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Ohio EPA

Division of Air Pollution Control

Engineering Guide # 70

Question:

What is Ohio EPA's current approach for evaluating emissions of toxic air pollution compounds when processing Permit-to-Install (PTI) applications?

Answer:

One of the Ohio EPA's goals in permitting new air pollution sources is to ensure that any new source does not cause any significant adverse environmental impacts due to the release of any toxic air pollutants. To help achieve this goal, the Ohio EPA allows a number of methods to be used to evaluate the impact due to toxic compounds. These methods include the use of a risk assessment analysis, compliance with appropriate Maximum Achievable Control Technology (MACT) federal standards, limiting "toxic" emissions to less than 1.0 tons/yr or the use of an evaluation method described in an Ohio EPA document entitled "Option A - Review of New Sources of Air Toxic Emissions" (issued May 1986 and sometimes known as the "Air Toxic Policy"). Other methods may be used on a case-by-case basis. Also, enforceable local requirements may be used by Local Air Agencies to establish a standard more stringent than that established by these methods. Best Available Technology (BAT) limitations can then be established, if needed, in order to ensure no adverse environmental impacts will occur from the new source.

Because of the simplicity of their approach, the compliance with the MACT method and the Option A - Review of New Source of Air Toxic Emissions method are used most often to do the toxic impact evaluation. The risk assessment analysis is too costly and time consuming to do for most permitting evaluations. A number of questions have been raised by agency staff related to the proper interpretation and use of the two commonly used methods. This Engineering Guide is intended to provide guidance concerning these common questions. A copy of "Option A - Review of New Source of Air Toxic Emissions" is attached to this Engineering Guide for reference. Also attached is a copy of the January 31, 1989 inter-office communication (memorandum) from Bob Hodanbosi that establishes a 1.0 ton per year cut-off for "TLV Air Toxics" modeling evaluations. Note that there are a couple of draft revisions to "Option A - Review of New Source of Air Toxic Emissions" which are not in effect.

Question 1: What is Ohio EPA's "air toxic policy?"

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Answer: For a number of years, the modeling procedure described in the "Option A - Review of New Sources of Air Toxic Emissions" document was described as the "air toxic policy." This description is incorrect because this document simply describes a modeling procedure that can be used to evaluate the impact of toxic emissions - it does not mandate that the procedure is followed nor does it set any policy. It is simply one procedure that can be used to do a toxic impact analysis.

Question 2: If "Option A - Review of New Sources of Air Toxic Emissions" is not the air toxic policy, what is?

Answer: Under ORC 3704.03 the director has the broad authority to restrict the emission of hazardous or toxic emissions. These restrictions need to be designed to meet the overall goal of the air program - to protect and enhance the quality of the state's air resources so as to promote the public health, welfare, economic vitality and productive capacity of the people of the state (ORC 3704.02(A)(1)). It is the policy of Ohio EPA to require an evaluation of all new sources to determine if installing and operating new source of hazardous or toxic emissions is likely to cause any significant adverse environmental impacts. In order to comply with this policy, the Ohio EPA utilizes a number of methods to make this determination. These methods include, but are not limited to, the following:

1. The use of a risk assessment analysis,
2. compliance with appropriate Maximum Achievable Control Technology (MACT) federal standards,
3. Limiting toxic emissions to less than 1.0 ton per year non "highly toxic" compounds, or
4. The use of an evaluation method described in an Ohio EPA document entitled "Option A - Review of New Sources of Air Toxic Emissions" (issued May 1986 and sometimes known as the "Air Toxic Policy").

The above methods may not be all that is needed for highly toxic or hazardous compounds. Also, other methods may be used on a case-by-case basis.

Question 1: Does the Ohio EPA require the use of "Option A - Review of New Source of Air Toxic Emissions" for all permits to install that proposed to emit toxics?

Answer: No. The Ohio EPA requires that an evaluation is made to ensure that the emission of any proposed toxic will not cause any significant adverse environmental impacts. The evaluation can be done using a number of methods. These methods include the use of a risk assessment analysis, compliance with appropriate Maximum Achievable Control Technology (MACT) federal standards, limiting the emissions to less that 1.0 ton per year, the use of the "Option A - Review of New Sources of Air Toxic Emissions" method or other methods approved by the Ohio EPA on a case-by-case basis. The "Option A - Review of New Sources of Air toxic Emissions" method is used most often because it is the simplest method

available if the emissions are not controlled by a MACT type standard or are not less than 1.0 ton per year.

