Final Report of the Michigan Air Toxics Workgroup

Michigan Department of Environmental Quality

Air Quality Division

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Purpose of the Report

This report was prepared by the Air Toxics Workgroup (ATW) and staff of the Michigan Department of Environmental Quality (MDEQ) Air Quality Division (AQD). The purposes of this report are to:

- address the nine air toxics rule recommendations made by the Office of Regulatory Reinvention's Environmental Advisory Rules Committee (ARC) in their 12/23/11 report;
- document the content of the ATW meetings that took place from December, 2012 to September, 2013, and;
- present recommendations to the AQD for revisions to Michigan's air toxics regulations for the Permit to Install (PTI) program, along with supporting rationale for those recommendations.

Summary of ATW Recommendations

A detailed presentation of the ATW recommendations appears in the body of this report and the Appendices, along with a description of the degree of agreement and areas of disagreement among ATW Members on each recommendation. Recommendations for all nine issues were reached with either unanimous agreement or consensus agreement by a majority of the nine-member Workgroup. The following table summarizes the nine ARC issues and recommendations, and the related recommendations of the ATW.

ARC 12/23/11 Recommendation	Summary of ATW Recommendations (by majority consensus or unanimous agreement; areas of disagreement are detailed elsewhere in this report)
1. Don't require T-BACT for VOCs	Agreement with ARC; AQD should clarify rule language.
2. Exempt changes that are not meaningful	Agreement with ARC; AQD should clarify Rule 285 by defining key terms and procedures.
3. Exempt sources in a MACT category	Disagreement by AQD and some ATW Members; no recommendation.
4. Exempt clean fuels	Partial agreement with ARC; exempt sources meeting specific criteria limited to three fuel types.
5. Exempt pollution control projects	Current exemptions and impending exemptions and rule changes provide significant regulatory relief; no further recommendations specific to pollution control projects.
6. TAC list should only include the EPA HAPs	Rule changes for a defined TAC list, longer than the HAPs list; approximately 756 chemicals; formal public review.
7. Limits should be consistent with nearby states	Rule changes to improve consistency and clarity: eliminate default ITSLs, change averaging times, and develop acute ITSLs.
8. Require less stack testing	A Policy and Procedure should clarify that the AQD should require stack testing only when warranted. AQD should post stack test results on their website.
9. Rescind Rule 228	Modify Rule 228 to say that the AQD will utilize relevant and reasonable information; DEQ can address non-TACs only by Director's decision that doing so is necessary to ensure public health protection.

Background

The ATW was convened by AQD to review and consider recommendations for the air toxics program made by the Office of Regulatory Reinvention's (ORR's) Environmental Advisory Rules Committee (ARC) and to review other air toxics rule issues that may be identified by the ATW or the AQD. The Environmental ARC report was reviewed and approved by the Governor's office, with direction for the DEQ to address the recommendations. A list of volunteer members for the ATW is attached in **Appendix A**. The ATW membership included two of the members from the ARC responsible for the original recommendations. Under direction from Michigan Governor Rick Snyder, the ARC was created by the ORR in accordance with Executive Order 2011-5. The purpose of the Environmental ARC was to produce recommendations to the ORR for changes to Michigan's existing environmental regulations. The recommendations were made by ORR in a report to Governor Snyder on December 23, 2011 and is available online at: http://www.michigan.gov/documents/deq/ORR_-_Environmental_Recommendations_-_Final_with_attachments_405292_7.pdf

The ORR report states:
"The Environmental ARC was tasked with evaluating and making recommendations for changes to Michigan's environmental regulations, including existing administrative rules, non-rule regulatory actions, regulatory processes, and as necessary, statutes. Evaluations and recommendations were based on the application of the seven factors described in Executive Order 2011-5. Those seven factors are as follows:

1. Health or safety benefits of the rules;
2. Whether the rules are mandated by any applicable constitutional or statutory provision;
3. The cost of compliance with the rules, taking into account their complexity, reporting requirements and other factors;
4. The extent to which the rules conflict with or duplicate similar rules or regulations adopted by the state or federal government;
5. Extent to which the regulations exceed national or regional compliance requirements or other standards;
6. Date of last evaluation of the rules and the degree, if any, to which technology, economic conditions or other factors have changed regulatory activity covered by the rules since the last evaluation; and
7. Other changes or developments since implementation that demonstrate there is no continued need for the rules."

