a request to the Director for a site-specific alteration to a standard in the Regulation. Subsections 32(1) to (12) of the Regulation specify who can request an altered standard and when they can submit their request. This is summarized in Table 1.

Table 1: Summary of who can request an Altered Standard and when (subsection 32(1) to (12) of the Regulation)

Who can make a request?	Why can they make a request?	When can they make a request?
Existing or modified facilities belonging to sectors listed in Schedule 4, (see Appendix I).	These facilities are affected by the requirement to use new approved models (i.e. as opposed to original models in Appendix A of Reg 346) to demonstrate compliance with Schedule 3 standards by February 1, 2010.	February 1, 2007 to October 31, 2008.
Existing or modified facilities belonging to sectors listed in Schedule 5, (see Appendix I).	These facilities are affected by the requirement to use new approved models (i.e. as opposed to original models in Appendix A of Reg 346) to demonstrate compliance with all Schedule 3 standards by February 1, 2013.	February 1, 2010 to October 31, 2011. *Note: Facilities belonging to sectors in Schedule 5 must demonstrate compliance with air standards in Schedule 2 that take effect between February 1, 2010 and 2013 using original models in Appendix A to Reg 346.*
Existing or modified facilities that do not belong to the sectors identified in Schedules 4 and 5 of the Regulation.	These facilities are affected by the introduction of new models and the requirement to comply with Schedule 3 standards by February 1, 2020.	February 1, 2013 to October 31, 2017.

Who can make a request?	Why can they make a request?	When can they make a request?
Existing or modified facilities emitting a substance in Schedule 7 (as amended).	These facilities are affected by a decision to set effects-based standards that are phased-in.	For standards phased-in by February 1, 2010: February 1, 2007 to October 31, 2008. For future new standards either: a) 15 months before a standard listed in Schedule 7 takes effect, or b) 12 months after the standard is added to Schedule 7, whichever date is later. Note: For example, for standards that are phased-in by February 1, 2013, a request must be made by November 1, 2011.
Any new facility ("greenfield") emitting a Schedule 7 substance.	These facilities are affected by the decision to set effects-based standards that are phased-in.	If the contaminant is listed in Schedule 7 when the facility applies for its initial C of A, then the facility must request its altered standard before their initial C of A is issued (see subsection 32(8) of the Regulation).
Any facility required to use a specific model or models, or ordered by a Director to comply with Schedule 3 using an approved model (e.g. SCREEN,ISCPRIME, AERMOD), and ASHRAE (for facilities that are required to assess self-contamination).	These facilities are affected by a notice or order issued under subsection 20(4) and (5) of the Regulation (see also subsection 7(1)(d) which does not apply until after February 1, 2010 as per subsection 20(5)).	Facilities affected must request within 3 years of being told to comply with Schedule 3 using approved models.
Any facility that is required to make a request as part of a plan developed or amended pursuant to an order under section 7 or 17 of the Act or paragraph 7 or 8 of subsection 18 (1) of the Act.	These facilities are being ordered to make a request for an alteration to a standard as part of their abatement actions.	Facilities must make the request by the date specified in the order.

Please note that the phase-in period for new or updated standards would normally be 3 to 5 years unless otherwise prescribed by the amending regulation that adds the new standards to the Regulation. As new standards are added to Schedule 7 of the Regulation, the window to request an alteration to a standard is as set out in subsection 32(10) of the Regulation.

In Table 1, a new or "greenfield" facility means a facility where construction of the facility began after November 30, 2005 and no application was made for a C of A on or before that day. New facilities do not include alterations, extensions or

replacements of existing facilities. The following is a further explanation of requirements that apply to new facilities or "greenfields":

- As of November 30, 2005, new "greenfield" facilities within sectors identified in Schedules 4 and 5 of the Regulation (see Appendix I) will be required to use the more advanced approved models (paragraphs 1 to 4 of subsection 6(1) of the Regulation) to show compliance with all the standards listed in Schedule 3. Where a contaminant in Schedule 3 has multiple standards, the facility must show compliance with all standards.

- A new "greenfield" facility may request a site-specific alteration of a standard provided that the contaminant is listed in Schedule 7 of the Regulation. Schedule 7 will continue to be updated as new air standards are introduced. Most of the contaminants added to Schedule 7 will have phase-in periods associated with them if the standard is new or more stringent. As previously mentioned, these standards are set based on health and environmental effects and do not consider implementation barriers such as technology limitations since that can vary considerably amongst different sectors.

- New facilities planning to request an alteration to a standard must request it before their initial C of A is issued (see subsection 32(8) of the Regulation). The Regulation does not allow economic feasibility to be considered for new facilities (see subsection 32(15) of the Regulation).

- If contaminants are added to Schedule 7 after the new facility is in existence, a new facility may request an alteration to a standard either: a) 15 months before a standard listed in Schedule 7 takes effect, or b) 12 months after the standard is added to Schedule 7, whichever is longer.

For more information, please refer to subsection 32(10) of the Regulation.

1.6 Submission Requirements for Altered Standards Requests

Eligible facilities must submit the following information to support their request for an alteration of a standard. The request requirements are set out in section 32 of the Regulation, a broad overview of which includes:

- An Emission Summary and Dispersion Modelling (ESDM) report for all contaminants emitted from the facility prepared in accordance with section 26 of the Regulation (see ESDM Procedure Document, ADMGO and GRAAS) (see Chapter 2.2.2 of this Guideline and subsection 32(13) paragraph 1 of the Regulation);

- An Assessment of Feasible Technologies (see GRAAS (Appendix A), Chapter 2.4 of the Guideline entitled Technology Benchmarking and subsection 32(13), paragraph 3, 4, 5 and 6 of the Regulation) which lists, analyzes and ranks all the methods that are used by other persons, or are available for use, to reduce the concentrations of the contaminant at POIs, including methods such as the use of pollution control technology or changes to equipment, processes or materials;

- An Economic Feasibility Analysis (Optional) (see GRAAS, Chapter 2.5 of the Guideline and subsection 32(14) of the Regulation);

- A report summarizing pre-submission consultation with affected local stakeholders including a list of the questions asked and comments made by persons who attended the public meeting and the responses of the person making the request (see Chapter 2.6 of this Guideline and subsection 32(13), paragraph 8 of the Regulation);

- An Action Plan to implement and monitor progress (see Chapter 2.7 and 2.8 of the Guideline and subsections 32(13), paragraph 7 or subsection 32(14), paragraph 4 of the Regulation as well as subsections 32(28) and 32(29)). This action plan needs to include a cycle to re-evaluate decisions based on the need for continuous improvement and the goal of striving towards compliance with the standard.

In addition, the facility is required to provide the MOE follow up verification that the steps outlined in the action plan that are imposed as conditions in the approval, have been implemented is also required (see Chapter 2.9 of this Guideline and subsections 32(25) and 32(26) of the Regulation).

Note: If the request involves more than one substance, the information may also include a ranking of substances using the risk scoring method outlined in Appendix II. For more information, see Chapters 2.3 and 2.4.4 and GRAAS.

This Guideline supports requirements set out in the Regulation for requests for an alteration of the standard(s) and provides more detail on the information required to be submitted. This information will be considered as part of risk-based decision making framework to determine whether or not an alteration to a standard set out in the Regulation is acceptable for some interim period of time, with a goal of continuous improvement over time. This Guideline also sets out factors to consider when evaluating exceedences in the “Region of Concern” or “ALARA Region” depicted in Figure 1 and assessing the need for more timely action.

Note: Sector-based Approaches

The Regulation requires that each facility submit individual requests for an altered standard. All components of the request for an altered standard (e.g. ESDM report, stakeholder consultation, etc.) must meet the requirements of the Regulation (section 32). In some cases, the MOE may consider a "sector-based" approach for requests for an altered standard. For example, components of the technology benchmarking or economic feasibility analysis (optional) may be developed on a sector basis. Responsibility for stakeholder consultation may also be shared by a sector so long as individual facilities meet the requirements of the Regulation (e.g. notification of local stakeholders, etc). Each facility may attach this sector-based information as part of their individual requests for an altered standard. Pre-submission consultation with the MOE is required before proceeding with a sector-based approach for altered standards. Further guidance on the sector-based approach is provided in Chapters 2.4, 2.5 and 2.6. Stakeholders may also contact the MOE.

2.0 ALTERATION OF STANDARDS USING A RISK-BASED DECISION MAKING FRAMEWORK

Figure 1 outlines the MOE's Risk Evaluation Framework for Air Standards and includes three regions: the "Broadly Acceptable Region"; the "Region of Concern"; and the "Upper Risk Region". Chapter 1.3 discusses the "Broadly Acceptable Region" which refers to the MOE's Standard Setting process. This Chapter 2 will examine the application of the risk-based framework for altered standards in the middle zone – referred to as the "Region of Concern" or "ALARA" Region.

Chapters 3 sets out the application of the "Upper Risk Region" where action is expected in a timely manner if concentrations are above the URTs at the types of receptors identified in subsection 30(8) of the Regulation. Chapter 4 sets out considerations for the Director when the combination of frequency and/or the magnitude of the exceedences may require more timely action. The information in Chapters 3 and 4 will be considered by the Director in determining whether or not an approval for the altered standard will be granted or if there is a need for more timely action to reduce contaminant concentrations. The requirements for URTs exist independent of the altered standards process (see section 30 of the Regulation).

This Chapter discusses the risk-based process developed for the "ALARA Region" or the "Region of Concern". It is an adaptation of the Canadian Standards Association's "Q850 Risk Management: Guideline for Decision Makers" and other similar documents used to manage risks. This process for air standards is outlined in Figure 2: Risk-Based Decision Making Framework ("ALARA Region"). It provides

a systematic method for analyzing, communicating and effectively addressing complex issues associated with implementation of air standards and consists of the following key elements:

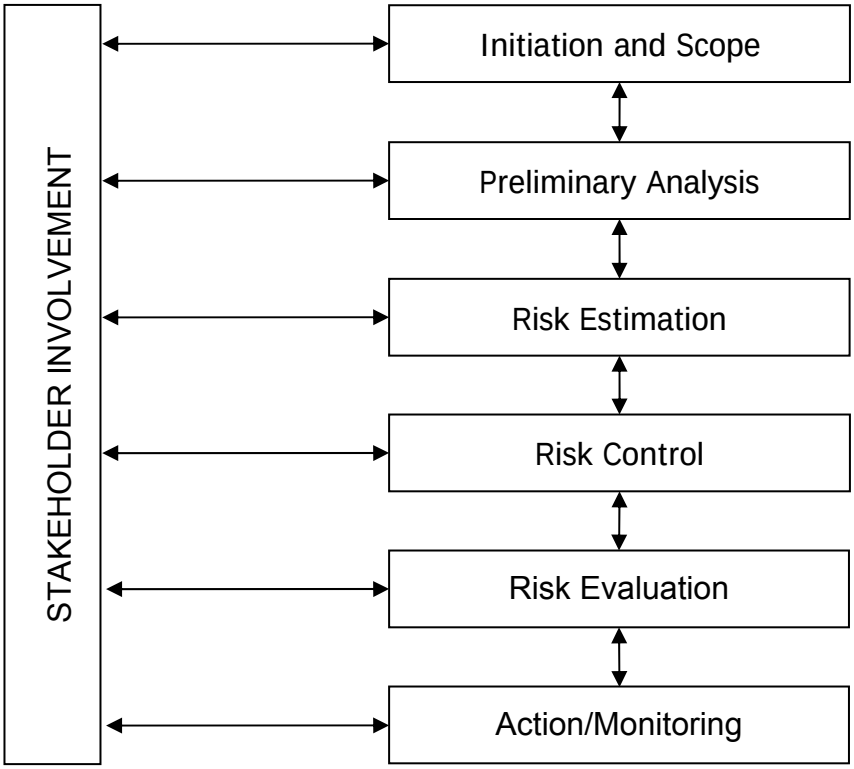
- Initiation and Scope Definition
- Preliminary Analysis (Scientific and Technical Assessment)
- Risk Estimation (which includes Risk Analysis and Risk Assessment)
- Risk Control (Technology Benchmarking)
- Risk Evaluation (Economic Considerations (optional))
- Action/Monitoring
- Stakeholder Involvement

Each step plays an important part in determining the appropriate plan of action to deal with barriers to complying with MOE air standard(s) due to technical, economic, and time-related considerations for those eligible to request an altered standard (as outlined in Chapter 1.5 of this Guideline and subsection 32 of the Regulation).

Stakeholder participation is essential for success and should be kept in mind throughout all the steps of the risk-based decision making process. Stakeholder involvement should promote development of a meaningful understanding by all stakeholders, and through this understanding, promote implementation of viable risk treatment solutions. For more information, see Chapter 2.6 of this Guideline.

Guidance for each of the decision steps identified in Figure 2 is contained in this Chapter. This is the information that will be used to support requests to the Director for an altered standard. Sector-based assessments may also be considered. If sector-based approaches are being contemplated, pre-submission consultation with the MOE is strongly recommended. Suggestions for sector-based approaches are highlighted in Chapters 2.4, 2.5 and 2.6 of this Guideline.

Figure 2: Risk-Based Decision Making Framework ("ALARA Region")



2.1 Initiation and Scope Definition

The risk-based framework is normally initiated when there is a change in an air standard (listed in Schedules 2 or 3 of the Regulation) or an approved air dispersion model (as set out in sections 6 and 7 of the Regulation) that could affect a facility's compliance status. Assessing compliance with air standards begins with assessing POI concentrations using an approved dispersion model as set out in the Regulation. Compliance with air standards can be assessed by facilities through both ambient air monitoring and modelling or modelling alone. The assessment is normally documented in an ESDM report. ESDM reports are required to be prepared in accordance with the section 26 of the Regulation, with guidance from the ESDM Procedure Document, the ADMGO, and GRAAS. ESDM reports are required to be:

- prepared by facilities in sectors listed in Schedules 4 and 5 (see Appendix I). These reports must also be updated and maintained on site in accordance with sections 23, 25 and 27 of the Regulation;
- submitted as part of the C of A application process in accordance with section 22 of the Regulation;

- prepared if there is any reason to believe there may be an exceedence of an URTs in Schedule 6 as per subsection 30(4) of the Regulation. ESDM reports made for this purpose must also be updated and maintained on site in accordance with sections 25 and 27 of the Regulation unless the Director is satisfied that there is not likely to be a contravention or adverse effect;

- submitted to the MOE if required by the Director in accordance with section 24 of the Regulation. ESDM reports made for this purpose must also be updated and maintained on site in accordance with sections 25 and 27 of the Regulation unless the Director is satisfied that there is not likely to be a contravention or adverse effect;

- submitted to the MOE if required because the Director has reasonable grounds to believe that the emissions may result in an exceedence of a standard or may cause an adverse effect in accordance with section 24 of the Regulation. ESDM reports made for this purpose must also be updated and maintained on site in accordance with sections 25 and 27 of the Regulation unless the Director is satisfied that there is not likely to be a contravention or adverse effect;

- submitted as part of an request for an alteration to a standard in accordance with subsection 32(13) paragraph 1 of the Regulation. ESDM reports made for this purpose must also be maintained on site and updated in accordance with section 25 and 27 of the Regulation unless the Director is satisfied that there is not likely to be a contravention or adverse effect.

This Guideline is to be used by those eligible to request an altered standard (as set out in subsection 32(1) of the Regulation and as outlined in Chapter 1.5 of this Guideline). Altered standards are interim site-specific standards based on technology considerations that are periodically reviewed to ensure continual improvement (economics may also be considered).

It is recommended that the facility identify key stakeholders early in the process and begin planning for stakeholder participation. While it is desirable to involve all the stakeholders in the process as early as possible, it is likely that the primary stakeholders initially will include, as a minimum, the facility, the MOE and other regulatory agencies. Once the information to support the request for an alteration to a standard is available, subsections 32(18), (19), (20) and (20.1) of the Regulation require pre-submission consultation with specific local stakeholders (for more information see Chapter 2.6 of this Guideline).

Subsection 32(28) of the Regulation refers to the fact that an altered standard may be approved by the Director for up to 5 years (or up to 10 years if the Director is satisfied that there are extenuating circumstances). Subsection 32(29) states that it

is possible to re-request an alteration to a standard, but that the Director may consider the number of previous requests that have been made for the source of contaminant that is the subject of the request. Upon each subsequent request, the facility will be required to submit all the necessary information to support their request (see Chapter 1.6 of this Guideline). The goal is to continuously improve and, where possible, to strive to achieve compliance with the MOE standard in the Regulation.

Elements of the risk-based decision making process may also be used at the discretion of the MOE for abatement purposes, to address an exceedence of a standard, guideline and/or to deal with a contaminant that does not have a guideline or standard that may be causing an adverse effect.

2.2 Scientific and Technical Assessment

The initial assessment of potential impacts from air emissions occurs through the standard setting process and the development of scientifically-based standards that protect against health or environmental effects (see Chapter 1.3 of this Guideline). In setting effects-based air standards, the MOE considers the available toxicological information as well as other environmental information to determine the potential effects of exposure to a contaminant. Once a standard is set, subsequent assessments focus on whether or not a facility can comply with standard and if not, where the standard will be exceeded and how often the standard may be exceeded at a specified location.

2.2.1 Identifying Receptor Points for Evaluation

One of the first steps in the assessment process is the identification of the areas of interest based on where the modelling shows exceedences of the MOE air standards. The areas of interest include all areas where an exceedence is modelled or monitored. The maximum POI concentration and its location must always be used in an assessment. If the maximum concentration for an exceedence is located in an area with no human or specified receptors, there is still an expectation that the exceedence be addressed. As part of a request for an altered standard, the MOE may consider an additional amount of time to address these exceedences provided the land-use or receptors in this area do not change, the facility can demonstrate that there are no known or anticipated adverse effects on the receptors (e.g. a lake) during some interim period, and the property owner and occupants are notified in writing. The affected property owner and occupants must also be identified as a key stakeholder and be made aware of the situation and the decision made as part of the altered standards process.