Question 2: The Ohio EPA has issued several draft updates to the Ohio EPA's "Option A - Review of New Source of Air Toxic Emissions." The drafts contain numerous updates including an evaluation for carcinogenicity and a tighter Maximum Acceptable Ground Level Concentration (MAGLC). Which version is currently in effect?

Answer: "Option A - Review of New Source of Air Toxic Emissions" issued May 1986 is the version that is currently in effect.

Question 3: If a new Maximum Achievable Control Technology (MACT) standard applies to a proposed new source or modified existing source, does this source also need to meet the "Option A - Review of New Source of Air Toxic Emissions" for the pollutant(s) addressed in the MACT standard?

Answer: If the compound being evaluated is a regulated compound under the MACT standard, and the compliance with the MACT standard is required when the permit is issued, then compliance with the MACT standard is normally sufficient to meet the toxic evaluation. One exception to this is for highly toxic compounds where the Director has reason to believe the MACT is not sufficiently protective of public health or environment. In this case, other methods may be used to complete the toxic impact evaluation on a case-by-case basis.

Note that other national standards may also be sufficient for the evaluation of toxic impact. For example, if PSD applies and the pollutant in question is regulated under and complies with the limits/modeling under PSD, then a toxic impact evaluation does not need to be done. MACT, NSPS, NESHAPS, PSD, or major New Source Review are areas where a toxic impact evaluation does not apply because of a pre-existing national standard. If the toxic pollutant in questions is not regulated by a national standard, then a toxic impact evaluation must be done.

Question 3b: If the MACT does not require controls, does modeing need to be done?

Answer: Yes, especially for highly toxic compounds.

Question 3c: If the MACT requires controls but not for some time, does modeling need to be done?

Answer: Yes, especially for highly toxic compounds.

Question 4: What about emissions of a highly toxic compound (e.g., a known human carcinogen) where the agency determines the normal toxic impact evaluation is not sufficient to protect public health? Is compliance with the normal toxic impact evaluation sufficient in this case?

Answer: The normal toxic impact evaluation is not necessarily sufficient. Highly toxic compounds can be evaluated on a case-by-case basis and limitations established to ensure that public health is protected. It is possible that emissions less than one ton per year of extremely toxic chemicals should be evaluated. Please contact the AQM&P Section for assistance in identifying pollutants of special concern and in evaluating these situations.

Question 5: A new source is being installed at an existing facility. Do the emissions from the existing sources at the facility need to be included in the model evaluation?

Answer: Only emissions from the proposed new source or modification must be evaluated.

Question 6: An existing source is being modified such that it needs a permit to install. Air toxic emissions will increase due to the modification. Does the "Option A - Review of New Source of Air Toxic Emissions" require that the total emissions after the modification be evaluated? Or, does the "Option A - Review of New Sources of Air Toxic Emissions" only require that the incremental increase in emissions be evaluated?

Answer: Only the increase in toxic emissions due to the change must be evaluated (i.e., the net difference between the new allowable and the old allowable for the air toxic).

Question 7: Are only gaseous/vapor VOC type pollutants reviewed under the "Option A - Review of New Sources of Air Toxic Emissions" or are some particulates such as toxic metals reviewed?

Answer: Any pollutant for which the American Conference of Governmental Industrial Hygienists (ACGIH) has adopted a TLV or a Ceiling Value must be reviewed. (Note: As indicated in the response to Question 2, pollutants that are regulated under a MACT, NSPS, NESHAPS, PSD, or Major New Source Review are excluded.)

Question 8: There are many "air toxic" lists. Which one do we use for "Option A - Review of New Sources of Air Toxic Emissions" evaluations?

Answer: The most recently published Threshold Limit Values (TLV) listing should be used ("Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices," American Conference of Governmental Industrial Hygienists).

Question 9: Are there certain types of emissions units that do not need to be modeled under the "Option A - Review of New Sources of Air Toxic Emissions" (for example, do the emissions from a Gasoline Dispensing Facility (GDF) require modeling)?