As noted previously, two members of the ATW were also members of the ARC. One of these members did not concur with the original ARC recommendations for changes to the AQD's air toxics rules, while the other member fully supported the ARC recommendations.

An overview of the ORR recommendations was provided to the ATW by Mr. Dave Fiedler, DEQ Regulatory Affairs Officer, at the January 17, 2013, ATW meeting. All meeting agendas and meeting summaries are provided in **Appendix B**.

Brief Air Toxics Program History

An overview of the current air toxics rules and the department's previous air toxics stakeholder workgroups is available in **Appendix C**. Three previous workgroups have been formed to address the permitting of air toxics emissions in Michigan. In 1981, the Special Air Advisory Committee

(SAAC) issued the report, "A Proposed Framework for Processing Air Quality Permit Applications for New Emission Sources of Non-Criteria Pollutants." The SAAC recommended that air toxics emissions from new sources should be evaluated using dispersion modeling and acceptable health-based concentrations. The second workgroup, known as the Michigan Air Toxics Policy Committee (MATPC), released their final report in 1989 titled, "A Proposed Strategy for Processing Air Quality Permit Applications for New Emission Sources of Toxic Air Pollutants." This report provided further guidance for the development of Michigan's first air toxics rules. The charge of this workgroup was to: "*develop a strategy/rules to control and abate air toxics emissions from new and existing sources in Michigan*." In summary, this report recommended that AQD should first focus on new or modified sources, a control technology requirement (T-BACT) should apply, all air toxics should be accounted for, and, it included procedures for deriving health-based screening levels.

The AQD's air toxics rules were first promulgated on April 17, 1992. In response to concerns raised by the regulated community, a third workgroup (the Air Toxics Subcommittee (ATS)) was convened in 1995. The 1997 ATS report, "A New Regulatory Framework for Control of Toxic Air Pollutants," led to several significant changes to the air toxics rules in 1998, resulting in the current rules.

ATW Charge and Process

The ATW met nine times on the following dates: 12/3/12, 1/17/13, 3/5/13, 4/16/13, 5/15/13, 6/19/13, 7/24/13, 8/1/13 and 9/25/13. At the first meeting, the group heard from DEQ Director Dan Wyant, who presented the DEQ mission and guiding principles. He offered the group his support and expressed his interest in moving the recommendations along in a timely manner. LARA Deputy Director Rob Nederhood also provided his support and stated that he recognized the importance of stakeholder input in the process.

At the first meeting the ATW agreed on ground rules and the following charge:

"The Air Toxics Workgroup (ATW) of the Air Quality Division (AQD) will provide meaningful input to the AQD in addressing ORR Recommendation A-1 and other air toxics rule issues as identified by the ATW and AQD members. The ATW will help ensure that the rules are updated, streamlined, protective of public health and not excessively burdensome. By August 1, 2013, the ATW shall have recommendations to the AQD."

The ATW agreed that they would first address the nine ORR recommendations and, if time allowed, they would also make additional recommendations to the AQD. At the August 1, 2013 meeting, some of the Members requested additional time to further review the significant amount of material recently assembled by the AQD and to review draft proposed rule language. It was agreed by the AQD and ATW to extend the deadline and hold one additional meeting in September.

All of the information used in the development of this report, additional resource materials, and PowerPoint presentations, are available on the ATW web site: http://www.michigan.gov/deq/0,4561,7-135-3310_4105-293104--,00.html. This website will be maintained until after the rule revision process for these air toxics rules is completed.

The organization of this report follows the nine ARC "A-1" air toxics recommendations, and presents the ATW recommendation on each issue, the degree of ATW agreement and areas of disagreement, a brief rationale for the ATW recommendation, and draft rule language (as appropriate).

Recommendations and Draft Proposed Rule Changes

A-1(1) T-BACT for VOCs

ARC 12/23/11 Recommendation:
A-1(1) The parts of R 336.1224 dealing with compounds that are considered volatile organic compounds (VOCs) should be rescinded. Portions of R 336.1224 are redundant because R 336.1702 requires a control technology review for VOCs. VOC-based emission control is more effective under R 336.1702 and this entire regulation exceeds federal standards.

ATW Recommendation:
ATW Members and staff agree that VOC emissions that are subject to Rule 702 are exempt from Rule 224, and that a change in the R 224 language would provide needed clarification.