If there are exceedences of the MOE standards at places where members of the public may be exposed to the contaminant, these must also be assessed and addressed as part of the action plan. Subsection 32(13) paragraph 2 of the

Regulation requires frequency of exceedence at all POIs to be assessed. However, in most cases, assessment of frequency of exceedences at the locations set out in subsection 30(8) of the Regulation as well as at the maximum POI concentration will suffice. Frequency and related information for exceedences at such locations must be included in the ESDM report (see also Chapters 2.3.1 and 4 of this Guideline).

Under Section 30 of the Regulation – Upper Risk Thresholds:

"(8) The following places are the places referred to in subsection (7) and in subsection 32 (22):

1. ***A health care facility.***
2. ***A senior citizens' residence or long-term care facility.***
3. ***A child care facility.***
4. ***An educational facility.***
5. ***A dwelling.***
6. ***A place specified by the Director in a notice under subsection (9) as a place where discharges of a contaminant may cause a risk to human health.***

(9) For the purpose of paragraph 6 of subsection (8), the Director may give written notice to a person who is required to notify the Director under subsection (3) stating that the Director is of the opinion that the discharge may cause a risk to human health at a place specified in the notice."

Paragraph 6 of subsection 30(8) above allows the Director to specify by notice a place where the discharge may cause a risk to human health. If the Director specifies such a location, then that location must be assessed in terms of its POI concentrations and frequency of exceedences of the standard(s).

As required by subsections 32(21) and (22) of the Regulation, this information will be one of the factors that the Director will consider in determining whether or not an approval of an altered standard will be granted (see also Chapter 4 of this Guideline).

Under Section 32 of the Regulation – Alteration of Schedule 3 Standards:

"(21) The Director may approve a request under subsection (1) to alter a standard set out in Schedule 3 if, ….

(b) the Director is of the opinion that, ….

(ii) the failures to comply referred to in subclause (i) would not be frequent, … (iv) there is no public interest reason sufficient to require the denial of the request. …"

"(22) Despite subsection (21), the Director shall not approve a request under subsection (1) to alter a standard set out in Schedule 3 for a contaminant if the contaminant is listed in Schedule 6 and the Director is of the opinion that the alteration is likely to permit discharges of the contaminant that result in the concentration of the contaminant at a point of impingement located on a place referred to in subsection 30 (8) exceeding the other time period upper risk threshold set out for the contaminant in Schedule 6."

2.2.2 Emission Summary and Dispersion Modelling Reports

Chapter 2.1 of this Guideline summarizes who is required to prepare, submit, update and/or maintain ESDM reports. If a preliminary analysis of the information shows an exceedence, the Regulation sets out requirements to refine the information and modelling inputs. Examples of information contained in the ESDM report that can be refined include:

- Emissions Estimates - Higher data quality can be used in estimating emission inputs for dispersion modelling including a combined modelling/monitoring analysis (sections 11 and 12 of the Regulation);
- Operating Conditions – More precise operating condition(s) of the facility can be used (sections 10 and 12 of the Regulation);
- Approved Dispersion Model – A more appropriate approved dispersion model can be used to assess concentrations (sections 6 and 7 of the Regulation); or
- Meteorological Data - Site-specific meteorological data used as inputs to the model (section 13 of the Regulation).

ESDM Reports to Support a Request for an Alteration of the Standard

Facilities preparing ESDM reports to support a request for an altered standard should refer to the ESDM Procedure Document, ADMGO and GRAAS for more information. An ESDM report submitted as part of a request for an alteration to a standard (under subsection 32(13) paragraph 1 of the Regulation) must include all contaminants emitted from the facility. The Regulation states:

Under Section 32 of the Regulation – Alteration of Schedule 3 Standards:

… "32(16) If a person makes a request under subsection (1) and section 20 does not apply to the person in respect of the contaminant that is the subject of the request, section 20 shall be deemed to apply to the person in respect of the contaminant for the purpose of preparing the report required by paragraph 1 of subsection (13). O. Reg. 419/05, s. 32 (16).

(16.1) Despite subsection 10 (1), a person who prepares a report required by paragraph 1 of subsection (13) shall, for the contaminant that is the subject of the request, use an approved dispersion model in accordance with both of the scenarios described in subsection 10 (1), and the report shall set out separately the information relevant to each scenario.

(16.2) Paragraphs 1 and 2 of subsection 11 (1) do not apply to a person who prepares a report required by paragraph 1 of subsection (13).

(16.3) Despite subsection (16.2), a person who prepares a report required by paragraph 1 of subsection (13) may use an approved dispersion model with an emission rate determined in accordance with paragraph 2 of subsection 11 (1), if the Director is of the opinion that the report will accurately determine the concentrations of contaminants.

(17) Paragraphs 1, 1.1, 2 and 2.1 of subsection 13 (1) do not apply to a person who prepares a report required by paragraph 1 of subsection (13). "…

Subsection 32(16) of the Regulation requires that the contaminant(s) that are the subject of the request be modelled using an approved US EPA model (e.g. AERMOD, or ISCPRIME) as if section 20 and Schedule 3 standards in the Regulation[3] applied. This is required even though a facility may not be yet be

[3] If section 7 of the Regulation applies to the facility, the contaminant must be modelled using the model that has been required under that section.

required to use the more advanced US EPA approved models listed in paragraphs 1 to 4 of subsection 6(1) for compliance assessment for other contaminants they emit. An approval of an altered standard means an approval to alter a Schedule 3 standard. Hence, the facility would be required to use the approved US EPA models to assess compliance for the contaminant(s) that are the subject of the request. Section 32 also requires that an ESDM report submitted in support of an altered standard request include both operational scenarios in section 10 of the Regulation as well as site-specific meteorological data approved by the Director.

Section 32 of the Regulation provides authority for the alteration of a Schedule 3 standard during the phase-in period of new standards and the newer models. To be clear, a facility that cannot meet a new Schedule 2 air standard (i.e. the contaminant is listed in Schedule 7 to the Regulation) is also eligible to request an alteration of that standard. Since all requests for altered standards require the use of US EPA models for the contaminant that is the subject of the request, the facility will be requesting an alteration to a Schedule 3 standard. While the facility is encouraged to use the approved US EPA models to model for all contaminants, it is possible to use the models in the Appendix to Regulation 346 (if applicable) to assess contaminants that are not the subject of the request.

Subsection 32(17) of the Regulation also sets out that the most site-specific meteorological data must be used, as approved by the Director, to support the request for an altered standard. This means meteorological data referenced in subsection 13(1), paragraphs 3 or 4 of the Regulation must be used and approved by the Director. Where regional meteorological data is the best data available, this will be considered but is subject to approval by the Director. Site-specific meteorological data is important because a request to alter a standard will also consider the frequency of exceedences of the standard (see Chapter 4.0 of this Guideline). As per subsection 32(21)(b)(ii), frequency shall be considered in the decision for approval of an altered standard. Site-specific meteorological data is also important in assessing the pattern and geographic extent of exceedences. For more information, see Chapters 2.3.1 and 4 of this Guideline.

All ESDM reports submitted to support requests for an alteration of a standard would also be required to be updated annually and maintained as per sections 25 and 27 of the Regulation (unless the Director is satisfied that there is not likely to be a contravention or adverse effect).

ESDM Reports for Upper Risk Thresholds

Under subsection 30(4) of the Regulation, an ESDM report is required to be submitted if there is reason to believe, based on any relevant information, that the URTs in Schedule 6 may be exceeded. Despite the fact that there is a phase-in

period for the standard, there are no phase-in periods for URTs. A facility is required to submit an ESDM report[4] for the contaminant which may be exceeding the URT in order to ascertain whether the exceedence(s) are likely to be occurring and to evaluate the concentrations of the contaminant at the receptors identified in subsection 30(8) of the Regulation. The ESDM report must be prepared as if section 20 (Schedule 3) of the Regulation applied. Subsection 30(5.1) requires that the ESDM report be prepared using AERMOD or ISCPRIME (or, if applicable, a model approved under s.7 of the Regulation).

Under Section 30 of the Regulation – Upper Risk Thresholds:

… "30(4) If subsection (1) applies to a discharge, the person who discharged or caused or permitted the discharge of the contaminant shall, within three months after the discharge, prepare a report in accordance with section 26 and submit the report to the Director.

(5) If a person is required to prepare a report under subsection (4) and section 20 does not apply to the person in respect of the contaminant, section 20 shall be deemed to apply for the purpose of preparing the report and for the purpose of subsections (7) and (8).

(5.1) A person who prepares a report required by subsection (4) shall prepare the report using,

(a) the AERMOD dispersion model described in paragraph 1 of subsection 6 (1);

(b) the ISCPRIME dispersion model described in paragraph 3 of subsection 6 (1); or

(c) a dispersion model or combination of dispersion models that,

(i) pursuant to subsection 7 (3), is deemed to be included in references in this Part to approved dispersion models, and

(ii) is capable of providing the information referred to in subsection (7).

[4] This ESDM report must be prepared in accordance with section 26 of the Regulation, the ESDM Procedure Document, ADMGO and this Guideline.

(5.2) Despite subsection 10 (1), a person who prepares a report required by subsection (4) shall use an approved dispersion model in accordance with both of the scenarios described in subsection 10 (1), and the report shall set out separately the information relevant to each scenario. O. Reg. 516/07, s. 24 (2).

(6) Paragraphs 1, 1.1, 2 and 2.1 of subsection 13 (1) do not apply to a person who prepares a report required by subsection (4) unless meteorological data described in paragraphs 3 and 4 of subsection 13 (1) is not available and cannot reasonably be available in time to prepare the report within the three-month period referred to in subsection (4). O. Reg. 419/05, s. 30 (6);

(6.1) If a report is required by subsection (4) to be prepared in accordance with section 26, it is not necessary for the lists of contaminants required by paragraphs 2 and 4 of subsection 26 (1) to include any contaminant other than the contaminant in respect of which the Director must be notified under subsection (3).”…

Subsection 30(5.2) requires that an ESDM report submitted for the purposes of s.30 include both operational scenarios in section 10 of the Regulation. Subsection 30(6) of the Regulation requires that the ESDM report must be prepared using the most site-specific meteorological information available approved by the Director. It is important to use the site-specific meteorological data because the ESDM report must assess concentrations and frequency of exceedences at the receptors identified in subsections 30(8) of the Regulation as well as at the POI where the maximum concentration occurs. For more information, see Chapters 3 of this Guideline.

2.3 Risk Estimation

Risk Estimation is a combination of Risk Assessment and Risk Analysis.

Risk Assessment is part of the standard setting process as outlined in the MOE Standards Plan (as amended) and discussed in Chapter 1.3. The MOE proposes an air standard based on the critical or limiting effect(s) of a contaminant and provides an opportunity for public consultation. If facilities are emitting contaminants for which the MOE does not have a standard or guideline, the MOE considers available toxicological information to assess possible adverse effects (see the ESDM Procedure Document).

Risk analysis, in the context of this Guideline, can be used to assess multiple contaminants that exceed the MOE standards, guidelines or recommended levels. In this framework, risk estimation considers both risk assessment and risk analysis and expresses them as a “risk score”. The risk score is determined using a

combination of the magnitude of the exceedence, the frequency of exceedences, and a weighting factor based on the limiting effect of the standard (see Table A-1: Consequence Categories Corresponding Weights Appendix II). The risk score provides a method to review multiple contaminants relative to each other. It is a surrogate number that can be used to make more informed decisions on potential risks from contaminants of greater concern. Although the risk scoring approach is optional, it can assist in the development of an action plan when multiple contaminants are involved. The risk scoring formula is:

$R = RQ * W_{cs} * W_L$

where

R = a dimensionless risk score

RQ = Risk Quotient = $[(C_{max})/MOE\ Standard]$

C_{max} = the maximum POI concentration

W_{cs} = a weight assigned to one of the 6 consequence categories identified in Table A-1 based on the limiting effect of the MOE standard (or MOE POI limit)

W_L = percentage of time the model predicts an exceedence of the MOE standard (or MOE POI limit)

The risk scoring methodology is described in more detail in Appendix II: Risk Scoring Methodology (see also GRAAS).

2.3.1 Assessment of Impacts

Facilities are required to comply with MOE standards at all POIs; however it is generally acceptable to just assess the maximum POI concentration because if compliance is achieved at the maximum concentration, it is reasonable to assume that it will be achieved at all other locations as well. However, when dealing with requests for an alteration to a standard, compliance with the effects-based standard cannot be achieved in the short term. In these circumstances, those requesting an altered standard will be required to provide more information to support their request by identifying potential receptors, the magnitude of the exceedence, and the frequency of the exceedence (see Chapters 2.2.1 and 4 of this Guideline). A request for an alteration to a standard in Schedule 3, under subsection 32 (1) of the Regulation, must include the information set out in subsection 32(13). Paragraphs 2 of subsection 32(13) states:

Under Section 32 of the Regulation – Alteration of Schedule 3 Standards:

"(13) A person who makes a request under subsection (1) shall include the following in the request:

1. A report prepared in accordance with section 26.

2. If, according to the approved dispersion model that was used for the purpose of preparing the report referred to in paragraph 1, discharges of the contaminant may result in a contravention of section 20 because of the concentration of the contaminant at a point of impingement,

- ***i. a written statement or map identifying the location of the point of impingement,***
- ***ii. a written statement specifying the highest concentration of the contaminant that the approved dispersion model predicts for the point of impingement, and***
- ***iii. a written statement specifying the number of averaging periods for which the approved dispersion model predicts that discharges of the contaminant may result in a contravention of section 20 because of the concentration of the contaminant at the point of impingement, expressed as a percentage of the number of averaging periods in,***
  - ***A. a period equal to the length of the period over which the meteorological data was collected, if the approved dispersion model was used in accordance with local or site-specific meteorological data described in paragraph 3 of subsection 13 (1), or***
  - ***B. a period equal to the length of the period that was used for the purposes of the computational method, if the approved dispersion model was used in accordance with meteorological data obtained from a computational method in accordance with paragraph 4 of subsection 13 (1). …"***

The additional information identified in subsection 32(13) paragraph 2 must be submitted with a request for an altered standard. In deciding whether or not to alter a standard, the Director will consider receptors and frequencies as per subsections (32)(21) b (ii) and (iv) as well as 32(22) of the Regulation. In most cases, the inclusion of the following information should satisfy the requirements of s.32(13) 2 of the Regulation:

- A written statement or contour map that identifies the location and magnitude of the POI concentrations for the scenario that results in the maximum POI concentration for the contaminant(s);

- A written statement of the frequency of occurrence of the exceedences and the magnitude at all the locations set out in subsection 30(8) of the Regulation as well as at the maximum POI concentration based upon the use of Director approved site-specific meteorological data in conjunction with an approved dispersion model (see ADMGO for more information on the appropriate use of an approved dispersion model).

The ESDM reports must also include, among other things, the following information:

- Incorporation of emission rates determined as part of a combined modelling/monitoring assessment (section 11 of the Regulation);

- Assessment of the frequency of exceedences based on any available monitoring data as well as the final approved dispersion model in the ESDM report.

- Assessment of the operating condition(s) that gives rise to the maximum POI concentration as required by the Regulation s. 32(16.1). These scenarios as well as the future operating condition based on the facility's request must be summarized in the ESDM report.

- A review of the contribution and significance of various sources to total emissions and maximum POI concentrations (see also Chapter 2.4.3 of this Guideline and GRAAS).

2.4 Technology Benchmarking (Risk Control)

Risk treatment measures are also commonly referred to as risk control or risk reduction measures. In the context of this Guideline, managing risks depends to a large extent, on the identification of applicable and feasible technical solutions, and the benchmarking of these solutions against (i) other facilities that emit the same contaminant; (ii) other facilities that are in the same business sector and (iii) requirements in other jurisdictions.

Technology benchmarking is a key component of the altered standard setting process. The purpose of a technology benchmarking assessment is to ensure that the action plan represents best practices in limiting off-site impacts of a contaminant(s).

The technology benchmarking and the identification of best practices is a regulatory requirement as set out in paragraphs 3 through 6 of subsection 32(13) (see below). It is recommended that the required information be compiled into a technology benchmarking report that is submitted in support of a request for an alteration of a standard.

Under Section 32(13) of the Regulation – Alteration of Schedule 3 Standards:

"… 3. A list of all the methods that are used by other persons, or are available for use, to reduce concentrations of the contaminant at any point, including methods such as the use of pollution control technology or changes to equipment, processes or materials.

4. An analysis of the methods identified under paragraph 3, and combinations of those methods, to determine which are technically feasible with respect to the sources of contaminant to which the request relates.

5. A list of the methods and combinations of methods that are determined under paragraph 4 to be technically feasible.

6. A ranking of the methods and combinations of methods identified under paragraph 5, based on the maximum concentration of the contaminant that, according to an approved dispersion model, would result at a point of impingement if each method or combination of methods were used with respect to the sources of contaminant to which the request relates. …"

Options to control or reduce air emissions can vary for different sectors as well as for facilities within the same sector. They can range from Cleaner Production, to Pollution Prevention, to End-of-Pipe (add-on controls), each with inherently different qualities, costs, and environmental performance. While End-of-Pipe options are essential for many industries and processes, preference should always be given to Cleaner Production options. Efficiency, resource conservation, raw material substitution, process modification, product substitution, and incorporating

environmental principles into designing and delivering services are valued higher than End-Of-Pipe controls.