Answer: Every emissions unit with one ton per year or more of the emissions of any air toxic must be modeled unless an acceptable alternative demonstration is made (the one ton cut-off was established in a memorandum from Bob Hodanbosi dated January 31, 1989). A potentially acceptable alternative demonstration may include modeling associated with an identical emissions unit with comparable site characteristics. Gasoline Dispensing Facilities do not normally require modeling because the Ohio EPA has done sufficient modeling in the past to know they comply.

Question 10: Does a toxic impact evaluation require an evaluation of each specific air toxic constituent of a VOC coating to determine if the one ton per year cut-off is exceeded? Are "fugitive emissions" included?

Answer: Any source that emits one ton per year or more of any air toxic must undergo a toxic impact evaluation. "Fugitive emissions" are included in this determination.

Question 11: Do air toxic emissions from combustion sources have to be evaluated? Are there any other special situations (contaminants or type of emissions unit) where Ohio EPA has determined where a toxic impact evaluation is not necessary?

Answer: Many combustion sources do not need to be evaluated for air toxics at this time. These include boilers and heaters that burn fossil fuels exclusively (coal, natural gas, fuel oil, etc.). Combustion sources that emit an air toxic from something other than the combustion of fossil fuels should be evaluated. Some examples of this include incinerators where air toxics are generated from the burning of the waste stream, boilers where waste fuel or tires are burned along with the fossil fuel and rotary dryers at asphalt plants.

Ohio EPA has determined that for the following emissions units and/or contaminants a toxic air pollutant evaluation is not necessary:

- Parking Lots
- Storage Piles
- Material Transfer Operations
- Storage Tanks
- Loading Docks
- Grain Dryers
- PM from Paint Booths
- PM from Concrete Batching
- Drum/Barrel Filling
- PM from Material Bagging
- Silica from Foundry Casting
- Emergency Generators/Diesels

Question 12: What are the applicable guidelines for modeling off-site air quality impact due to toxic emissions? What is the "worst case" for modeling?

Answer: Refer to Engineering Guide #69 for a comprehensive discussion of air quality modeling requirements. Engineering Guide #69 provides guidance on the selection of a model, modeling fugitive versus stack emissions, modeling horizontal stacks or stacks with a "rain cap," etc.

The "worst case" will vary depending on a number of factors, including the degree of "toxicity" of the various chemicals that may be emitted (e.g., a chemical with a TLV of 25 ppm is "more toxic" than a chemical with a TLV of 100 ppm) as well as the maximum emissions rates. The "worst case" for a paint booth would be to assume that the maximum hourly VOC emissions were comprised solely of the "air toxic" with the lowest TLV used in any coating that will be applied in that booth.

Question 13: What permit terms and conditions are appropriate for PTIs issued after a "Option A - Review of New Sources of Air Toxic Emissions" review?

Answer: Standard "Option A - Review of New Sources of Air Toxic Emissions" Terms and Conditions have been developed for: (a) emissions units that utilized this review method; and, (b) emissions units that are exempt from toxic pollutant review because emissions of all air toxics were less than 1 ton per year.

Question 14: Can an "Option A - Review of New Sources of Air Toxic Emissions" evaluation be performed for contaminants for which the ACGIH has not adopted a Threshold Limit Value (TLV), but has adopted a Ceiling Value?

Answer: In these cases, simply multiply the 10-min average Ceiling Value by 0.737 to derive an 8-hr TLV.

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Ohio EPA - Division of Air Pollution Control
Engineering Guide #70
Summary