Degree of Consensus with this ATW Recommendation:
Unanimous agreement.

Summary of the Rationale for this ATW Recommendation:
Rule 702 states the control technology requirements for new sources of VOC emissions. Rule 224 states the "T-BACT" control technology requirements for TACs, some of which are VOCs. AQD staff has considered the Rule 702 requirements as sufficient for satisfying the T-BACT requirement of R 224 for TACs that are VOCs. However, to the regulated community, the requirements appear to be redundant. A change in the R 224 language will provide the needed clarification.

Draft Proposed Rule Changes:
R336.1224(2)(c) currently reads as follows:

The requirement for T-BACT in subrule (1) of this rule shall not apply to any of the following:

(c) An emission unit or units which only emits toxic air contaminants that are particulates or VOCs and which is in compliance with BACT or LAER requirements for particulates and VOCs.

It is noted that the rule does not specifically mention that a source meeting the requirements of Rule 702 BACT is also exempt from Rule 224. The following revised language for R336.1224(2)(c) is proposed to address this concern.

The requirement for T-BACT in subrule (1) of this rule shall not apply to any of the following:

(c) An emission unit or units which only emits toxic air contaminants that are particulates or VOCs and which is in compliance with BACT, ***including R336.1702 BACT****, or LAER requirements for particulates and VOCs.*

A-1(2) Meaningful Change

ARC 12/23/11 Recommendation:
R 336.1225 should be amended and specifically include the following:
A-1(2) Limit permit modification reviews to those increases in a Hazard Index exceeding 10% above the previously permitted baseline.

ATW Recommendation:
Rule 285 should be revised to include needed definitions for the key terms as they apply to relatively small changes in air toxics emissions from existing sources. A separate exemption to Rule 225 would not provide significant additional streamlining and is not needed.

Degree of Consensus with this ATW Recommendation:
There was consensus agreement, but not unanimous support. Representatives of the regulated community supported the recommendation, but some other Members were not supportive due to concerns that the exemption definitions and procedure do not address potential interactive effects of air toxics, do not account for non-TACs, do not account for cumulative impacts, and allow up to a 10% increase.

Summary of the Rationale for this ATW Recommendation:
The recommendation clarifies and improves an already existing rule and procedure that is utilized by companies and AQD in determining if a relatively small process change may be exempt from the requirement to obtain a Permit to Install (PTI). Currently, Rules 285(b) and 285(c) state that a PTI is not required for:

*(b) Changes in a process or process equipment which do not involve installing, constructing, or reconstructing an emission unit and which do not involve any **meaningful change in the quality and nature or any meaningful increase in the quantity** of the emission of an **air contaminant** therefrom.*

Examples of such changes in a process or process equipment include the following:
(i) Change in the supplier or formulation of similar raw materials, fuels, or paints and other coatings.
(ii) Change in the sequence of the process.
(iii) Change in the method of raw material addition.
(iv) Change in the method of product packaging.
(v) Change in process operating parameters.
(vi) Installation of a floating roof on an open top petroleum storage tank.
(vii) Replacement of a fuel burner in a boiler with an equally or more thermally efficient burner.
(viii) Lengthening a paint drying oven to provide additional curing time.

*(c) Changes in a process or process equipment which do not involve installing, constructing, or reconstructing an emission unit and which involve a **meaningful change in the quality and nature, or a meaningful increase in the quantity**, of the emission of an **air contaminant** resulting from any of the following:*

(i) Changes in the supplier or supply of the same type of virgin fuel, such as coal, no. 2 fuel oil, no. 6 fuel oil, or natural gas.
(ii) Changes in the location, within the storage area, or configuration of a material storage pile or material handling equipment.

(iii) Changes in a process or process equipment to the extent that such changes do not alter the quality and nature, or increase the quantity, of the emission of the air contaminant beyond the level which has been described in and allowed by an approved permit to install, permit to operate, or order of the department. (emphasis added)

However, the terms **"meaningful change in the quality and nature"** and **"meaningful increase in the quantity"** are not defined in the Statute (NREPA) or in the AQD's rules. Companies and AQD have implemented these rules by utilizing a method for determining if a change in air toxics emissions is "meaningful" or not (Avery, 1993; also contained in MDEQ, 2005).