As described in Chapter 1.6, a request for an altered standard, under subsection 32(1) of the Regulation must include the information set out in subsection 32(13). In general, a technology benchmarking report can be used to achieve the information requirements of paragraphs 3 through 6 of subsection 32(13) of the Regulation using the following approach. For more information on how to develop a technology benchmarking report, please refer to GRAAS (Appendix A).

Step 1. Developing a list of all methods available for use to reduce POI concentrations based upon,

- a comparison of methods used by other facilities within the same or similar industrial sector to reduce concentrations of the contaminants. This must consider both significant sources and overall facility reduction methods.

- a review of requirements and pollution control options, from other jurisdictions (e.g., the United States and Europe, etc), that are relevant to the facility and will reduce air emissions and contribute to reduced POI concentrations of the contaminant;

- an assessment of the possibility of transferring technology and pollution control options from other industrial sectors using the same or similar contaminants; and

- a consideration of inherently less polluting processes/practices, including pollution prevention and changes in materials used within and produced by the facility.

Step 2. Analyzing the methods identified under Step 1 and (if applicable) combinations of those methods which are technically feasible; and an explanation of why other viable options are not feasible for that facility.

Step 3. Ranking of the technically feasible options and combinations of options that are based upon a top-down analysis approach[5] to reduce air

[5] "Top-down analysis" is an approach developed by the US EPA that can be used to identify, in a systematic manner, the most effective pollution control strategy for a source or combination of sources. See the US EPA document, "Significant Deterioration and Nonattainment Area Permitting, Draft, October 1990. Refer to www.epa.gov/ttn/nsr/gen/wkshpman.pdf

emissions that will in turn contribute to reduced POI concentrations for the contaminant(s) that are the subject of the request.

Step 4. Considering Risk Scores (optional) in particular for situations where there are exceedences of multiple contaminants.

Step 5. Documenting and Reporting

A primary objective of assessing pollution control options is to ensure consideration of all available and emerging technical solutions. The identification of all available options ensures that the maximum reduction in concentrations is identified. Technology benchmarking also allows for the relative comparison of environmental performance of current and proposed pollution control options within a given industrial sector.

Subsection 32(28) of the Regulation allows a Director to approve a facility to operate with an altered standard for up to 5 years (up to 10 years in extenuating circumstances). Under Section 32(29), a facility may re-request an altered standard. As such, regular up-dates to the technology benchmarking assessment will be necessary. The Director may consider the number of previous requests and extent of these up-dates may depend upon the completeness and success of the technology benchmarking assessment in reducing off-site impacts, local input, and demonstrating that best practices are employed to reduce POI concentrations and limit off-site impacts.

Technically feasible pollution control strategies or combinations that result in a POI concentration that is either as close to the standard as possible or results in compliance with the standard is always the preferred approach. The economic implications of implementing the p*referred technically feasible pollution control combination* may be considered in a separate economic feasibility analysis (see Chapter 2.5 of this Guideline, GRAAS and subsection 32(14) of the Regulation).

Further guidance on the above-noted five step approach to completing a Technology Benchmarking Report is provided in GRAAS (Appendix A). They are briefly summarized below.

Note: Sector-based Approaches

Subsection 32(13) of the Regulation sets out the requirement for assessing p*referred technically feasible pollution control combinations*. An analysis of all available technically feasible alternatives must be submitted by a facility to support a request to alter a standard. Technology benchmarking reports may be developed for a sector (or part of a sector) if the facilities in the sector share common technical challenges in reducing contaminant concentrations. Individual facilities in that sector may then use this technology benchmarking

report to support their own individual requests for an altered standard. Pre-submission consultation with the MOE is required for sector-based approaches.

2.4.1 Step 1: Identify Technical Options for Contaminant(s)

All technical options available to reduce concentrations of contaminants that are the subject of the request (both from all significant sources of these contaminants, and facility-wide reduction options) must be documented. It is required that the development of technical methods consider:

a) Materials: The assessment shall consider the various raw materials and how they affect emissions of the contaminant(s) that are the subject of the request.

- Are there product substitution opportunities?
- Are there raw material substitution opportunities?

b) Processes: The assessment shall consider a comprehensive review of both the process and operating practices in order to determine:

- Are there opportunities for emission reductions through a change in the overall approach to production?
- Are there inherently less polluting processes/practices or pollution prevention options?

c) Add-On-Controls: The assessment shall include a review of add-on controls for each major source of the contaminant(s) that is the subject of the request.

The identification of pollution control options shall include a review of requirements from other jurisdictions to reduce concentrations; a review of other facilities that emit the same contaminant or that may use similar technology; and other related industries where information to control similar emissions may be relevant.

The review of options shall include applicable codes of practice, guidelines and best practices, established or recommended by any provincial or federal authority, local or international organization and industry association. One of the primary sources of information is the United States Environmental Protection Agency (US EPA) (www.epa.gov/ttn). For example, the Maximum Achievable Control Technologies (MACT) standards for hazardous air pollutants and National Emission Standards for Hazardous Air Pollutants (NESHAP) are good sources of information for comparison

of US technology requirements for specific sector processes. For criteria pollutants, the US EPA's regulatory framework requires facilities to install and/or determine Best Available Control Technology (BACT); Reasonably Available Control Technology (RACT); or Lowest Achievable Emission Rates (LAER) technologies for their facilities depending on whether or not they are located in an airshed that exceeds or meets the prescribed National Ambient Air Quality Standards. Along with the US EPA RACT-BACT-LAER Clearinghouse (which lists previously used technology solutions for criteria pollutants), the New Source Performance Standards (NSPS) are also valuable sources of information for benchmarking assessments.

In benchmarking and assessing the environmental integrity of the technically feasible options, the following sources of information benchmarks must be considered where available. Other possible sources of information are identified in Table 2.

a) MACT – Maximum Achievable Control Technology

b) LAER - Lowest Achievable Emission Rate

c) BACT - Best Available Control Technology

d) RACT - Reasonably Available Control Technology

e) State and Territorial Air Pollution Program Administrators (STAPPA) and Association of Local Air Pollution Control Officials (ALAPCO)… see www.cleanairworld.org/.

f) Environment Canada and the Canadian Council of Ministers of the Environment (CCME) documents (http://www.ccme.ca/publications/) where several sector-specific codes of best practices and emissions guidelines have been developed with some minimum environmental performance targets.

Table 2: Other Sources of Information for Benchmarking Analysis

The following information sources are available for the technology benchmarking review process. This list of agencies/information is provided here for reference only and is not intended to be all inclusive.

a) National Office of Pollution Prevention, Environment Canada (http://www.ec.gc.ca/nopp/en/index.cfm)

b) Environmental Technology Verification, Environment Canada (http://www.etvcanada.com/English/e_home.htm)

c) Clean Air Technology Center, United States Environmental Protection Agency (http://www.epa.gov/ttn/catc)

d) Global Network of Environment and Technology, United States Department of Energy (http://www.gnet.org/government/stategov/default.cfm)

e) Compliance Assistance Program, California Environmental Protection Agency (http://www.arb.ca.gov/cap/cap.htm)

f) Best Available Control Technology (BACT) Clearinghouse Database, Air Resources Board, California Environmental Protection Agency (http://www.arb.ca.gov/bact/bact.htm)

g) Clean Air Assistance Program, Department of Environmental Quality, State of Michigan (http://www.michigan.gov/deq)

h) Pollution Prevention Technical Assistance, Compliance Assistance Center, Texas Commission on Environmental Quality (http://www.tnrcc.state.tx.us/exec/sbea/p2tech.html)

i) Division of Technology, Industry and Economics, United Nations Environment Programme (http://www.uneptie.org//)

j) Air Pollution Control Cost Manual, United States Environmental Protection Agency (http://www.epa.gov/ttn/catc/products.html#cccinfo)

k) International Institute for Applied Systems Analysis (http://www.iiasa.ac.at/docs/IIASA_Home.html)

l) Department for Environment, Food and Rural Affairs, United Kingdom (http://www.defra.gov.uk/environment/index.htm)

m) German Federal Environment Ministry (http://www.bmu.de/en)

2.4.2 Step 2: Eliminating Options that are not Technically Feasible

Feasibility means that the technology can be reasonably installed and operated on the source under consideration. A preliminary screening of identified technologies must be performed to identify viable technical solutions to reduce POI concentrations. For example, screening-out technically infeasible options might consider site-specific technical issues or space limitations; and/or a significant lack of performance data for options that are based upon new or emerging technologies. This review shall be supported by an explanation of why eliminated options are not technically feasible for that facility or sector. In particular, a detailed analysis is

required to support eliminating options that would otherwise be commonly considered applicable to processes within the same industrial sector or to sources emitting similar contaminants.

2.4.2.1 Multiple Major Sources: Identifying Combinations

In situations where there are multiple major sources of the contaminant(s) of interest, the facility shall identify combinations of technologies that could be used to control the various sources at the facility that are contributing significantly to the POI concentrations. In such cases, each technology combination shall be treated as a pollution control strategy to be assessed. For more information, please refer to GRAAS.

2.4.3 Step 3: Technically Feasible Options are Ranked/Benchmarked

Once all technically feasible pollution control strategies have been identified, the next step is to determine the combination of methods for all the sources overall to reduce the overall POI concentrations at a facility. Each technically feasible pollution control combination is then ranked from the most to least effective at reducing the maximum POI concentration. The default technically feasible pollution control combination is the best of all technically feasible pollution control strategies for each source once it has been assessed for feasibility. The Subsection 32(13) paragraph 2 of the Regulation requires the facility to submit information on the extent or geographic footprint of the exceedences as well as the frequency of exceedences (see also Chapter 2.3.1 of this Guideline). Before an approval is granted, the Director is required to consider frequency of exceedences under subsection 32(21) b (ii) of the Regulation.

In most cases, the ranking requirements of paragraph 6 of subsection 32(13) would be satisfied when the technology benchmarking report includes the following information:

i. A list of technically feasible pollution control combinations that are ranked, using a top-down analysis approach, based on their maximum POI concentrations.

ii. For each technically feasible pollution control combination, a description of the effectiveness of reducing concentrations (including geographic extent and frequency of exceedences in accordance with subsection 32(13) paragraph 2 of the Regulation. See also Chapter 2.3.1 if this Guideline); expected emission reductions that lead to the maximum POI concentration reductions (including information regarding reduction in maximum emissions in grams per second; reduction in kilograms per tonne of product; and reductions in emissions in tonnes per year).

iii. A review of the contribution and significance of various sources to total emissions and maximum POI concentrations; and

iv. A summary of any relevant information on any other health or environmental issues. For more information, see Chapters 2.2.1 (Identifying Receptor Points for Evaluation) and Chapter 4 of this Guideline.

It is recommended that the technology benchmarking report also include a review and summary (where information is available through surveys or published data) of:

- the overall performance of the facility (i.e., in terms of emissions per tonne produced) relative to other similar facilities; and
- the performance of unit processes and/or source types relative to other similar processes/source types (e.g., process fugitive emissions per tonne produced).

The technically feasible pollution control combination that either results in compliance with the air standard (or MOE POI Limit), or provides for the greatest level of reduction in concentrations is the preferred technically feasible pollution control combination. If none of the technical options achieve compliance with the standard and an economic feasibility analysis is not provided then, the technically feasible pollution control combination option that achieves the lowest maximum POI concentration is required to be included in the implementation plan as set out in paragraph 7 of subsection 13(2) of the Regulation. Maximizing reduction in concentrations means that the MOE is encouraging facilities to achieve the lowest possible concentrations for their processes in order to achieve as close to compliance with the MOE standard (or MOE POI limits) as possible.

If facilities are not able to implement the preferred technically feasible pollution control combination that achieves the lowest maximum POI concentration due to economic arguments, an economic feasibility analysis may be submitted to support another option for an altered standard (see Chapter 2.5 of this Guideline and GRAAS).

2.4.3.1 Ranking Technically Feasible Options Based on Concentrations

Potential reductions in maximum concentrations of contaminants affected by each option are identified through remodelling operational scenarios for each technically feasible pollution control combination and obtaining a maximum concentration for each contaminant of interest. For requests for an alteration to a standard, the contaminants of interest are the ones that are the subject of the request. The options are then ranked based on the ability to achieve the maximum reduction of POI concentrations. The preferred technically feasible pollution control combination is the combination which gets the facility closest to achieving compliance with the standard or in compliance with the standard by a certain date.

Note: In most cases, if two or more technical options are within 15% of each other in terms of maximum POI concentrations, then the one with the lowest cost may be accepted based on a simple economic analysis. The MOE may consider this as an acceptable solution to maximize risk reduction without the need for a more detailed economic analysis. Such a decision, however, must be documented with rationale and is subject to the MOE discretion and approval.

2.4.4 Step 4: Considering Risk Scores (Optional)

Depending upon the number of contaminants under review, there may be a desire to use the risk scoring system outlined in Appendix II. Risk scores may be used for a single contaminant but may be more useful when dealing with multiple contaminants. Risk scores can be used to illustrate and rank the technically feasible pollution control combinations for multiple contaminants. An example is provided in Appendix III.

In order calculate risk scores, the maximum concentration for each contaminant in each technically feasible pollution control combination (technical combination (TC)) would be determined. This would then be used to compute an equivalent risk score for that technical combination. Each TCi will have a risk score calculated for each contaminant that would result if the technical combinations were implemented. For example, each TCi is a "risk scenario" and the risk score is calculated as follows:

$R_{TCi} = \sum R_{cj} = R_{c1} + R_{c2} + \ldots$

Where

R_{TCi} = Risk Score for Technical Combination "i" (and i=1, 2, 3…)
Cj = contaminant "j" (and j=1, 2, 3…)
R_{cj} = Risk Score for contaminant "j"
R_{cj} (carcinogens/non-carcinogens) = $(RQ)_{cj} * (W_{cs})_{cj} * (W_L)_{cj}$

$RQ_{cj} = [(C_{maximum})_{cj} / \text{MOE standard}]$

W_{cs} = a weight assigned to one of the 6 consequence categories identified in Table A-1 (Appendix II) based on the limiting effect of the MOE standard being exceeded

W_L = percentage of time the model predicts an exceedence of the MOE standard at the point that represents the maximum POI concentration.

Where the technical combination involves the reduction of more than one contaminant, calculate the maximum concentration and frequency of exceedences for each contaminant individually. These dimensionless risk scores may then be added together for an overall score for that technology combination. If risk scores are used in the assessment, then another table showing the ranking of technical combinations based on risk scores may also be provided. However, this is in addition to ranking the options based on individual contaminant POI concentrations

as set out in Step 4, which is a regulatory requirement. Risk scoring is optional and is not a regulatory requirement.

Note: The same risk score formula can be used to calculate the risk score for both co-benefits (options that also reduce other harmful pollutants) and dis-benefits (options that increase concentrations of other harmful pollutants).

2.4.5 Step 5: Reporting and Documentation of the Technology Benchmarking Process

Once all the information is gathered and considered, it must be documented in a report format that can be shared with the MOE and other stakeholders (see Chapter 2.6 – Stakeholder Involvement). Paragraphs 3 through 6 of subsection 32(13) of the Regulation sets out the information required to be submitted to document the technology benchmarking assessment. The information requirements in paragraphs 3 through 6 of subsection 32(13) of the Regulation must be provided but, in most cases, these information requirements are satisfied when a Technology Benchmarking Report includes the following information:

a) A summary of Steps 1 through 5, described in Chapters 2.4.1 through 2.4.5 of this Guideline as well as GRAAS including,

   i. a listing of all methods identified for use (with all significant sources of the contaminants, that are relevant to the request, at the facility) to reduce concentrations of the contaminants.

   ii. a summary of the analysis of the methods identified in the above paragraph, and combinations of those methods, to determine which are technically feasible with respect to the sources of contaminant to which the request relates.

   iii. a description of the “top-down analysis” and a listing and ranking of the methods and combinations of technically feasible methods.

The technology benchmarking report must also include the following information:

a) A summary of the ESDM report and supplemental information required by paragraphs 1 and 2 of subsection 32(13) and 32(13) paragraph 6 of the Regulation for each technically feasible pollution control option (see also Chapter 2.2.1, 2.2.2 and 2.3.1).

b) A section that outlines the reference material used to develop a full range of pollution control option(s).

A Conclusion and Recommendation section that summarizes the selection of the preferred technically feasible pollution control combination.

The p*referred technically feasible pollution control combination* that maximizes the reduction in the POI concentrations is the one to be included in the implementation plan. A schedule for implementation would be included separately (see Chapter 2.7 the Development of an Action Plan and subsection 32(13), paragraph 6 of the Regulation). If the facility requests that economic information be a consideration in the decision making, appropriate economic information as described in Chapter 2.5 of this Guideline and set out subsection 32(14) of the Regulation may be submitted. For more information on technology benchmarking reports, please see the GRAAS (PIBs # 6322) (as amended).

2.5 Economic Considerations (Risk Evaluation)

A request for an alteration of a standard in Schedule 3 under subsection 32(1) of the Regulation must include the information set out in subsection 32(13) of the Regulation and discussed in Chapter 2.4 of this Guideline. After completing a technology benchmarking report, facilities may claim they cannot afford to comply with the effects-based air standard or implement the preferred *technically feasible pollution control combination* to maximize the reduction of POI concentrations within a reasonable period of time. If that is the case, a facility may choose to bring forward an economic feasibility analysis to support another *technically feasible pollution control combination* in their request. This is allowed under subsections 32(14) of the Regulation.

Under Section 32 of the Regulation – Alteration of Schedule 3 Standards:

"(14) A person who makes a request under subsection (1) may include the following in a part of the request that is separate from the part of the request that contains the material required by subsection (13):

1. ***An analysis of the economic feasibility of the methods and combinations of methods that are determined under paragraph 4 of subsection (13) to be technically feasible.***

2. ***A list of the methods and combinations of methods that are determined under paragraph 1 to be economically feasible.***

3. ***A ranking of the methods and combinations of methods identified under paragraph 2, based on the maximum concentration of the contaminant that, according to an approved dispersion model, would result at a point of impingement if each method or combination of***

methods were used with respect to the sources of contaminant to which the request relates.