Element	Ohio EPA's Current Policy
PTI applications that require an air Toxic Impact Evaluation	All **new emissions units** and all **modifications of emissions units** that *involve emissions increases of ?1 ton per year of any air contaminant for which the ACGIH has adopted a Threshold Limit Value (TLV) or Ceiling Value*. (Note: Multiply a 10-min average Ceiling Value by 0.737 to derive an 8-hr TLV.)
Contaminants that require analysis	All contaminants with an ACGIH TLV *in effect at the time the application is received*.
Exemptions	**Emission units subject to a MACT standard are exempt**. **Emissions that are restricted by another federal standard** are also excluded from the analysis (i.e., NSPS, BACT, LAER or NESHAPS)
Amount of emissions that must be evaluated	*The amount of the emissions increase requested in the PTI application* (unless a previous PTI included a provision that requires future increases to be evaluated in conjunction with previous authorized emissions).
Maximum acceptable ground level concentration (MAGLC)	TLV adjusted for exposure to the general public and the duration of the exposure. **Maximum:** TLV/10 (for operations ?40 hours per week operation) **Intermittent:** (TLV/10) x (8/actual daily operating hours) x (5/actual operating days per week) **Minimum:** TLV/42 (for continuous operations.) (Note: Multiply a 10-min average Ceiling Value by 0.737 to derive an 8-hr TLV.)
Averaging time for MAGLC comparison	*One-hour average* concentration. (The MAGLC specified as a 1-hour average concentration versus the maximum predicted 1-hour concentration at the maximum hourly emission rate.)
Methodology for MAGLC analysis	*SCREEN3 or other US EPA approved model* (model using the maximum 1-hour emission rate to predict the maximum off-site concentration). Follow the modeling requirements specified in Engineering Guide #69. (Note: The distance to the nearest property line can be used in this analysis.)
Synergistic effects for MAGLC contaminants	*Not required*, each contaminant is evaluated independently.

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Element	Ohio EPA's Current Policy
Class A, B and C Carcinogens	The current "Option A - Review of New Sources of Air Toxic Emissions" does not include any special provisions for Class A, B or C carcinogens. Extremely toxic contaminants and/or carcinogens should be evaluated independent of the "Option A - Review of New Sources of Air Toxic Emissions."

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OPTION A

REVIEW OF NEW SOURCES OF AIR TOXIC EMISSIONS

Ohio Environmental Protection Agency
Division of Air Pollution Control
1800 WaterMark Drive
Columbus, Ohio 43215

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REVIEW OF NEW SOURCES OF TOXIC EMISSIONS

Synopsis

The following is a summary of the Ohio Environmental Protection Agency (EPA) policy for the control of toxic air emissions.

1. Determine if a threshold limit value (TLV) exists for the specific compound which is emitted form the source.

2. Divide the TLV by ten to adjust the standard from the working population to the general public (TLV/10).

3. Adjust the standard to account for the duration of the exposure (operating hours of the source) of "X" hours per day and "Y" days per week from 8 hours per day and 5 days per week. This formula is used to obtain the Maximum Acceptable Ground-Level Concentration (MAGLC).

$$\frac{TLV}{10} \times \frac{8}{X} \times \frac{5}{Y} = 4\,\frac{TLV}{XY} = MAGLC$$

4. The Director may, on a case-by-case basis, accept an alternate analysis from a new source applicant.

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Introduction

The basis for the air program's activities have been based upon the ambient air quality standards for "criteria pollutants." These standards, designed to protect health and welfare, have been established by U.S. EPA for the following six (6) pollutants:

1. Total suspended particulates,
2. Sulfur dioxide,
3. Carbon monoxide,
4. Nitrogen dioxide,
5. Ozone, and
6. Lead (Pb).

Emission limitations for new and existing sources have been established under the federal National Emission Standards for Hazardous Air Pollutants (NESHAPs) for the following pollutants:

1. Vinyl chloride,
2. Asbestos,
3. Beryllium,
4. Mercury,
5. Benzene, and
6. Arsenic (proposed).

The federal New Source Performance Standards (NSPS) also address several additional pollutants which are:

1. Fluorides,
2. Sulfuric acid mist,
3. Hydrogen sulfides, and
4. Reduced sulfur compounds.

For new sources, the Permit to Install rules require the application of Best Available Technology, and emissions of non-specified contaminants can be controlled through this mechanism. However, this level of

review may not be adequate for toxic emissions. U.S. EPA has been slow to promulgate NESHAPs for additional pollutants. In order to assist in the review of new sources of toxic contaminants, the following policy has been developed by the Air Quality Modeling and Planning Section of the Division of Air Pollution Control.

Background and Rationale

The American Conference of Governmental Industrial Hygienists (ACGIH) has been involved with the safety aspects of work places where individuals may be exposed to varying levels of toxic substances. The ACGIH publishes and continuously updates a list of "Threshold Limit Values" (TLVs) for many substances. These TLVs represent maximum concentrations under which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effects. Most of the TLVs refer to time-weighted average concentrations for a normal work day, with certain excursions within limits permissible during that time period, as long as the weighted average is not exceeded. However, for certain substances, there are levels that should not be exceeded at any time.