The ATW Members representing the regulated community, and AQD, want to continue to utilize this exemption. They believe that including the meaningful change definitions for air toxics in the AQD's rules would help to provide clarity and flexibility for companies when making a small change to a process. They believe that the definitions in the draft proposed rules, and the procedures described in the discussion paper on this issue, will provide the needed flexibility and clarity while not posing a threat to the public health or environment. However, some Members are not fully supportive because they feel that the exemption is too broad and inclusive.

The proposed definitions will continue the AQD policy and practice of considering air toxics emission increases of less than 10% over a specified baseline as not meaningful for the purposes of the Rule 285 exemption. However, the exemption could not be used if the change would cause a permit limit to be exceeded, even if the increase was less than 10%. The definition does not allow the combining of carcinogenic and noncarcinogenic effect-based screening levels as done historically. Additionally, neither a "floating" baseline nor grandfathering of sources (prior to the air toxics rules promulgation on April 17, 1992) would be allowed.

The Discussion Paper on this issue **(Appendix D)** provides significant detail on issues related to the baseline and the 10% determination, as well as several examples of how the procedure and definitions of "meaningful change in the quality and nature" and "meaningful change in the quantity of the emission" would be implemented. The AQD will develop a Policy and Procedure document including these details. That document should also state that odors could potentially be an issue with the process changes, and that odor impacts should be considered, consistent with the new Policy Guidance document pertaining to the appropriate use of Rule 901.
Additionally, Rule 285(f) exempts pollution control projects that do not generate a, "…meaningful quantity of toxic air contaminants." This is slightly different phrasing than found in R 285(b) and (c), and it is also undefined. Therefore, the language of this subrule should also be revised to use the same terms as in Rule 285(b) and (c).

Draft Proposed Rule Changes:
A revision to R 336.12285(b) is recommended as follows:

R 336.12285(b)

(b) Changes in a process or process equipment which do not involve installing, constructing, or reconstructing an emission unit and which do not involve any meaningful change in the quality and nature or any meaningful increase in the quantity of the emission of an air contaminant therefrom.
(i) **For the purposes of this rule, meaningful with respect to toxic air contaminant emissions is defined as follows:**

"Meaningful change in the quality and nature" means a change in the toxic air contaminants emitted that results in an increase in the cancer or noncancer hazard potential that is 10%

or greater, or which causes an exceedance of a permit limit. The hazard potential is the value calculated for each toxic air contaminant involved in the proposed change, before and after the proposed change, and it is the potential to emit (hourly averaging time) divided by the IRSL or the adjusted annual ITSL, for each toxic air contaminant and screening level involved in the proposed change. The adjusted annual ITSL is the ITSL that has been adjusted as needed to an annual averaging time utilizing averaging time conversion factors in accordance with the models and procedures in 40 C.F.R 51.160(f) and Appendix W, adopted by reference in R 336.1299. The percent increase in the hazard potential is determined from the highest cancer and noncancer hazard potential before and after the proposed change. The potential to emit before the proposed change is the baseline potential to emit established in an approved PTI application on or after 4/17/92 that has not been voided or revoked, unless it has been voided due to incorporation into a renewable operating permit.

"Meaningful increase in the quantity of the emission" means an increase in the potential to emit (hourly averaging time) of a toxic air contaminant that is 10% or greater compared to a baseline potential to emit, or which results in an increase in the cancer or noncancer hazard potential that is 10% or greater, or which causes an exceedance of a permit limit. The baseline is the potential to emit established in an approved PTI application on or after 4/17/92 that has not been voided or revoked, unless it has been voided due to incorporation into a renewable operating permit."

Examples of such changes in a process or process equipment include but are not limited to the following:

(ii) Change in the supplier or formulation of similar raw materials, fuels, or paints and other coatings.

(iii) ~~(ii)~~ Change in the sequence of the process.

(iv) ~~(iii)~~ Change in the method of raw material addition.

(v) ~~(iv)~~ Change in the method of product packaging.

(vi) ~~(v)~~ Change in process operating parameters.

(vii) ~~(vi)~~ Installation of a floating roof on an open top petroleum storage tank.

(viii) ~~(vii)~~ Replacement of a fuel burner in a boiler with an equally or more thermally efficient burner.

(ix) ~~(viii)~~ Lengthening a paint drying oven to provide additional curing time.