4. A plan on how to implement,

i. the method or combination of methods that is ranked under paragraph 3 as the method or combination of methods that predicts the lowest maximum concentration of the contaminant at a point of impingement, or

ii. a method or combination of methods that, according to an approved dispersion model, would not result in a contravention of section 20.

(15) Subsection (14) does not apply to a person who makes a request under subsection (1) that relies on paragraph 4 of subsection (1).”

Note: Subsection 32(15) of the Regulation states that a new facility may not use economic arguments to support a request for an alteration to a standard but is allowed to make a request based on technical issues as set out in Chapter 2.4 of this Guideline.

If the recommended option is not based on maximum reduction of POI concentrations but, instead, is based on economic arguments, then an economic feasibility analysis must be submitted as part of the request. Any request for an alteration to a standard that does not support the preferred option will likely be approved for a period that is less than 5 years (see Chapter 2.8 of this Guideline on Continuous Improvement). Economic considerations will generally not be considered extenuating circumstances warranting an approval period greater than 5 years.

A thorough analysis of available pollution control options, strategies and combinations must always be included in the request (as set out in section 32(13) of the Regulation, Chapter 2.4 of this Guideline and GRAAS). Technology benchmarking is a critical decision point in this process. The logic used in the analysis, and the costs associated with those alternatives must be defendable in a publicly transparent forum. This information leads to more informed decision-making for all affected stakeholders. Under subsection 32(20) and (20.1) of the Regulation, all the information submitted as part of the request must also be made available to other stakeholders upon request.

The cost of each technically feasible pollution control combinations can be established on a Net Total Annualized Cost (NTAC) basis, relative to current, or

baseline operations, and actual baseline values. These costs would be summarized in Table 3. NTAC is calculated using the following approach:

$$NTAC = (O\&M - SAV) + \frac{K\,i}{1 - \frac{1}{(i+1)^n}} - REV$$

where,

NTAC = Net Total Annualized Cost in the period t = 1,…, n years

O&M = Annual Operating and Maintenance Costs

SAV = Annual cost savings (e.g., in energy, chemicals, etc.) resulting from implementing the risk treatment alternative

K = One-time Capital Cost

i = Annual interest rate (borrowing cost)

n = Life of equipment or system (amortization period, years)

REV = Revenues from by-products of risk treatment, including revenue increases due to productivity improvements resulting from implementing the risk treatment alternative

An annual interest rate and amortization period that is agreed to by the MOE shall be used in the cost calculation. This is to ensure consistency in terms of borrowing costs, and to avoid potential issues regarding how individual facilities may consider environmental investments with respect to their internal return-on-investment targets.

The recommended economic parameters are:

a) the interest rate i = 6%; and b) the amortization period n = 10 years.

Alternate values may be requested by the MOE or the facility (subject to MOE approval). If a facility would like to suggest alternate values, pre-submission consultation is recommended.

Table 3: Sample Abatement Technology and Costing Template

Facility Name:
Date:

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9	Column 10	Comments
Emission Reduction Option	Abatement Technology Type/Name	Operating Life(i) (Years)	Capital Costs ($)	Operating Costs ($)	NTAC ($)	Contaminant 1 – POI Concentration (µg/m³)	Contaminant 1 – Predicted Emissions Reduction (%)	Contaminant 1 – Final Maximum Emission Rate (g/s)	Contaminant 1 – Final Max Annual Avg. Emission Rate (Tonnes/yr)	Uncertainty
Current Status (Base Case)										
Option A – Source 1										
Option A - Source 2										
Option A - Source n										
Option B – Source 1										
Option B - Source 2										
Option B - Source n										

COLUMN DESCRIPTIONS:

1) List and, if necessary, describe the abatement or prevention technologies in each technology (combination) option consisting of a group of sources. For current status, please enter the current POI concentrations with the appropriate averaging time.
2) Type of abatement technology proposed.
3) Predicted Equipment Operating Life.
4) One time costs include equipment costs, installation, design and engineering and consulting costs. If any capital items require periodic replacement, note in "comments column".
5) Recurring operating costs include at least energy, labour, materials and supplies and any other recurring costs. Express as an annual cost.
6) NTAC – Net Total Annualized Costs
7) POI Concentration (µg/m³)
8) Predicted Percentage Reductions from Current Status (First Row).
9) Current status and final predicted Emission Rate in g/s after implementation of control technology, representing a maximum averaging time period that corresponds to the standard/limit.
10) Current status and final predicted Emission Rate in Tonnes/year, reflecting operating days and conditions.
11) Comments and level of uncertainty (e.g. ±30%) in the estimates of costs, loading reductions & concentrations changes, and any information relating to the calculation of the annualized costs for other rows.

NOTES:

i) Impact of using a fixed Operating Life (e.g. 10 years) for evaluation purposes will be assessed. ii) Ministry acceptable discount rate is 6%.

At this stage, the identified technical methods have been assessed for their technical feasibility with no economic considerations (see Step 4 of Chapter 2.4 of this Guideline). Feasibility means that the technology can be reasonably installed and operated by the source type under consideration. Once all technically feasible pollution control combinations are identified and ranked based on their ability to reduce POI concentrations, their NTACs are calculated for each source and contaminant assessed. The NTAC is the sum of individual combination added together to obtain the total cost for the *technically feasible pollution control combination(s)*.

In general, an Economic Feasibility Report can be used to achieve the information requirements of subsection 32(14) of the Regulation, with the request for an altered standard. This report should provide a clear explanation of the reason why a facility cannot allocate sufficient funds for compliance activities within the relevant time period. As per the MOE Procedure F-14 (Economic Analysis of Central Documents on Private Sector and Municipal Projects) (as amended), a regulated party must provide sufficient financial data to document and substantiate such claims. It is recommended that this report include the information discussed in this Chapter as well as the information set out in Table 4: Indicators of Financial Hardship. In situations where economics is an issue brought forward by the company, the MOE will consider the ratios outlined in Table 4 as well as other information to assess their situation on a case-by-case basis.

Regulated parties who opt to submit economic analysis are expected to provide such financial and other types of information to the MOE personnel or its consultants, as needed, to carry out the analyses. Failure to provide the required information will mean that an approval of an altered standard cannot be issued and the facility would be operating in non-compliance with the standard. Therefore, companies who claim potential financial hardship must provide evidence in support of such hardship. For companies, such evidence should include at least 5 years (10 years preferred) of audited financial statements and copies of corporate income tax returns. Individuals would need to provide copies of personal income tax returns and statements of personal assets as evidence.

Companies may also provide copies of completed Statistics Canada surveys of the annual Census of Manufacturers. Evidence must also show how potential compliance costs from the Least Cost Abatement Cost Functions (LCACF) might change key financial indicators and ratios. Furthermore, financial performance data for a single year are not sufficient to reveal financial health of a corporation or individual. For a corporation, trends in financial indicators over an entire business cycle should be reviewed. That is why 10 years of financial data are preferred.

Note: Sector-based Approaches

Under subsection 32(14) of the Regulation, an economic feasibility analysis may be submitted by a facility to support a request for an alteration to a standard. Economic Feasibility Reports may be developed on a sector basis (or part of a sector) if the facilities in the sector share common economic challenges in reducing concentrations. Individual facilities in that sector may then use the information to support their own individual requests for an altered standard. However, in some cases, site-specific economic information may also be required. If sector-based approaches are contemplated, pre-submission consultation with the MOE is required.

The US EPA and other sources have suggested various financial ratios and indicators and they have sometimes cited threshold values that are indicators of financial distress or even bankruptcy for a firm. While there are some benchmarks, as well as thresholds or decision rules for a few financial indicators, generally, there are no widely accepted criteria, benchmarks, thresholds or decision rules to determine whether a particular level of cost is "affordable" or "cost prohibitive." That said, there is precedence to guide the development of a suite of economic affordability indicators. For instance, the US EPA Office of Air Quality Planning and Standards "Economic Analysis Resource Document" (Page 5-44) recommends that a "...company-level analysis should focus on changes in key measures of profitability". Ratios such as return on sales, and return on equity may also be useful to evaluate economic hardship. A list of recommended economic indicators is summarized in Table 4: Indicators of Financial Hardship.

If different threshold values or indicators are suggested by a facility, they must provide a rationale for using them. The information on hardship claims will be evaluated by reviewing how these and other financial indicators change as result of incurring compliance costs. These indicator values are provided as examples to those requesting an altered standard and are not to be construed as absolute and final proof of reduced competitiveness or non-affordability.

If a company proposes threshold values that are different from those in Table 4, a documented explanation and rationale must be provided. The MOE would also be interested in other financial indicators that represent funds that could be allocated to compliance activities. These indicators include after-tax profits, depreciation, working capital, tangible assets (e.g. real estate, aircraft, etc.), consulting fees and dividends paid to owners and officers of the firm. Cost effectiveness indicators may also be considered on a case-by-case basis subject to approval by the MOE.

Public information that affects the decision making must be made available through the stakeholder involvement process. Any information submitted to support a request to alter a standard, including economic feasibility analysis and reports, must be made available to local stakeholders as part of the pre-submission consultation with the local community

(see subsection 32(20) and 32(20.1) of the Regulation). The release of information contained in request forms and documentation submitted in support of requests for an altered standard is subject to the provisions of the *Freedom of Information and Protection of Privacy Act*. See Chapter 2.10 of this Guideline for more information.

Table 4: Indicators of Financial Hardship

Indicator (unit)	Description/Formula	***Not Desirable*** "Indicator" Thresholds values that are:		Explanatory Notes (desirable for firms)
		less than	greater than	
Return on Assets (%)	Earnings Before Interest but After Taxes(EBIAT) / Total Assets x 100	2.5%		The higher the percentage the better. Source: KPMG, 1990
Beaver's Ratio	After-tax Cash Flow / Total Liabilities	0.1		The higher the value the better. Source: US EPA, ABEL Model
Total Debt to Total Assets (%)	Total Short and Long Term Debt / Total Assets x 100		70%	The lower the percentage the better. Source: KPMG, 1990
Cash Flow to Total Debt (%)	After-tax Cash Flow/Total Debt x 100	8%		The higher the percentage the better. Source: KPMG, 1990
Compliance Costs as a % of Total Sales (Revenue)	NTAC / Total Sales (or Revenue) x 100		3%	The lower the percentage the better.
Compliance Cost as a % of Operating Profit	NTAC/Before-Tax Income (Profit) x 100		1%	The lower the percentage the better.
Ratio of Compliance Cost to After-Tax Profit as compared to the Ratio of Compliance Cost to Total Sales (Revenue)	(NTAC / Before-Tax Profit) - (NTAC / Total Sales)		1	The lower the index the better.
Quick Ratio	Current Assets (less Inventories) / Current Liabilities	1		The higher the value the better.
Current Ratio	Current Assets / Current Liabilities	2		The higher the value the better. Source: US EPA, ABEL Model
Altman's Z-Score	Z = 1.2xX1 + 1.4xX2 + 0.6xX4 + 1.0xX5* + 3.3xX3 (1)	1.23		Less than 1.23 indicates that the firm could go bankrupt within the next two years if its financial situation does not dramatically improve. Source: US EPA, ABEL Model

(1) X1 = Current Assets - Current Liabilities / Total Assets; X2 = Retained Earnings / Total Assets; X3 = Before Tax Profit / Total Assets; X4 = Value of Equity / Total Liabilities; X5 = Revenues from Sales / Total Assets

2.6 Stakeholder Involvement

A risk-based decision making process prevents undesirable outcomes, supports better decision-making, and provides greater insights and transparency on the proposed outcomes. This Guideline considers scientific information, uncertainties, and other factors such as community concerns and perceptions. The request for an altered standard must include: an ESDM report for the whole facility; a technology benchmarking assessment; an optional economic feasibility analysis; a proposed action plan with a schedule to implement the preferred option and a summary of pre-submission consultation with the community. The Regulation requires that the person requesting an alteration to a standard hold a public meeting on the proposed request prior to submission. Subsections 32 (18), (19), (20) and (20.1) and 32(13) paragraph 8 of the Regulation specify the requirements for stakeholder involvement.

Under Section 32 of the Regulation – Alteration of Schedule 3 Standards:

"(18) Before making a request under subsection (1), a person shall hold a public meeting on the proposed request.

(19) The person making a request under subsection (1) shall, at least 15 days before the public meeting required by subsection (18),

(a) publish a notice in a newspaper having general circulation in the area where the source of contaminant is located, setting out the name, address and telephone number of the person and informing the public of the person's intention to make the proposed request, the purpose of the request and the date, time and place of the meeting; and

(b) ensure that a copy of the notice referred to in clause (a) is given to,

(i) the owners and occupants of,

(A) every property that adjoins or is within 500 metres of the property on which the source of contaminant is located, and

(B) every property where, according to an approved dispersion model, there is a point of impingement where, as a result of discharges of the contaminant that is the subject of the request, the concentration of the contaminant may exceed the standard that is the subject of the request,

(ii) the medical officer of health for the health unit in which the source of contaminant is located and the medical officer of health for each health unit in which a property described in subclause (i) is located,

(iii) the Ministry, and

(iv) each municipality in which the source of contaminant is located and every other municipality that is within 500 metres of the property on which the source of contaminant is located.

(20) The person making a request under subsection (1) shall, at the public meeting required by subsection (18),

(a) make available, to everyone in attendance,

(i) a written copy of the executive summary of the report required by paragraph 1 of subsection (13), and

(ii) a written explanation, written in language that can be understood by persons without specialized scientific training, of the proposed request, including the materials that are to be included under subsections (13) and (14);

(b) offer to provide a complete written copy of a draft of the proposed request, including the materials that are to be included under subsections (13) and (14), to every person in attendance who asks for a copy;

(c) provide the copies requested under clause (b), or make arrangements to provide those copies as soon as practicable after the meeting;

(d) explain the proposed request;

(e) explain how the Environmental Bill of Rights, 1993 will apply to the proposed request; and

(f) provide a reasonable opportunity for those in attendance to ask questions of the person making the request under subsection (1) and to comment on the proposed request."

(20.1) The person making a request under subsection (1) shall provide written material referred to in clause (20) (a) or (b) as soon as practicable to any person

who makes a request for the material within 30 days after the public meeting required by subsection (18).

Section 32(13) paragraph 8 of the Regulation – Alteration of Schedule 3 Standards:

"8. A description of the steps taken under subsections (18) to (20) by the person making the request under subsection (1), including a summary of the questions asked and comments made by persons who attended the public meeting and the responses of the person making the request. …"

Notification of the public meeting must be in a language that can be understood by persons without specialized scientific training. The format, style, title or content of the notification may vary from facility to facility to suit specific circumstances and local requirements. The following is recommended:

- Name and address of facility requesting the alteration of a standard(s);
- A brief description of the basis of the request, which outlines the nature of the alteration being requested and the reasons the alteration is needed;
- Indication that the facility is following the process required by the Regulation;
- Details of when and where the public meeting will take place, and where further information can be obtained if a member of the public is unable to attend the meeting;
- Name or title of a company contact person to whom comments or requests for information should be directed;
- Suggested date by which comments/input may be received by the facility.

Notification to the MOE shall be both to the local MOE district office as well as to the Director under s.32 of the Regulation (Standards Development Branch). The nature of the issues analyzed and discussed should all form part of a risk communication plan. As outlined above, facilities will be required to provide a plain language version to the public that summarizes their proposal and their proposed path forward.

Note: Sector-based Requests

In some cases, sectors who have chosen to share their resources to develop technology benchmarking reports or economic feasibility reports may also want to conduct sector-based public meetings. This is acceptable provided the requirements set out the Regulation are adhered to. For example, any facility who wants to rely on sector-based public meetings must ensure that all required local stakeholders are notified of the meeting at least 15 days prior. In addition, local newspapers, or province-wide newspaper advertising can also be considered. For sector-based approaches, local open houses are recommended in addition to the larger information sessions to ensure that local issues have an opportunity to be considered. Pre-submission consultation with the MOE is required for sector-based approaches so that the intent of the Regulation is more likely to be satisfied.

2.6.1 Developing a Risk Communication Plan

It is recommended that stakeholder identification begin as soon as possible and that risk communication focus on the key stakeholder(s) – the local community. This is an important element of public transparency.

The Key Communications Objectives are to ensure that:

- Stakeholders are aware of the barriers to the implementation of air standards and any potential incremental health or environmental risks associated with altering the standard.
- Community members are given an opportunity to understand the barriers for the facility in complying with the standards at this time.
- Stakeholders/Community members are given an opportunity to review the proposed action plan (see Chapter 2.7 of this Guideline).
- Community members understand the regulatory framework and have an opportunity to comment on the proposal by the facility for an altered standard and the outcome reached by the facility in terms of corrective actions to address the issue.
- The community is given an opportunity to provide input into the risk-based decision making process both before the request is submitted and through the Environmental Bill of Rights process after the request is submitted to the MOE.
- Stakeholders know where information is available and whom to contact for answers to their questions.
- If a request for an altered standard is approved by the MOE, the final Approval and supporting documents must be made available upon request as set out in subsection 32(31) of the Regulation.

Under Section 32 of the Regulation – Alteration of Schedule 3 Standards:

"(31). If the Director approves the alteration of a standard under subsection (21), the person who requested the alteration shall,

(a) give a copy of the approval to any person who requests it; and

(b) make the written material referred to in clause (20) (a) or (b) available for inspection by any person at the facility during regular business hours during the period that the alteration of the standard applies.