As outlined below, there are certain limitations and dangers in the literal application of TLVs for air pollution control purposes.

1. Threshold Limit Values are based on the information gathered in industrial/commercial settings, through experience from medical research and practice, from experimental human and animal studies, and also from a combination of these sources. Only in a few instances have the values been established firmly on a basis of examinations of human subjects correlated with extensive environmental observations.

2. The TLVs were determined for a population of workers who are essentially healthy and who fall within a "working age group" of about 17 to 65 years.

3. Synergistic effects of mixtures of substances are not considered in the development of TLVs, although the TLVs for mixtures can be calculated via the appropriate formula.

4. Individuals vary in sensitivity of susceptibility to toxic substances.

5. Often a single value is given for substances which occur in different forms and may have different toxicities.

6. For most contaminants, a worker during a normal work schedule (8 hours per day, 5 days a week) receives 40 hours of exposure per week daily and weekend periods in which the body may rid itself of the accumulated substances before toxic levels are reached. For a person living continuously in an environment containing such substances, however, these recovery periods do not exist. Exposure to TLV levels may, therefore, subject the person to an unacceptably high risk of injury.

In setting ambient goals for toxic substances, two time periods must be considered.

1. Duration of Exposure - This is the amount of time a person spends in contact with a toxic substance. (In this application, it is assumed that a person may continuously be exposed to the specific contaminants during the operating hours of a source.)

2. Averaging Time - This time period is used to measure compliance with the standard.

For example, the OSHA TLVs have a maximum allowable duration of exposure of 8 hours/day and 40 hours/week, but an averaging time of 8 hours for determining compliance with the rules. Similarly, the ambient lead standard has a continuous duration of exposure, but a quarterly averaging time for determining compliance. Also, the ACGIH publishes acceptable ceiling concentration values within an 8-hour workday, and acceptable peak concentrations for a short period of time, in addition to the time-weighed 8-hour weekday.

Determination of Maximum Acceptable Ground-Level Concentration (MAGLC)

Taking into account the duration of exposure and averaging time, the following stepwise procedure should be used to determine the allowable ambient air concentration for a toxic substance:

1. Determine if a TLV exists for the specific compound which is emitted from the source.

2. Divide the TLV by ten (10) to adjust the standard from the working population to the general public (TLV/10).

3. Adjust the standard to account for the duration of the exposure (operating hours of the source) of "X" hours per day and "Y" days per week from 8 hours per day and 5 days per week.

$$\frac{TLV}{10} \times \frac{8}{X} \times \frac{5}{Y} = 4\,\frac{TLV}{XY}$$

4. The TLVs are based on an averaging time of 8 hours per day. The standard method of determining the ambient air quality effect of the source is through dispersion modeling. The most readily adaptable averaging time for dispersion models is generally one hour. The approvability of a source will be based on the predicted one-hour averaging time (under worst-case meteorology) in comparison to the MAGLC obtained from Step 3. If the impact of the source is greater than the MAGLC, additional measures by the source will be necessary before the Permit to Install can be issued. Because no adjustment is made to the formula in Step 3, an additional safety factor of approximately 30% is produced (see Appendix A for the derivation of the 30% safety factor).

$$MAGLC = 4\,\frac{TLV}{XY}$$

By using a factor of 10 in Step 2 and by decreasing the averaging time in Step 3, the TLV has been adjusted for the greater susceptibility of the general population in comparison to healthy workers.

The 8/X and the 5/Y multipliers in Step 3 are used to relate the exposure to longer than 40-hour time periods and ascertain that the individual's total exposure will be no greater than that allowed by the TLV.

For less than 40 hours per week of plant operation, the MAGLC formula will yield a value greater than the TLV/10. Although excursions of up to three times the TLV can be calculated in some cases, it does not appear reasonable to permit this situation for the general population. A condition on the formula is,

therefore, necessary to limit the allowable concentration to TLV/10 for operating times less than 40 hours per week.

Thus, from the above analysis, the derivation of the maximum acceptable ground-level concentration (maximum one hour average) beyond the plant boundary of a continuous emitting source would be:

$$MAGLC = \frac{TLV}{10} \times \frac{8\ hours}{24\ hours} \times \frac{5\ days}{7\ days} = \frac{TLV}{42}$$

An example of this procedure is contained in Appendix B.