Note: While there is a great emphasis on public transparency and open communication, the regulated community's proprietary information will be considered confidential if it is deemed to be so under the Freedom of Information Act and Protection of Privacy. See Chapter 2.10.1 of this Guideline for more information.

The communication guidelines outlined below assume that the ESDM reports have already been completed as set out in the Regulation, the ESDM Procedure Document, ADMGO and GRAAS. The following are some suggested guidelines for communication.

Public Communication to support Request to Alter a Standard(s):

1. **Identify key stakeholders:** Identify key stakeholders (community groups/existing local environmental groups/MOE/Public Health Units, municipalities, First Nations or other levels of government, etc.). At a minimum, the stakeholders identified in Subsection 32(19) of the Regulation must be notified of the public meeting.

2. **Public Meeting:** As per subsection 32(18) of the Regulation, before the request for an alteration to the standard is submitted to the MOE, the facility must, as a minimum, host one public meeting and notify all key stakeholders (identified in subsection 32(19) of the Regulation) and the MOE (which includes the local District Office as well as the Director of Altered Standards) at least 15 days before the meeting.

   Note: The proposed communications plan may have to be adjusted to correspond to the perceived level of risk acceptance in the community. If risk acceptance is low, the communications response may need to be modified to respond to questions from the community.

3. **Seeking Input:** Before the request is submitted, the document(s) that will be used to support a request to alter the standard must be made available to the public as set out in the Regulation (subsection 32(20) and 32(20.1)). These would include: the ESDM Report Executive Summary, Technology Benchmarking Assessment; and Economic Feasibility Analysis (if the facility opted to consider economics) and the action plan.

4. **Community Forum:** The community informational meeting is to be organized by the company. The meeting will be chaired by the facility and representative(s) from the MOE should be present. At the meeting, the facility must provide a plain language informational package to the interested stakeholders including an outline of the proposed action plan (see subsection 32(20) of the Regulation). The company is expected to respond to questions raised by the meeting participants. The company must also offer to provide a complete written copy of the the proposed request for an altered standard, including supporting materials.

5. **Summary of Comments:** As set out in subsection 32(13), paragraph 8 of the Regulation, the facility must provide a written summary of the public meeting which must be submitted as part of the request for an altered standard(s).

6. **EBR Comment Period:** The facility's request to the MOE for an altered standard will be posted on the Environmental Registry (under the Environmental Bill of Rights) (EBR)) for a minimum 30-day comment period. The MOE will review the request and the supporting documents at the same time. During this review period, all stakeholder comments received through EBR Registry will be shared with other stakeholders upon request. The facility should be available to respond to specific comments submitted under EBR as needed.

7. **Outcome:** The MOE will consider the summary of comments from the local community as well as input from other interested stakeholders submitted via EBR Registry to make a final decision on the approval of the action plan proposed by the facility. If approved, the Regulation requires that key information be made available to the public and all identified stakeholders upon request.

" … 32(31) If the Director approves the alteration of a standard under subsection (21), the person who requested the alteration shall,

(a) give a copy of the approval to any person who requests it; and

(b) make the written material referred to in clause (20) (a) or (b) available for inspection by any person at the facility during regular business hours during the period that the alteration of the standard applies. …"

2.7 The Action Plan

Subsection 32(13), paragraph 7 and subsection 32(14) paragraph 4 of the Regulation require the submission of a plan on how the facility will implement the preferred solutions identified through its analysis of technical or economic feasible methods.

Subsection 32(13) of the Regulation is the subsection that allows for technical feasibility arguments. Paragraph 7 of this subsection requires a person who makes a request for an altered standard based on technical considerations to include an action plan as per the following:

Under Section 32(13) of the Regulation – Alteration of Schedule 3 Standards:

"…. 7. Unless a plan is included under paragraph 4 of subsection (14), a plan on how to implement,

i. the method or combination of methods that is ranked under paragraph 5 as the method or combination of methods that predicts the lowest maximum concentration of the contaminant at a point of impingement, or

ii. a method or combination of methods that, according to an approved dispersion model, would not result in a contravention of section 20."

Subsection 32(14) is the subsection that allows for economic feasibility arguments. Paragraph 4 of this subsection requires a person who makes a request for an altered standard based on economic considerations to include an action plan as per the following:

Under Section 32(14) of the Regulation – Alteration of Schedule 3 Standards:

"…. 4. A plan on how to implement,

i. the method or combination of methods that is ranked under paragraph 3 as the method or combination of methods that predicts the lowest maximum concentration of the contaminant at a point of impingement, or

ii. a method or combination of methods that, according to an approved dispersion model, would not result in a contravention of section 20."

An action plan developed under either of the two above subsections must be submitted with the request for an altered standard and should:

- represent the best the facility can do to get as close to the standard as possible under current circumstances;

- propose maximum or considerable risk reduction where possible;
- represent an improvement over 'business-as-usual'; and
- propose further improvements over time.

The final action plan can be incorporated as conditions on the approval of an altered standard(s), an order under subsection 32(31.1) and/or the C of A. Further public meetings may be considered depending on community responses to the proposal and timing of the action plan.

Under Section 32 of the Regulation – Alteration of Schedule 3 Standards:

(23) If the Director approves the alteration of a standard under subsection (21), the standard shall be deemed to be altered as set out in the approval. O. Reg. 419/05, s. 32 (23).

(24) Subsection (23) applies only to discharges of the contaminant from the facility to which the request related.

(25) The Director may impose conditions in an approval under subsection (21).

(26) If conditions are imposed under subsection (25),

(a) subsection (23) applies only if the conditions are complied with; and

(b) the person who made the request under subsection (1) shall notify the Director when the conditions have been complied with. O. Reg. 419/05, s. 32 (26).

(27) Subsection (26) applies, with necessary modifications, to conditions that are imposed in a certificate of approval to ensure compliance with section 20 with respect to a contaminant for which a standard has been altered under this section.

…

(31.1) If the Director approves the alteration of a standard under subsection (21), he or she may make an order requiring a person to whom the alteration applies to take steps specified by the order, not later than the dates specified in the order, that are related to complying with section 20, having regard to the altered standard.

(31.2) An order made under subsection (31.1) does not apply if the person against whom the order was made complies with section 20, having regard to the standard set out in Schedule 3 that was altered by the approval under subsection

(21).

(31.3) If the Director makes an order under subsection (31.1), the person against whom the order was made shall give a copy of the order to any person who requests it.

The following steps are part of the development of the action plan:

1. Step 1 - Document the strategy for implementing the preferred technically feasible pollution control combination. This should include the details of the chosen preferred technically feasible pollution control combination and a schedule for implementation. The draft action plan shall be communicated to the MOE and other stakeholders including the public during pre-submission consultation (see Chapter 2.6 of this Guideline).

2. Step 2 – Consider modifications to the initial proposed action plan, if necessary, based on input from various stakeholders or the MOE. The MOE will formally review the plan when the request for an alteration to the standard is submitted.

3. Step 3 – Determine whether interim site-specific limits need to be included in the final action plan. Interim limits are short term limits that the facility would have to meet on its way to meeting the altered standard. Any interim limits need to be approved by the MOE and periodically reviewed to ensure continuous improvement (see Chapter 2.8 of this Guideline). Any proposed interim approach must ensure that the URTs identified and discussed in Chapter 3 of this Guideline are not exceeded at the receptors listed in 30(8) of the Regulation. There must also be an assessment of frequency of exceedences, magnitude and geographic footprint as outlined in Chapter 4 of this Guideline.

4. Step 4 – Develop a schedule for the implementation of the preferred technically feasible pollution control combination and interim steps to ensure continual improvement and reduction of POI concentration over time. The preferred technically feasible pollution control combination or selected option shall be implemented according to the approved final action plan. The final action plan, may be incorporated as conditions on the approval for altered standards, an order under subsection 32(31.1) and/or the C of A (see subsections 32(25) to (27) of the Regulation).

5. Step 5 - Review the plan periodically to ensure continuous improvement (see Chapter 2.8 of this Guideline). An expiry date on the approval of an altered standard will ensure that, if a facility is still not able to comply by the expiry date, then the facility

may re-request an alteration to the standard after that date. Each review or re-issuance of the approval means that all of the steps outlined in Chapter 2/Figure 2 would be repeated including stakeholder involvement.

2.8 Continuous Improvement

The risk-based process to alter a standard that is outlined in this Guideline and the Regulation recognizes the need for continuous improvement. This is accomplished through repeated application of the process steps outlined in Figure 2 and ensuring that the principle of striving to maximize risk reduction is achieved. If the preferred technically feasible pollution control combination does not achieve compliance with the MOE standard, then the MOE will consider an interim site-specific altered standard for a specified period of time. A sector-based approach can also be considered as described throughout this Guideline.

Facilities will be required to periodically review overall progress and revise any interim altered standards as necessary and practicable, to ensure continuous improvement in protecting health and the environment (see Chapter 2.7 of this Guideline, items 4 and 5). This approval would specify how often this review would need to occur. Subsection 32(23), (28) and (29) of the Regulation state that:

Under Section 32 of the Regulation – Alteration of Schedule 3 Standards:

"(23) If the Director approves the alteration of a standard under subsection (21), the standard shall be deemed to be altered as set out in the approval."…

"(28) Subsection (23) applies only to a period specified by the Director in the approval that ends not later than,

(a) five years after the period begins; or

(b) ten years after the period begins, if the Director is satisfied that there are extenuating circumstances.

"(29) Subsection (28) does not prevent the making of further requests under subsection (1) in respect of the contaminant but, in considering a further request, the Director may consider the number of previous requests that have been made for the source of contaminant that is the subject of the request."

Each time the approval of an altered standard expires, the facility would be able to make another request. For each subsequent request, , the facility will be required to re-submit an updated ESDM report, re-evaluate technically feasible pollution control combinations,

re-evaluate their economic situation (optional) and communicate with local stakeholders. The goal is to continuously improve and, where possible, strive to achieve compliance with the MOE standard in the Regulation.

2.8.1 Factors that may affect the Period of Approval for Altered Standards

The Director may approve an altered standard for up to 5 years (or up to 10 years in extenuating circumstances). The timing for these approvals may vary based on incremental risks to potentially affected receptors present in the area. For more information, see Chapters 3 and 4 of this Guideline.

Including an analysis of economic feasibility under subsection 32(14) when seeking a an altered standard may affect the approval period. Where economic hardship prevents the implementation of the option that best reduces the POI concentrations, it is likely that, if the altered standard is approved, it would be for a period that is less than 5 years.

2.9 Verification/Monitoring

As per subsection 32(26) of the Regulation, facilities are required to notify the MOE when they have moved forward with their action plan and installed technical solutions to reduce concentrations. Any installation of equipment that affects emissions would also likely require a C of A under Section 9, EPA. The Regulation allows facilities to submit their application for a C of A concurrently with their request for an altered standard.

Under Section 32 of the Regulation – Alteration of Schedule 3 Standards:

"…(4) An application for a certificate of approval or amendment to a certificate of approval may be made in conjunction with a request under subsection (1).
… "

"(25) The Director may impose conditions in an approval under subsection (21)."

The approval of an altered standard is only in effect provided the conditions of the approval are being met. Subsection 32(26) of the Regulation states:

Under Section 32 of the Regulation – Alteration of Schedule 3 Standards:

"(26) If conditions are imposed under subsection (25),

(a) subsection (23) applies only if the conditions are complied with; and

(b) the person who made the request under subsection (1) shall notify the Director when the conditions have been complied with."

An approval of an altered standard may also be amended.

Under Section 32 of the Regulation – Alteration of Schedule 3 Standards:

"(31.4) The Director may give a person to whom the alteration of a standard applies a notice amending the approval of the alteration,

(a) to alter the conditions imposed under subsection (25);

(b) to alter the period referred to in subsection (28) so that it ends on an earlier date, if the Director is of the opinion that the person should be capable of complying with a more stringent standard by the earlier date; or

(c) to replace the altered standard with a more stringent standard, if the Director is of the opinion that,

(i) the person is capable of complying with the more stringent standard, or

(ii) discharges of the contaminant that are permitted by the altered standard may cause an adverse effect.

(31.5) The Director shall not amend the approval of the alteration of a standard under subsection (31.4) unless the Director first gives the person to whom the alteration applies a draft of the amendment and an opportunity to make written submissions to the Director during the period that ends 90 days after the draft is given."

An approval of an altered standard may be revoked as set out subsection 32 (32) of the Regulation which states:

Under Section 32 of the Regulation – Alteration of Schedule 3 Standards:

"(32) The Director may give a person to whom the alteration of a standard applies a notice revoking the approval of the alteration if the Director is of the opinion that,

(a) discharges of a contaminant that are permitted as a result of the altered standard may cause an adverse effect;

(b) conditions referred to in subsection (26) or (27) are not being met;

(c) the person is unable to comply with section 20, even though the standard was altered; or

(d) the person would be able to comply with section 20 without the alteration of the standard.

(33) Before the Director gives a person a notice under subsection (32), the Director shall give the person a draft of the notice and an opportunity to make written submissions to the Director during the period that ends 15 days after the draft is given."

2.10 Processing the Request

In summary, a complete request for an alteration to a standard must meet all of the requirements of section 32 of the Regulation, which generally include:

- A full site-wide ESDM (see Chapter 2.2.2 of this Guideline and subsection 32(13) paragraphs 1 and 2 of the Regulation)
- Technology Benchmarking Report (see Chapter 2.4 of the Guideline and subsection 32(13), paragraphs 3, 4, 5, and 6 of the Regulation)
- Economic Feasibility Report (Optional, see Chapter 2.5 of the Guideline and subsection 32(14), paragraph 1, 2 and 3 of the Regulation)
- Action Plan (including continuous improvement measures, see Chapter 2.7 of the Guideline and subsection 32(13), paragraph 7 or subsection 32(14), paragraph 4 of the Regulation)

- Summary of Stakeholder Involvement (see Chapter 2.6 of the Guideline and subsection 32(13), paragraph 8 and 32(18), (19), (20), (20.1) of the Regulation)

If the facility decides to proceed with a request for an altered standard, it would be submitted to the MOE for review. The MOE will review the information or may administer a series of contracts that would have the ESDM Report, the Technology Benchmarking Report or the Economic Feasibility Analysis (optional) reviewed by a third party on contract to the MOE.

2.10.1 Submission of Confidential Information

A request for an alteration to a standard may contain sensitive technical or economic information. Some companies may be concerned about the requirement to share information with the public (as well as with the MOE).

In terms of the provisions of the regulation that require a company to share information with the public, the MOE expects that, at a minimum, information shared would include anything which would normally be publicly available. This would include publicly available financial statements and reports in current and previous years. In addition, emissions data that affect POI concentrations must also be made available for public review, as well as a detailed explanation of why compliance cannot be achieved.

The MOE does not expect a company to have to share with the public sensitive information that is submitted in confidence to the Director. If a member of the public requests access to such information, the MOE will handle the request in accordance with the Freedom of Information and Protection of Privacy Acy ("FIPPA"). That statute defines what may and may not be disclosed to the public, and is used to assess all requests for information contained in documents on file with the MOE.

Among other things, FIPPA provides a process for evaluating and considering requests for access to information submitted in confidence to an institution, where certain enumerated harms could result (see FIPPA section 17). In order to avail themselves of the protection afforded by FIPPA section 17, a person requesting an altered standard should identify each record that contains confidential information, and mark the specific, confidential sections clearly. The person must also be prepared to provide detailed evidence in support of the confidentiality claim, based on FIPPA section 17, should a request for disclosure be made to the MOE. It is important to understand that the Information and Privacy Commissioner (IPC), not the MOE, is the ultimate decision maker, and the MOE may be ordered to disclose information even where it is marked confidential.

Apart from the process envisioned by the Regulation, information submitted with a request for a for approval may also be subject to posting on the Environmental Registry pursuant to the Environmental Bill of Rights (EBR), or requested by a member of the

public pursuant to EPA section 19. Regardless of the circumstances, the MOE's practice is still to evaluate the release of information in accordance with FIPPA principles. Where an individual is dissatisfied with a decision of the MOE in terms of making information available, they have the option of making application under FIPPA in order to invoke the statutory scheme and have the request considered further by the IPC.

2.10.2 Considerations in Granting Approval

Subsections 32 (21) and (22) set out the authority under which the Director may approve a request for an altered standard. The Director will consider these subsections in making a decision. These subsections state:

Under Section 32 of the Regulation – Alteration of Schedule 3 Standards:

"(21) The Director may approve a request under subsection (1) to alter a standard set out in Schedule 3 if,

(a) the person making the request has complied with this section; and

(b) the Director is of the opinion that,

(i) the person making the request cannot comply with section 20 with respect to the standard set out in Schedule 3 for the contaminant because,

(A) it is not technically feasible for the person to comply, in the case of a person who is relying on any paragraph of subsection (1), or

(B) it is not economically feasible for the person to comply, in the case of a person who is relying on a paragraph of subsection (1) other than paragraph 4,

(ii) the failures to comply referred to in subclause (i) would not be frequent,

(iii) the alteration of the standard is the minimum alteration necessary to enable the person to comply with section 20 with respect to the contaminant, and

(iv) there is no public interest reason sufficient to require a denial of the request.

(22) Despite subsection (21), the Director shall not approve a request under subsection (1) to alter a standard set out in Schedule 3 for a contaminant if the contaminant is listed in Schedule 6 and the Director is of the opinion that the

alteration is likely to permit discharges of the contaminant that result in the concentration of the contaminant at a point of impingement located on a place referred to in subsection 30 (8) exceeding the other time period upper risk threshold set out for the contaminant in Schedule 6.

(22.1) The Director shall not approve or refuse to approve a request under subsection (1) unless the Director first gives the person making the request a draft of the approval or refusal and an opportunity to make written submissions to the Director during the period that ends 30 days after the draft is given."

3.0 UPPER RISK THRESHOLDS

Section 30 of the Regulation specifies the actions required when a URT may be exceeded. URTs are generally based on levels that represent a Hazard Quotient (HQ) of 10 for non-carcinogens and a cancer risk of 10^{-4} for carcinogens(refer to Chapter 1.3 for further explanation). Another way of expressing these toxicology principles are:

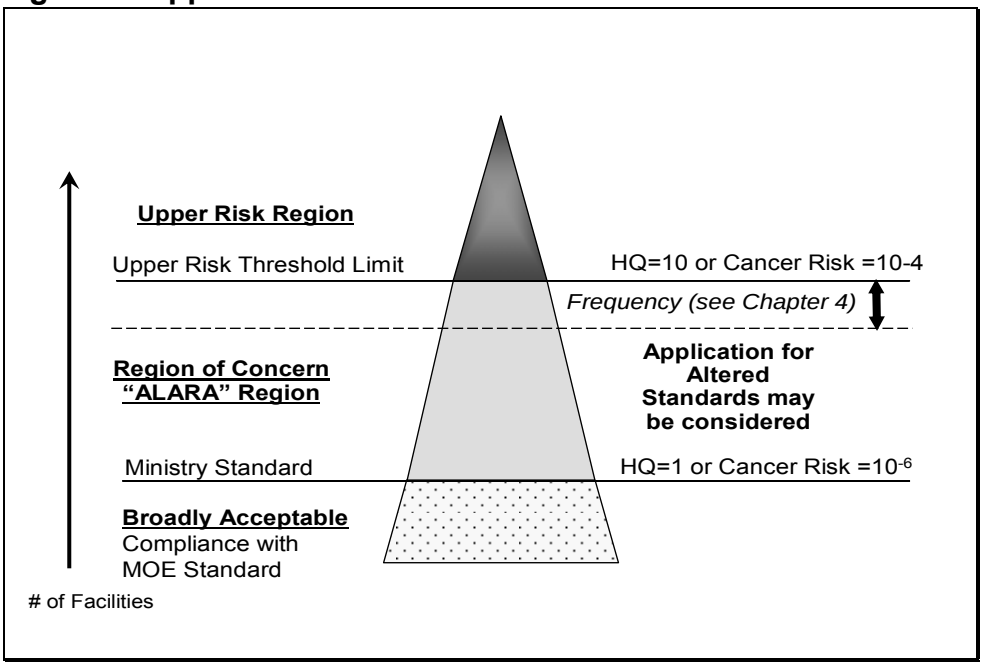
Carcinogens: 10^{-4} risk level (or an exceedence of 100 times the standard if the standard is based on a 10^{-6} risk level)

Non-carcinogens: HQ=10 (or an exceedence of 10 times the standard if the standard is based on an HQ of 1)

Exceedences of air standards that were established based on environmental effects need to be carefully reviewed to ensure that other health effects do not occur as well. URTs are set out in Schedule 6 of the Regulation.

Figure 3: URTs is similar to Figure 1: MOE's Risk Evaluation Framework for Air Standards. However, instead of depicting the level of risk, it depicts the number of facilities likely to be in this "Upper Risk Region" as being very low.

Figure 3: Upper Risk Thresholds



URTs are considered in the Regulation in two ways:

1) **Altered Standards and URTs**

2) **Notification and Actions for URTs**

These two situations are further discussed below.

3.1 Altered Standards and URTs

A company which plans to request an alteration to a standard must demonstrate that the POI concentrations are likely to be below the URTs at the receptors referenced in subsection 30(8) of the Regulation. Otherwise, the Director cannot approve the request (see subsection 32(22) of the Regulation).

Requests for altered standards are assessed by determining the maximum POI concentrations and ascertaining the greatest possible reduction. However, if there are possible exceedences of the standard at the types of receptors identified in subsections 30(8) – concentrations at child care facilities, educational facilities, senior's facility, health care facility or dwelling/residence or the like – then information at these receptors must also be submitted including an assessment of the frequency of exceedence at those locations. As per subsection 32(22) of the Regulation, the Director cannot approve a request for an altered standard, for a contaminant listed in Schedule 6 of the Regulation, if the Director is of the opinion that the alteration would likely permit discharges of the

contaminant that result in the concentration of the contaminant at a POI exceeding the URT, at a location listed in subsection 30(8) of the Regulation. In addition, there may be circumstances where, even though the URTs are not exceeded, the combination of the magnitude of the exceedence and the frequency of the occurrence may be endangering human health. Under subsection 32(21) paragraph b, ii, when considering a request to alter a standard, a Director will also consider the frequency of the exceedences of the standard. Frequency is further discussed in Chapter 4 of this Guideline.

3.2 Notification and Actions for URTs

Where an exceedence of a URT (listed in Schedule 6 of the Regulation) is suspected at any POI, subsection 30(3) of the Regulation requires a person to notify the MOE immediately in writing. Section 30 of the Regulation sets out the requirements for taking action if the URTs for the contaminants listed in Schedule 6 of the Regulation may be exceeded based on any relevant information (e.g. modelling, monitoring, observation etc.). Subsection 30(4) of the Regulation, requires that the person who discharged the contaminant to prepare an ESDM report in accordance with section 26 of the Regulation within 3 months of the discharge. It states:

Under Section 30 of the Regulation – Upper Risk Thresholds:

30(1) A person who discharges or causes or permits the discharge of a contaminant listed in Schedule 6 into the air shall comply with subsections (3) and (4) if there is reason to believe, based on any relevant information, that discharges of the contaminant may result in,

(a) the concentration of the contaminant exceeding the half hour upper risk threshold set out for that contaminant in Schedule 6 at a point of impingement, if section 18 or 19 applies to the person in respect of the contaminant; or

(b) the other time period upper risk threshold set out for that contaminant in Schedule 6 at a point of impingement, if section 20 applies to the person in respect of the contaminant."…

"(2) Without limiting the generality of subsection (1), the reference in that subsection to relevant information includes relevant information from predictions of a dispersion model, including,

(a) an approved dispersion model or other dispersion model; or

(b) a dispersion model that is not used in accordance with this Regulation.

(3) If subsection (1) applies to a discharge, the person who discharged or caused or permitted the discharge of the contaminant shall immediately notify the Director in writing.

(4) If subsection (1) applies to a discharge, the person who discharged or caused or permitted the discharge of the contaminant shall, within three months after the discharge, prepare a report in accordance with section 26 and submit the report to the Director.

(5) If a person is required to prepare a report under subsection (4) and section 20 does not apply to the person in respect of the contaminant, section 20 shall be deemed to apply for the purpose of preparing the report and for the purpose of subsections (7) and (8).

(5.1) A person who prepares a report required by subsection (4) shall prepare the report using,

(a) the AERMOD dispersion model described in paragraph 1 of subsection 6 (1);

(b) the ISCPRIME dispersion model described in paragraph 3 of subsection 6 (1); or

(c) a dispersion model or combination of dispersion models that,

(i) pursuant to subsection 7 (3), is deemed to be included in references in this Part to approved dispersion models, and

(ii) is capable of providing the information referred to in subsection (7).

(5.2) Despite subsection 10 (1), a person who prepares a report required by subsection (4) shall use an approved dispersion model in accordance with both of the scenarios described in subsection 10 (1), and the report shall set out separately the information relevant to each scenario.

(6) Paragraphs 1, 1.1, 2 and 2.1 of subsection 13 (1) do not apply to a person who prepares a report required by subsection (4) unless meteorological data described in paragraphs 3 and 4 of subsection 13 (1) is not available and cannot reasonably be available in time to prepare the report within the three-month period referred to in subsection (4).

(6.1) If a report is required by subsection (4) to be prepared in accordance with section 26, it is not necessary for the lists of contaminants required by paragraphs 2 and 4 of subsection 26 (1) to include any contaminant other than the contaminant in respect of which the Director must be notified under subsection (3).

(6.2) A person who is required to prepare a report under subsection (4) shall ensure that the table required by paragraph 14 of subsection 26 (1) contains the following additional information:

1. ***The other time period upper risk threshold set out for the contaminant in Schedule 6.***

2. ***A comparison of the concentration referred to in subparagraph 14 v of subsection 26 (1) and the other time period upper risk threshold set out for the contaminant in Schedule 6, expressed as a percentage of the threshold."***

If there is any reason to believe that discharges from a facility could result in an exceedence of a URT, then even though there is a phase-in period for the standard, the facility is required to submit an ESDM report (prepared in accordance with section 26 and the ESDM Procedure Document). The ESDM report only needs to address the contaminant that is believed to be exceeding the URT. The ESDM report will provide further information on whether or not the exceedences are likely to be occurring and to evaluate the concentrations of the contaminant at the receptors identified in subsection 30(8) of the Regulation.

The ESDM report must be prepared as if section 20 of the Regulation applied. This means that the person must prepare the ESDM report for that contaminant using one or more advanced approved dispersion model that is capable of assessing frequency of exceedences: AERMOD, ISCPRIME (see section 6[6] of the Regulation). The ESDM report must be done in accordance with the Regulation using the highest form of data quality available and appropriate operating conditions (see the ESDM Procedure Document and sections 10, 11 and 12 of the Regulation). Subsection 30(6) of the Regulation requires that the ESDM report must be prepared using the most site-specific meteorological information available. It is important to use the site-specific meteorological data because the report must assess concentrations and frequency of

[6] If section 7 of the Regulation applies to the facility, the ESDM Report must use the model that has been required under that section.

exceedences at the receptors identified in subsections 30(8) of the Regulation as well as at the maximum POI concentration.

Paragraph 6 of subsection 30(8) allows the Director to specify by notice a place where the discharge may cause a risk to human health. If the Director specifies such a location, then that location must be assessed in terms of exceedences and frequency of exceedences of standards.

Under Section 30 of the Regulation – Upper Risk Thresholds:

"(9) For the purpose of paragraph 6 of subsection (8), the Director may give written notice to a person who is required to notify the Director under subsection (3) stating that the Director is of the opinion that the discharge may cause a risk to human health at a place specified in the notice.

(10) Before the Director gives a person a notice under subsection (9), the Director shall give the person a draft of the notice and an opportunity to make written submissions to the Director during the period that ends five business days after the draft is given."

Monitoring data must also be included in the ESDM report where available or required. For more information on ESDM reports under section 30, please refer to the ESDM Procedure Document. For the contaminant that may exceed the URT in Schedule 6, subsections 30(7) and (11) of the Regulation require that the frequency of exceedences of the Schedule 3 standards at the listed locations be included in the ESDM report. This includes modelled as well as monitored frequency of exceedences. If the ESDM report indicates that there is an exceedence of a standard at a receptor identified in subsection 30(8) or if the frequency of exceedences at those receptors is unacceptable (see Chapter 4 of this Guideline), then the MOE may require timely abatement action to reduce the risk levels in the interim The Regulation requires the following pertaining to frequency as it relates to URTs:

Under Section 30 of the Regulation – Upper Risk Thresholds:

"(7) If, according to an approved dispersion model that is used for the purpose of preparing a report under subsection (4), discharges of a contaminant may result in a contravention of section 20 because of the concentration of the contaminant at a point of impingement located on a place referred to in subsection (8), the person who prepares the report shall include the following in the report:

1. *A statement or map identifying the place that the point of impingement is located on.*

2. *A statement specifying the highest concentration of the contaminant that the approved dispersion model predicts for the point of impingement.*

3. *A statement specifying the number of averaging periods for which the approved dispersion model predicts that discharges of a contaminant may result in a contravention of section 20 because of the concentration of the contaminant at the point of impingement, expressed as a percentage of the number of averaging periods in,*

    i. *a period of five years, if the approved dispersion model was used in accordance with meteorological data described in paragraph 1, 1.1, 2 or 2.1 of subsection 13 (1),*

    ii. *a period equal to the length of the period over which the meteorological data was collected, if the approved dispersion model was used in accordance with local or site-specific meteorological data described in paragraph 3 of subsection 13 (1), or*

    iii. *a period equal to the length of the period that was used for the purposes of the computational method, if the approved dispersion model was used in accordance with meteorological data obtained from a computational method in accordance with paragraph 4 of subsection 13 (1).”*

“(11) If, according to measurements of air samples collected at a point of impingement, discharges of a contaminant may result in a contravention of section 18, 19 or 20 because of the concentration of the contaminant at the point of impingement, a person who prepares a report under subsection (4) shall include in the report,

(a) a statement or map identifying the place that the point of impingement is located on;

(b) a statement specifying the number of air samples that were collected at the point of impingement and measured for the contaminant; and

(c) a statement specifying the number of air samples that were collected at

the point of impingement and measured for the contaminant and that indicated that discharges of the contaminant may result in a contravention of section 18, 19 or 20 because of the concentration of the contaminant at the point of impingement, expressed as a percentage of the number of air samples referred to in clause (b).”

As set out in subsection 30 (12), an ESDM report for the contaminant listed in Schedule 6 may not be required if the person can satisfy the Director that discharges of the contaminant will not result in a contravention of sections 18, 19 or 20 and will not cause an adverse effect.

Under Section 30 of the Regulation – Upper Risk Thresholds:

“(12) Subsection (4) does not apply if the Director is satisfied that discharges of the contaminant will not result in a contravention of section 18, 19 or 20 and will not cause an adverse effect”.

For example, if a monitoring result was recorded based on a failure to operate in the normal manner and this triggered an exceedence of the URT being measured, then there may not be a requirement for the report since it can be demonstrated this it was a one time occurrence. Further discussions with the MOE staff are required before this decision can be considered.

Need for Timely Action

If a facility has demonstrated that a URT is likely being exceeded (e.g. through monitoring or an approved dispersion model) at a childcare facility, educational facility, health care facility, senior’s facility, residence/dwelling or a place specified in a notice from the Director, it is expected that the facility would take timely action to ensure that the concentrations are reduced to levels below the URT.

If the Director has reasonable grounds to believe that a person has discharged or caused or permitted the discharge of a contaminant in circumstances that is likely to cause an adverse effect or endanger human health, the Director may require action to be taken to reduce the concentrations as soon as possible. The MOE may use order provisions under the EPA to require people to take timely action in these circumstances.

Another situation that may warrant timely action is where, even though the URTs are not exceeded, the combination of the magnitude of the exceedence and the frequency of the occurrence may cause a risk to human health. This is further discussed in Chapter 4 of this Guideline.

URT action levels for contaminants not listed in Schedule 6 may be provided by the MOE as guidelines. However, exceedences of these values would be subject to further assessments of potential adverse effects and consistency with the toxicological principles in outlined in Chapter 1.3 of this Guideline.

Where a facility is exceeding a standard, notification and routine abatement action is required as set out in the sections 28 and 29 of the Regulation and the MOE's Compliance Guideline (F-2) (as amended). Note that where a facility has confirmed an exceedence of a URT, they are also in non-compliance with a standard. Accordingly, the facility must comply with the requirements of section 30 of the Regulation in addition to the requirements of sections 28 and 29 of the Regulation.

4.0 FACTORS TO CONSIDER WHEN THERE ARE EXCEEDENCES

A facility may be required to complete an ESDM report for different reasons as described in Chapter 2.2.2 of this Guideline and the ESDM Procedure document. Once a facility has completed an ESDM report (as per section 26 of the Regulation), and it indicates an exceedence of an air standard (or MOE POI Limit), then appropriate action needs to be taken. Prohibitions under section 20 of the Regulation are shown below. There are similar prohibitions for sections 18 and 19.

Section 20 - Schedule 3 standards:

"(1) A person shall not discharge or cause or permit the discharge of a contaminant listed in Schedule 3 into the air if a standard is set out in that Schedule for the contaminant for a specified averaging period and the discharge results in the concentration of the contaminant at a point of impingement exceeding that standard.

(2) A person shall not discharge or cause or permit the discharge of a contaminant listed in Schedule 3 into the air if a standard is set out in that Schedule for the contaminant for a specified averaging period and the discharge would result, according to an approved dispersion model, in the concentration of the contaminant at a point of impingement exceeding that standard."…

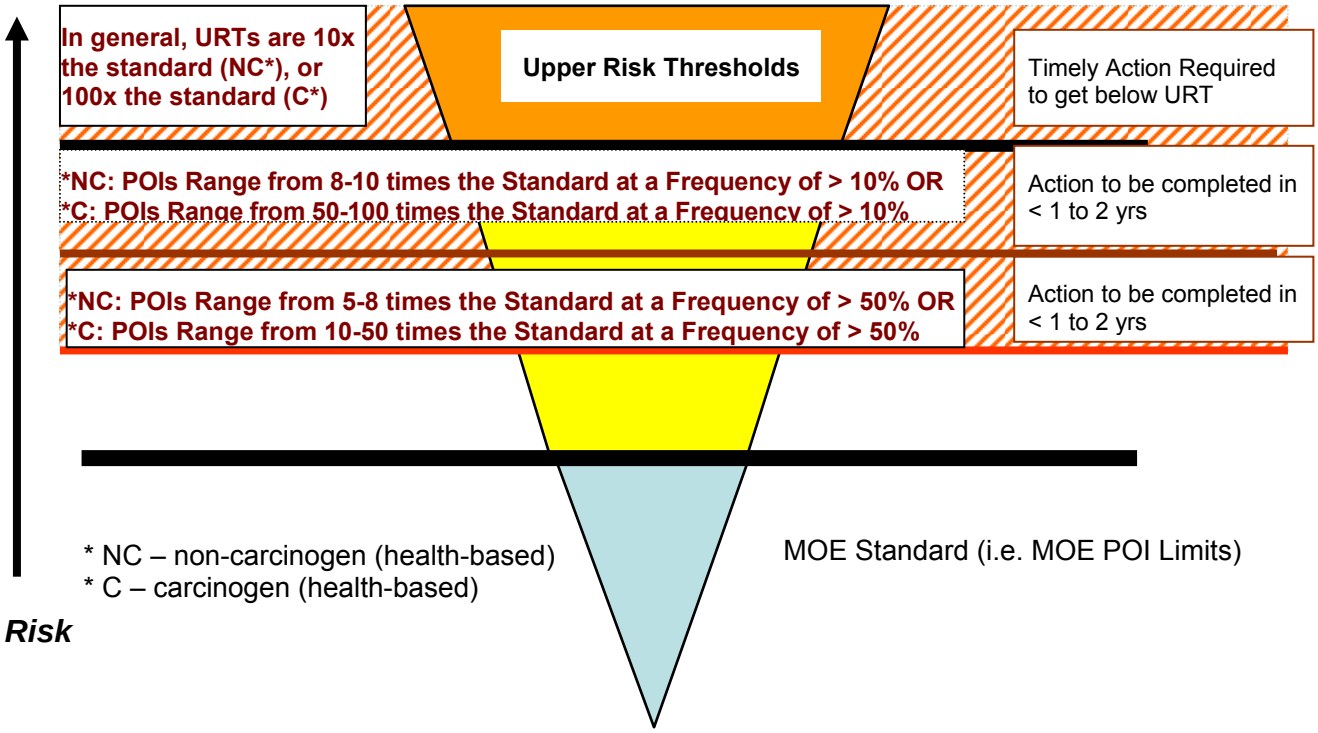
Any exceedences of monitored or modelled results must be reported to the Director under section 28 of the Regulation. Section 30 of the Regulation requires reporting of exceedences of URTs. Confirmed exceedences must be also followed up with an abatement plan within 30 days as set out in section 29 of the Regulation.