The application of the policy is for use as a guideline in the review of new source applications. There may be cases where the TLV values are inappropriate for this type of application. The Director may consider, on a case-by-case basis, other data in the determination of a Maximum Acceptable Ground-Level Concentration from a new source.

Comparisons of MAGLC to National Ambient Air Quality Standards Values

In order to determine the relative stringency of this procedure, a comparison was made using this method with the National Ambient Air Quality Standards (NAAQS) for sulfur dioxide and ozone, and with the NESHAP for beryllium:

A. Sulfur Dioxide

For a continuously emitting sulfur dioxide source, the acceptable one-hour ground-level concentration would be:

$$MAGLC = \frac{4\ TLV}{X\ Y} = \frac{(4)\ (5\ ppm)}{(24\ hr/day)(7\ days/week)} = 0.12\ ppm$$

Under the NAAQS, the three-hour standard is 0.5 ppm, not to be exceeded more than once per year.

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B. Ozone

For an intermittent ozone source operating three hours per day, five days per week, the allowable impact would be:

$$MAGLC = \frac{TLV}{10} = \frac{0.1\ ppm}{10} = 0.01\ ppm$$

The NAAQS for ozone is 0.12 ppm one-hour average, not to be exceeded more than once per year over a three-year period.

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APPENDIX A

The vertical ($?_z$) and horizontal ($?_y$) dispersion parameters utilized in most gaussian models were developed by Pasquill[1] and modified by Gifford[2]. Although the original experiments were based on a ten-minute sampling time, in practice, $?_y$ and $?_z$ values are considered to represent dispersion for a one-hour average. Due to wind direction fluctuations and variations in wind speed, it is necessary to adjust predictions which are greater than one-hour to account for these meteorological phenomena. To apply the predictions to longer than a one-hour period, the following equation is suggested by Turner[3]:

$$X_s = X_k \frac{(t_k)^p}{t_s}$$

Where

X_s is the concentration predicted over an averaging time t_s,

X_k is the concentration predicted over an averaging time t_k, and

^{p} is a constant and should be between 0.17 and 0.2

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[1] F. Pasquill, "The estimation of the dispersion of windborne material," Meteorological Magazine, Vol. 90, 1961, pp. 33-49.

[2] F.A. Gifford, "Use of routine meteological observations for estimation atmospheric diffusion," Nuclear Safety, Vol. 2, 1961 p. 47.

[3] D.B. Turner, "Workbook of Atmospheric Dispersion Estimates," Office of Air Programs Publication, No. AP-26, U.S. EPA, Research Triangle Park, North Carolina, 1970.

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As shown below, applying this equation to the case of estimating an eight-hour average concentration, the one-hour predicted concentration should be reduced by 32%.

$$X_s = \frac{(t_k)^p}{t_s}$$

$$\frac{X_s}{X_k} = \frac{(1)}{(8)}^{0.185}$$

$$\frac{X_s}{X_k} = 0.680$$

By not allowing for this adjustment when reducing the averaging time from eight-hour to one-hour in step 4, an additional safety factor of 32% is realized.

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APPENDIX B

A new hazardous waste incinerator is proposing to burn sludge containing cadmium. The incinerator is equipped with a wet scrubber which is designed to remove 98% of the cadmium in the waste gas stream and will emit 4.6 pound per hour of cadmium. The incinerator will operate 24 hours per day, 7 days per week.

The TLV for cadmium is 0.1 mg/m^3, and from Step 4, the maximum allowable ground-level concentration would be:

$$MAGLC = \frac{4\ TLV}{X\ Y} = \frac{(4)\ (0.05\ mg/m^3)}{(24\ hr/day)(7\ days/week)} = 1.19 \times 10^{-3}\ mg/m^3$$

$$= 1.19 \times 10^{-6}\ g/m^3$$

From the PTMAX model, the maximum one-hour impact from the source is predicted to be 6.24×10^{-6} at 0.5 m/sec wind speed and F stability.

Since the predicted concentration is greater than the MAGLC of 1.19×10^{-6} g/m^3, the source will be required to develop a plan to reduce the ambient impact of the cadmium emissions.