If an ESDM shows an exceedence of the standard, but it is below the URT, this requires action to get into compliance. In certain circumstances, there will be a need for more timely action to be taken if the magnitude and frequency of exceedences in the "Region of Concern" are considerable. The magnitude of the exceedence refers to the extent to which the POI concentration exceeds the standard (e.g. is the POI 10 times the standard or 50 times the standard?). The frequency refers to the number of times the model (or monitoring information) indicates that an exceedence of the standard has likely occurred over a period of time. Frequency is normally expressed as a percentage of time. Criteria to evaluate both the magnitude of the exceedence and the frequency of exceedences for concentrations above the standard, but below the URT, have been developed. The suggested approach is described in the Figure 4: Approach for Consideration of Magnitude and Frequency.

The approach illustrated in Figure 4 suggests that where exceedences of a contaminant (e.g. a carcinogen or a non-carcinogen), evaluated at a receptor identified in subsection 30(8) of the Regulation, are of a certain magnitude and frequency, there is a need for more timely action to be considered. This approach recognizes that, depending on the contaminant, the significance of the public being exposed to high concentrations at high frequencies can be of more concern than if the concentration were higher but occurred less frequently (e.g. < 1 % of the time). For example, if a facility is emitting a non-carcinogen contaminant at concentrations where the maximum POI concentration was 5 times the standard (below the URT) for significant periods of time (e.g. 50% frequency) then Figure 4 suggests that action should be considered to reduce those concentrations

within one to two years. This is further explained in Table 5: Examples of Assessing Magnitude and Frequency. Of course, the action taken may vary depending on the individual contaminant(s) involved, the receptors in the area and the potential to endanger human health or cause adverse effects. As a minimum, the approach to assessing frequencies shown in Figure 4 could trigger the need for a more thorough assessment.

Figure 4: Approach for Consideration of Magnitude and Frequency



If an ESDM confirms an exceedence of the URTs at a receptor identified in subsection 30(8) of the Regulation, then timely action will likely be required to get concentrations below those levels. For more information, please refer to Chapter 3 of this Guideline. For the analysis of frequency associated with an exceedence of a URT, it is necessary to determine a number of ranges for frequency. As illustrated in Figure 4 above, the following is required:

- the number of times that the model shows a concentration that is above the URT at a receptor specified in subsection 30(8) of the Regulation or other receptor requested by the Director;

- the number of times that the model shows a concentration that is in range of 8 to 10 times the standard for non-carcinogens or 50 to 100 times the standard for a carcinogen;

- the number of times that the model shows a concentration that is in the range of 5 to 8 times the standard for non-carcinogens or 10 to 50 times the standard for a carcinogen;.

- the number of times that the model shows an exceedence of the standard at any receptor specified in subsection 30(8) of the Regulation or other receptor requested by the Director;

When using ISCPRIME or AERMOD, it is possible to specify the same averaging period for multiple thresholds using different source groups with the MAXIFILE output option. Hence, the required information may be obtained from a single model run for each contaminant.

POSTFILE

The POSTFILE option is similar to the MAXIFILE option except that there is no threshold and every modelled concentration for every specified averaging period for every receptor is sent to the post output file (.POS). This can generate huge files. In most cases the formatted (ASCII) file format is the desired option. The most practical way of processing the data in a POSTFILE is with the use of a separate program or customized spreadsheet/database macros that have been designed for that purpose.

Table 5: Examples of Assessing Magnitude and Frequency.

Carcinogens (RQ)

The magnitude of the exceedence and the frequency of exceedence can be calculated as follows:

Magnitude of the exceedence = RQ (the risk quotient) = C/MOE Standard (or MOE POI limit)

Frequency = W_L and would be calculated as follows for a 24 hr health-based standard or limits:

$$W_L = \left(\frac{\#\text{ of 24 hr (or days) exceedences of the MOE standard}}{\text{Total \# of days}} \right) * 100$$

= % [# of 24 hr (or days) of exceedences][7]

In order to determine W_L for modelling, a post processing step is required (see ADMGO).

Facilities must assess potential exceedences of standards at receptors described in subsection 30(8) of the Regulation. If the RQ is between 10 and 50 for more than 50% of the time or the RQ is between 50 and 100 for more than 10% of the time, then timely action to reduce the concentrations should be considered. The suggested timeframe is to reduce those concentrations at human receptors listed in subsection 30(8) is within a one to two year timeframe.

Non-Carcinogens (HQ)

Magnitude of the exceedence = RQ (the risk quotient) = HQ = C/MOE Standard (or MOE POI limit)

Frequency = W_L and would be calculated as follows for a 24 hr health-based standard or limits:

$$W_L = \left(\frac{\#\text{ of 24 hr (or days) exceedences of the MOE standard}}{\text{Total \# of days}} \right) * 100$$

[7] Frequency of exceedences must be assessed using modelled concentrations: monitoring data where available may also be presented. Both results must be reported separately but both must be included in the ESDM Report.

= % [# of 24 hr (or days) of exceedences][8]

In order to determine W_L for modelling, a post processing step is required (see ADMGO).

Facilities must assess potential exceedences of standards at receptors described in subsection 30(8) of the Regulation. If the HQ is between 5 and 8 for more than 50% of the time or the HQ is between 8 and 10 for more than 10% of the time, then timely action to reduce the concentrations should be considered. The suggested timeframe is to reduce those concentrations at human receptors is within a one to two year timeframe.

The magnitude of the exceedence, the geographic extent or footprint of the exceedence, the frequency of the exceedence, and the possible human receptors in subsection 30(8) may all be important factors to consider when a facility is operating above the effects-based standard. The combination of frequency of the exceedence and magnitude of the exceedence of the standard/MOE POI limit may be considered when:

- assessing health risks at the types of receptors referenced in subsection 30(8) including childcare facilities, educational facilities, senior's facilities, health care facilities and dwellings/residences or the like that would require timely action; and

- determining whether or not a facility should be allowed to operate in a manner that results in such exceedences for some extended interim period of time when a request for an alteration to a standard has been submitted.

For example, as outlined in Figure 4, if the magnitude of the exceedence and the frequency of exceedence is considered a risk that could endanger human health, the approval of an altered standard would be recommended to be for no more than 1 to 2 years. In that time frame, facilities are expected to get below those levels. It is only possible to re-request if the requirements of section 32 and the process outlined in Chapter 2.10 of this Guideline as well as GRAAS are met.

If there are exceedences of the MOE standards (or the MOE POI Limits) at places where members of the public may be exposed to the contaminant, these must also be assessed and addressed as part of the action plan. The ESDM report must accurately assess contaminant concentrations at locations where the public may be exposed to the contaminants. Subsection 32(13) paragraph 2 of the Regulation requires the frequency of exceedences at all POIs to be assessed. However, in most cases, assessment of frequency of exceedences at the locations set out in subsection 30(8) of the Regulation and at the maximum POI concentrations will suffice. The frequency and magnitude of exceedences will be used to inform a Director's decision under subsection 32(21)

paragraph (b) (ii) and (iv), on whether or not to approve a request for an altered standard(s). The nature of the contaminant will also be considered.

If either modelling or monitoring indicates that discharges from a facility may result in an exceedence of the standard or the MOE POI Limits, a facility is required to notify the Director under section 28 of the Regulation. Subsections 25 (10), (11) and 28 (2), (3) of the Regulation state that the Director may require a person to provide maps and information on the frequency of the exceedences. This will assist in a further analysis of the magnitude, geographic extent, and receptors that are potentially affected. In some cases, this assessment may lead to the need for more timely abatement action to reduce the POI concentrations. This information may also be considered in determining an acceptable abatement plan for a facility. In most cases, the information that should be included under these sections is:

- A written statement or contour map that identifies the location and magnitude of the POI concentrations for the scenario that results in the maximum POI concentration for the contaminant(s) where compliance with the standard cannot be achieved.

- A written statement of the frequency of occurrence of the exceedences at all the locations set out in subsection 30(8) of the Regulation as well as at the maximum POI concentration based upon the use of the most site-specific meteorological data in conjunction with an approved dispersion model (see ADMGO for more information on the appropriate use of an approved dispersion model).

- A summary of any monitoring data at any location and assessment of the frequency of exceedences.

This information is also required to be submitted if there is reason to believe that there is an exceedence of the URT (see subsection 30(7), (11) of the Regulation). The use of the US EPA approved models listed in section 6 of the Regulation (ISCPRIME and AERMOD), means that the frequency of exceedence or occurrence at any given location can be assessed. When assessing frequency, it is important that the best available local meteorological data is used to assess concentrations and frequencies of exceedences at the receptors identified in subsection 30(8). The most site-specific meteorological data is required to be used for requests for altered standards (see subsection 32(17) of the Regulation). The best available meteorological data is also required to be used for assessments of the URTs (see subsection 30(6) of the Regulation). As per subsection 13(2) of the Regulation, the Director may give written notice to a person who discharges or causes or permits the discharge of a contaminant requiring that an approved dispersion model that is used for the purposes of this Part be used with a type of meteorological data specified in the notice that, in the opinion of the Director, accurately reflects meteorological conditions.

In summary, any exceedence of an MOE POI Limit would require notification under section 28 of the Regulation followed by an abatement plan under section 29 of the Regulation. The information in this Chapter 4 may be used to determine the timeframe for appropriate action to be taken. It will also be considered for the approval of altered standards.

5.0 GLOSSARY OF TERMS

ADMGO: *Air Dispersion Modelling Guideline for Ontario (as amended) PIBs# 5165e02*

Air: means open air not enclosed in a building, structure, machine, chimney, stack or flue.

Approved Model: is a model approved for use in Ontario as set out in sections 6 and 7 of the Regulation.

ALARA: *As Low As Reasonably Achievable*

C: means the concentration in $\mu g/m^3$

CCME: *Canadian Council of Ministers of the Environment*

Dispersion Model: A group of related mathematical algorithms used to estimate (model) the dispersion of contaminants in the air due to factors such as transport by the wind and turbulence.

EPA: *Ontario's Environmental Protection Act*

ESDM report: Emission Summary and Dispersion Modelling report

ESDM Procedure Document: means the "*Procedure for Preparing an Emission Summary and Dispersion Modelling Report" (as amended) PIBs# 3614e03.*

GIASO: *means the "Guideline for the Implementation of Air Standards in Ontario" (as amended) PIBs#5166e02*

GLC: *Ground Level Concentration* - the concentration of contaminant at ground level from a dispersion model

GRAAS: means the "*Guide to Requesting an Alternative Air Standard*" *(as amended) PIBs#6322.*

HQ: *Hazard Quotient:* is used to measure potential human health hazards from non-carcinogenic substances. The HQ is the ratio of the daily intake (or in the context of GIASO, daily average concentration) of a specified non-carcinogenic substance during a specified time period over (divided by) a reference dose (or in the context of GIASO, Reference Concentration which is generally the MOE standard for a non-carcinogen) for a similar time period. If the HQ exceeds one, the possibility exists for systemic toxic

effects. HQ = Daily intake/Reference dose, or in the context of GIASO, HQ = Daily average concentration/24 hour avg. Reference Concentration.

MACT: *Maximum Achievable Control Technology*

MOE POI Limit: The generic term "MOE POI limits" used in the context of this Guideline means any numerical concentration limit set by the MOE including standards in the schedules of the Regulation, guidelines and recommended levels for chemicals with no standard or guideline.

µg/m^3: a microgram, one millionth of a gram in a cubic meter of air

MOE or Ministry: means the Ontario Ministry of the Environment.

Regulation: the Regulation means Ontario Regulation 419/05: Air Pollution – Local Air Quality (as amended) that revoked and replaced Ontario Regulation 346.

RfC: *Reference Concentration* - an estimate of a daily inhalation exposure not likely to induce adverse health effects during a lifetime.

RQ: *Risk Quotient* - In the context of GIASO, RQ is the ratio of the contaminant concentration (generally 24-hour average) divided by the MOE POI Limit (using the same averaging period which is generally 24 hr).

US EPA: means the United States Environmental Protection Agency.

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APPENDIX I: TARGETED SECTORS

Sectors targeted to use the US EPA approved dispersion models in paragraphs 1 to 4 of subsection 6(1) of the Regulation and maintain an ESDM report are listed in Schedule 4 and 5 of the Regulation.

SCHEDULE 4
TARGET SECTORS FOR 2010

Item	NAICS Code	North American Industry Classification System Description
1.	2122	Metal Ore Mining
2.	221112	Fossil-Fuel Electric Power Generation*
3.	324110	Petroleum Refineries
4.	3251	Basic Chemical Manufacturing
5.	3252	Resin, Synthetic Rubber, and Artificial and Synthetic Fibres and Filaments Manufacturing
6.	3311	Iron and Steel Mills and Ferro-Alloy Manufacturing
7.	331410	Non-Ferrous Metal (except Aluminum) Smelting and Refining

*Note: A fossil-fuel electric power generation facility with a maximum electrical power output capacity of less than 25 megawatts shall be deemed not to be part of the class identified by NAICS code 221112 (Fossil-Fuel Electric Power Generation).

SCHEDULE 5
TARGET SECTORS FOR 2013

Item	NAICS Code	North American Industry Classification System Description
1.	3221	Pulp, Paper and Paperboard Mills
2.	324190	Other Petroleum and Coal Products Manufacturing
3.	325	Chemical Manufacturing[8]
4.	326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing
5.	3279	Other Non-Metallic Mineral Product Manufacturing
6.	331	Primary Metal Manufacturing
7.	332	Fabricated Metal Product Manufacturing
8.	336	Transportation Equipment Manufacturing
9.	5622	Waste Treatment and Disposal

Notes:
i) A mobile PCB destruction facility within the meaning of Regulation 352 of the Revised Regulations of Ontario, 1990 (Mobile PCB Destruction Facilities) made under the Act shall be deemed not to be part of the class identified by NAICS code 5622 (Waste Treatment and Disposal); and

ii) A facility shall be deemed not to be part of the class identified by NAICS code 5622 (Waste Treatment and Disposal) unless the facility,
- is a solid waste combustor or incinerator, or
- is used for hazardous waste treatment or disposal.

[8] This is in addition to those facilities identified in Schedule 4.

APPENDIX II: A Risk Scoring Method

For a given contaminant, the level of risk will be directly proportional to the concentration and the frequency of exposure to that contaminant. A methodology has been developed to calculate a risk score. This risk score is not a regulatory requirement – it is optional. The risk scoring method may be useful if a facility were dealing with exceedences of multiple contaminants and there was a desire to determine which contaminants may be of greater concern and hence require quicker action. The risk score is only intended to allow consideration of higher risk contaminants for priority action. It is a relative score and should never be used in isolation to make determinations about health and environmental impacts. In order to understand the basis of the risk score, some background information has been provided in Chapter 1.3 on the MOE objectives for setting air quality standards. The following section outlines information on fundamental risk concepts and how they can be used to develop a risk score.

A: 1.1 Risk Concepts

The concept of risk comprises five components:

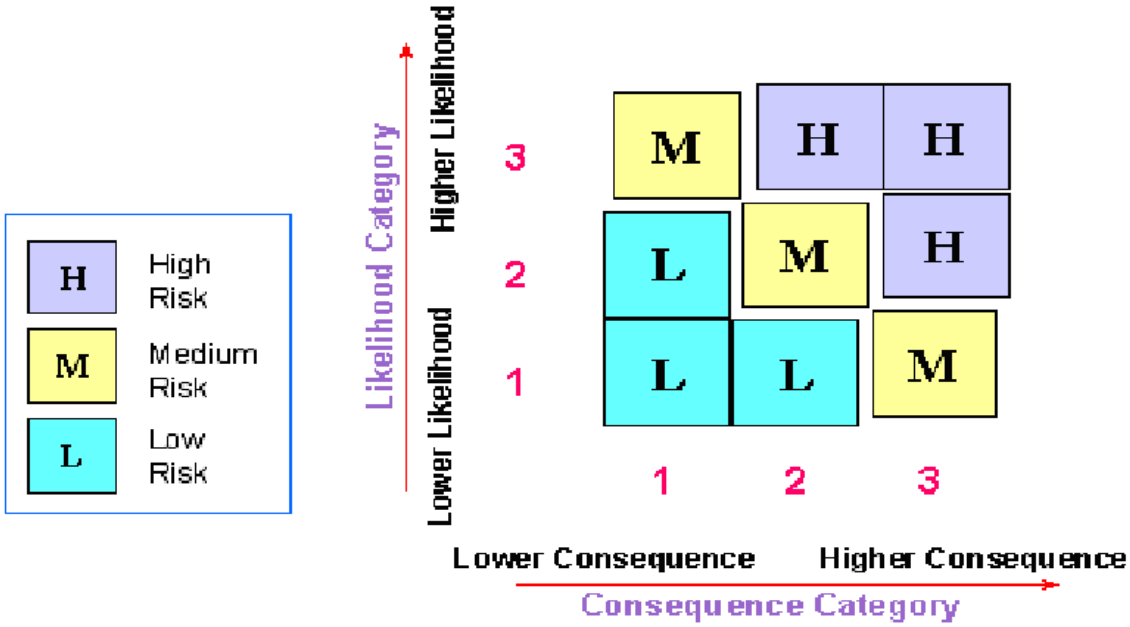
- The hazard inherent in an activity that is otherwise deemed beneficial,
- A potential undesirable event, which brings out the hazard,
- Adverse consequence (and severity) of the undesirable event,
- Likelihood of whether the undesirable event will happen or not,
- Perception about the combination of the above components (perceptions arise because of the uncertainty about the hazard, likelihood and consequence components of risk).

In the context of this risk-based framework,

- “hazards” are the potential health and environmental effects of the contaminants emitted into the air,
- “undesirable events” are exceedences of the MOE air standards or limits,
- “consequences” can be described as the various health and environmental effects that are possible for a given exceedence of an MOE standard or limit for a contaminant, and
- “likelihood” is defined as the frequency or probability of occurrence of the exceedence.

Conceptually, risk decisions are made based on the premise that the higher the likelihood or consequence of the event, the greater the significance of it and the need for action. Figure A-1 is an illustration of a risk ranking matrix. These concepts have been used in the development of this risk scoring system.

Figure A-1: Risk Ranking Matrix Example



A: 1.2 Risk Scoring Methodology

The risk scoring methodology in this Guideline considers a system of assessing the consequences of being exposed to a contaminant as well as the likelihood of being exposed. Facilities are not required to determine risk scores for the contaminants of interest. Risk scores are optional. The risk score is based on the following:

Risk = Consequence of the Effect **x** Likelihood of the Event

In assessing the toxicological information on any chemical, a variety of effects may be identified. Examples of possible effects are outlined in Table A-2: Consequence Categories and Examples of Possible Health & Environmental Effects of Exposure. The risk scoring methodology assigns each consequence category a weighting factor (W_C) to account for the significance of that effect relative to another category. In order to keep the scoring simple, the limiting effect of the standard or limit is chosen to develop the risk

score even though exceedences of the standard could mean that effects, in addition to the limiting effect of the standard, may occur. There are 6 consequence categories summarized as follows in order of significance and their assigned weights[9]:

Table A-1: Consequence Categories Corresponding Weights (W_C)

Consequence Categories	Weights (W_C) Consequence Categories
Major Health	10
Medium Health	7
Major Environmental	6
Medium Environmental	3
Minor Health	2
Minor Environmental	1

Consequence

(see Table A-2)

Risk is a function of not only the possible consequence, but also the likelihood of exposure. The "likelihood" scale (also referred to as "frequency of occurrence" or "probability of occurrence") is also given a weighting factor to account for low to high frequencies of exposure (W_L). In this framework, W_L is the percentage of time the air dispersion model predicts an exceedence of the MOE standard (or MOE POI limit) using the appropriate averaging time period for that contaminant. For example, if the standard for a contaminant is based on a 24 hour averaging time period, then W_L would be the total number of days or 24hr periods that the model predicts an exceedence of the MOE standard (or MOE POI limit) in the given 5 year meteorological data set[10] used to run the approved air dispersion models.

[9] Weighting criteria may change or be reassessed by MOE periodically.

[10] In order to determine the frequency of occurrence or likely exceedence of the MOE standard, the most site-specific local meteorological data sets accepted by MOE must be used. The frequency is then based on the calculated percentage. Monitoring information may also be considered along with the modelled results but should not be used in isolation.

Table A-2: Consequence Categories and Examples of Possible for Health & Environmental Effects of Exposure (developed by ILSI expert panel – International life Sciences Institute):

1) Minor Environmental Effects	2) Minor Health Effects	3) Medium Environmental Effects	4) Major Environmental Effects	5) Medium Health Effects	6) Major Health Effects
Minor environmental impairment, i.e. impairment of the environment that is localized, short in duration with no potential for long term impact.	Minor human health impact, i.e. short in duration and no long term effects; and likely does not require medical attention.	Known or anticipated adverse impact to animal, plant, property or resources which are amenable to full or substantial remediation through the application of abatement measures.	Known environmental impairment, i.e. results in irreparable harm, permanent damage to an ecosystem, requires significant resources to contain, abate or manage.	Known or anticipated human health impact, i.e. acute and/or chronic exposure to contaminants, hospitalization, or serious illness.	Known human health impact, i.e. results in death, or could result in death or multiple deaths.
EXAMPLES					
Vegetation ‣ Changes in pigmentation ‣ Temporary coating with dust/particulate matter that impairs photosynthesis. **Property** ‣ Discolouration ‣ Soiling ‣ Short Term Odour	**Generally reversible, generally not life-shortening:** - Irritation (eye, skin, mucosal that is transient) - Sensitization (allergy) - Reversible acute organ or system effects (gastrointestinal inflammation) Others include: - Chronic Odour - mild irritation (eyes, respiratory) - Nausea, dizziness - mild asthma in existing asthmatic	**Vegetation** ‣ Minor necrosis or chlorosis. ‣ Minor reductions in growth or vegetative period. ‣ Premature senescence (early loss of leaves or fruit). **Property** ‣ Minor corrosion or pitting of material	**Vegetation** ‣ Plant Death ‣ Significant necrosis or chlorosis. ‣ Major reductions in growth or vegetative period. **Property** ‣ Significant corrosion of material	**May be reversible, could be life-shortening:** - Immunotoxicity - Neurotoxicity - Nephrotoxicity (kidney damage) - Hepatotoxicity (liver damage) - Pulmonary toxicity (lung damage) - severe asthma -Cardiotoxicity (heart damage) - Possible or Probable carcinogen	**Irreversible/Life-shortening effects:** - Reproductive effects - Teratogenic effects (birth defects) - Acute fatal or acute severe & irreversible effects (e.g., fatal poisoning) - Mutagenicity - Known Human Carcinogen

Hence, W_L would be calculated as follows:

$$W_L = \left(\frac{\#\text{ of 24 hr (or days) exceedences of the MOE standard}}{\text{Total \# of days}} \right) * 100$$

= % [# of 24 hr (or days) of exceedences]

In general, the underlying principle of the approach is that emissions that may cause higher consequential impacts and that are also likely to occur more frequently, are of greater concern than those that cause less severe effects and are not as likely to occur as often. The benefit of this risk scoring system, as outlined in this Guideline, is that it can be used as a tool to assess potential risks from carcinogens, non-carcinogens and environmental effects relative to each other. The risk scoring method would only be used if a facility were dealing with exceedences of multiple contaminants and there was a desire to determine which contaminants may be of greater concern and hence require quicker action.

The risk score is based on the following simple calculations:

<u>For carcinogens:</u>

$R = RQ * W_{cs} * W_L$

where

R = a dimensionless risk score

RQ = Risk Quotient = [(C_{max})/MOE Standard]

C_{max} = the maximum POI concentration

W_{cs} = a weight assigned to one of the 6 consequence categories identified in Table A-1 based on the limiting effect of the MOE standard (or limit)

W_L = percentage of time the model predicts an exceedence of the MOE standard (or MOE POI limit)

If a facility is dealing with multiple contaminants exceeding the MOE standards (or MOE POI limits), this framework is intended to support a decision making process that considers the potential individual effects of those contaminants relative to each other.

For non-carcinogen:

In order to consider relative risks from carcinogens and non-carcinogens, the following formula is suggested:

R = a dimensionless risk score

RQ = Risk Quotient = HQ = [(C_{max})/MOE Standard]

C_{max} = the maximum concentration

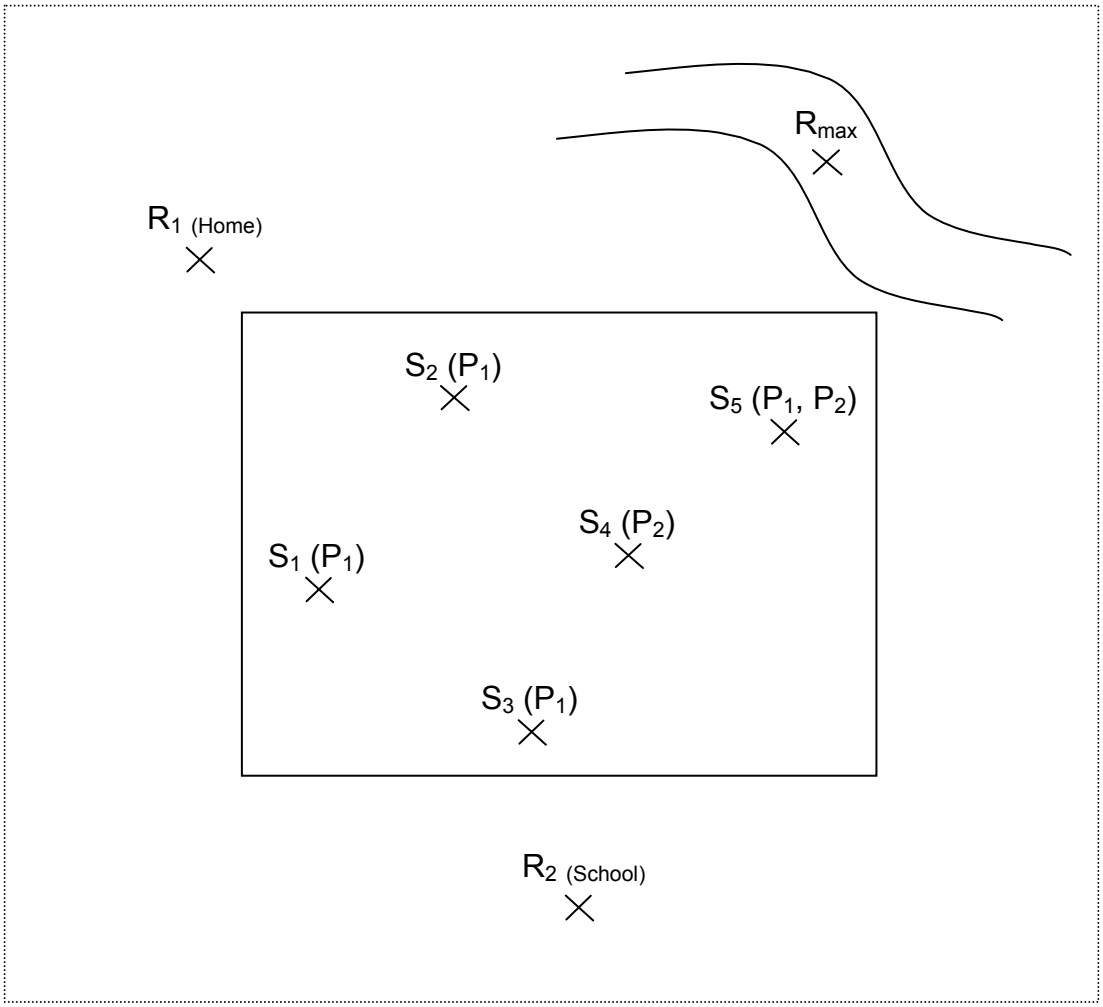
W_{cs} = a weight assigned to one of the 6 consequence categories identified in Table A-1 based on the limiting effect of the MOE standard

W_L = percentage of time the model predicts an exceedence of the MOE standard

Evaluating risk scores can be a useful tool to assist in decision making. It enables the public and other stakeholders to consider the health and environmental risks from multiple contaminants so that the action plan can focus on the reduction of risk from the contaminant(s) of greatest concern. For example, an identified health effect consequence may be of greater concern than one that leads to short term nuisance odour. Again, this step is optional for stakeholders and the MOE.

APPENDIX III: Case Study–Risk Analysis & Evaluation of Technically Feasible Risk Treatment Alternatives

A sample facility layout is presented below, where the sources and associated contaminants being emitted are identified, along with neighbouring receptors.



Where:

- R – Receptor
- S – Source
- P – Pollutant or Contaminant
- $S_1(P_1)$ – Source # i, emitting Contaminant i
- R_{max} – Maximum modelled POI concentration

Example: One Contaminant

This example illustrates the use of risk scores and concentrations. The outcome is the same because we are dealing with one contaminant. If multiple contaminants were used, then risk scores are one way to assess relative importance amongst different contaminants and their possible effects. However, the risk score is limited because it only considers the basis of the standard and it does not consider other possible effects that may occur if the standard is exceeded.

Identify Contaminants Exceeding the MOE Air Standards

The ESDM report identifies contaminants that are exceeding the standard. Identify base-case existing maximum POI concentrations for the contaminant that is the subject of the request for an alteration to a standard. Sample data output from the model has been summarized in Table B-1: Count of Exceedences.

Table B-1: Count of Exceedences

POI Co-ordinates		Cmax (ug/m3)	Total Count of 24-hr exceedences in a 5 Yr Period
X	Y		
595	621	50	183
720	380	39.585	132
553	627	35.616	99
753	406	33.587	82
636	615	26.721	43
511	634	22.161	21
740	336	26.041	21
787	433	16.96	4
470	640	19.264	2
820	460	17.114	1
854	487	17.023	1

From the data, it shows that the POI (maximum) = Cmax = 50 ug/m^3

Optional: Compute the base-case risk score.

Where: W_{CS} = *consequence category weight*
W_L = *frequency of occurrence*

$$W_L = \frac{183}{5 \times 365} \times 100 = 10\%$$

Assuming W_{CS} =10 and MOE Limit (24 hour average) = 1 ug/m^3

$$R_0 = \frac{50}{1} \times W_{cs} \times W_L$$

= 50 X 10 X 10%

= 50

$$R_{0(\text{BaseCase})} = \left[\frac{GLC_{\max-\text{allsources}}}{\text{MOE\_Limit}} \right] \cdot W_{cs} \cdot W_L$$

e.g., $R_0 = 50$

Identify significant sources contributing to POI

The contribution of sources to the overall POI can be determined as part of the ESDM report and air dispersion modelling.

Source	Contribution to POI
1	30%
2	25%
3	20%
4	13%
5	12%

Step 1: Identify Technical Options for Contaminants

- Sources: MACT; Top-Down BACT; CCME; Industry Codes of Practice

Table B-2: Pollution Control Options*

Available Technology Name	Source 1	Source 2	Source 3	Source 4	Source 5
T_a	T_a	T_a		T_a	
T_b	T_b	T_b	T_b		T_b
T_c	T_c	T_c			
T_d				T_d	
T_e	T_e	T_e	T_e		T_e

** Note: pollution control options for each source include material substitution, process change and add on control. The default technically feasible pollution control strategy is the best of all 3 categories for the source eliminating control strategies using assessment of feasibility.*

Step 2: Eliminate options that are not technically feasible

All options that were considered must be documented in the technology benchmarking report. If some of these options are not technically feasible, then a written rationale to explain why options that are technically feasible for other facilities may not be feasible for this facility is required. There is no assessment of economics at this stage. If economic

feasibility is requested to be assessed as part of the request, a separate Economic Feasibility Analysis must be submitted. Factors to consider:

- Plant limitations, etc;
- Operational scenarios;
- Determine Technically Feasible Pollution Control Strategies/Combinations for the Facility.

Step 3: Rank Technically Feasible Pollution Control Combinations based on POI

- Assess ability to develop pollution control strategies for each source.
- Determine technically feasible pollution control combinations for the facility.
- The air dispersion model must be re-run for each feasible option to re-evaluate C_{max}.
- Rank Technically Feasible Pollution Control Combinations based on POI.

Step 4: Risk Score (Optional)

Assuming:
W_L = 10 %, W_{CS} = 10, MOE Limit = 1 ug/m^3, POI concentration for TC1 = 20 ug/m^3

With these assumptions, the value of the calculated risk score is:

$$R_{TC1} = \left[\frac{GLC_{max-allsources}}{MOE\_Limit} \right] \cdot w_{CS} \cdot w_L$$

$$R_{TC1} = \frac{20}{1} \times 10 \times 10\% = 20$$

Table B-3: Technically Feasible Pollution Control (TFPC) Combinations

Combination	**Source 1**	**Source 2**	**Source 3**	POI	Risk Score	Optional: $\Delta R = R_o - R_i$
TFPC Combination 1	$T_e(S_1)$	$T_e(S_1)$	$T_c(S_1)$	20	20	50-20=30
TFPC Combination 2	$T_c(S_2)$	$T_e(S_2)$	$T_c(S_2)$	40	40	50-40=10
TFPC Combination 3	$T_e(S_3)$		$T_b(S_3)$	30	30	50-30=20

Rank technically feasible pollution control combinations based on POI concentrations as well as Risk Scores: 1) TFPC Combination 1; 2) TFPC Combination 3; and 3) TFPC Combination 2. Hence, TFPC Combination 1 is the preferred option and must be used because it reduces the POI concentration to get as close to the standard as possible. It also has the lowest risk score.

Step 5:

Results should be documented and reported in the technology benchmarking report.