Additionally, a revision to R 336.12285(f) is recommended as follows:

(f) Installation or construction of air pollution control equipment for an existing process or process equipment if the control equipment itself does not actually generate a significant amount of criteria air contaminants as defined in R 336.1119(e) or a meaningful **increase in the** quantity **of the emissions of toxic air contaminants or a meaningful change in the quality and nature** of toxic air contaminants.

A-1(3) Exemption for Sources in a MACT Category

ARC 12/23/11 Recommendation:
R 336.1225 should be amended and specifically include the following:
A-1(3) Exempt sources that are identified in a MACT source category.

ATW Recommendation:
This issue was found to be a very divisive policy issue, with no apparent option for compromise. ATW Members, and AQD staff and management, did not agree on rule changes for a shift in policy.

Degree of Consensus with this ATW Recommendation:
Based on the ATW discussions, it appeared that some Members agreed with AQD's concerns with the ARC recommendation, while some Members apparently agreed with the ARC recommendation. Member's opinions and positions cannot be more clearly described because a vote was not taken.

Summary of the Rationale for this ATW Recommendation:
This ARC recommendation had significant discussion during the Workgroup process. The information distributed by some ATW members indicates that the recommendation would be implemented via a modification of Rule 226 ("Exemptions from the health-based screening level requirement") to include emission units or fugitive emissions that are subject to a control technology requirement. This would include: a 40 CFR Part 61 requirement; a Section 112(d), (g), or (j) requirement; a CAA section 129 or 111(d) requirement; VOCs that are subject to Rule 702; particulate emission sources subject to a BACT or LAER requirement; and, source categories that have been delisted under the Clean Air Act Section 112(c)(9).

One ATW Member characterized this ARC recommendation as being predominantly a "policy" issue. The issue may be framed as: if a source is subject to an emission control technology requirement, should the applicant have to demonstrate that the emissions are health protective, or should the burden of that demonstration (if conducted at all) fall to the AQD? Under the AQD's current rules, the burden of that demonstration falls on the applicant (Rule 203(1)(h)).

AQD staff and Members considered that under the Clean Air Act Amendments (CAAA) of 1990, air toxics are regulated via control technology requirements (the first step) and residual risk assessment (section 112(f) of the CAAA). The EPA's second step of the two-step process is also referred to as Risk and Technology review (RTR), and is described at http://www.epa.gov/airtoxics/rrisk/rtrpg.html. As of October 2, 2012, EPA had completed the residual risk assessment for 32 of the 170 source categories. The RTR process results in either a finding of acceptable risk, or, a finding that risks are elevated and do not provide an ample margin of safety ("AMOS"). In the latter situation, standards are set to provide AMOS considering all health information and all other relevant factors including, for example, costs and feasibility. Of the 32 source categories with completed RTRs, several were found to have air toxics risks that were elevated or did not provide AMOS. It is important to note that sources that are subject to a MACT standard and also a section 112(f) standard (RTR) are already exempted from Rule 225 (see Rule 226(b)).

The AQD stated that the two-step requirement for emission control technology and health risk assessment has been and remains an appropriate and responsible regulatory approach. The AQD did not support this recommended change in policy and thought that it would be very problematic.

AQD's position is that there is no basis to presume that air toxics emissions that meet control technology requirements would provide sufficient public health protection. The AQD did not think the burden of the second step should fall to the agency. Shifting the burden to the agency would place a significant additional workload on agency staff. More time and effort by agency staff (permit, modeling, and toxicologist staff), and permit screening with incomplete air toxics reviews, may be necessary. This would not streamline the permitting process, and would put a strain on the AQD's permit turnaround goals. Also, implementing Michigan's air toxics rules often calls for the DEQ to be able to reassure the public that the permitted source is safe for the public health and the environment. An exemption that would relieve applicants from having to make this demonstration in their permit application, based on a control technology requirement only, would place the agency in a very difficult position. The rules as written are not duplicative with federal regulations and the state air toxics rules allow the DEQ to consider the health and safety of Michigan's citizens. The health and safety of state rules and redundancy with federal regulations were two factors that the ARC was directed to use in evaluating Michigan's environmental regulations. For these reasons, the AQD disagreed with the ARC recommendation.

In the ATW discussions, there was no rational argument that a control technology requirement could be relied upon to provide public health and environmental protection. However, some Members noted that MACT controls that target specific HAPS would also control other air toxics, particularly if they belong in the same chemical class (such as VOCs or metals).

The primary policy issue is, should the burden of demonstrating the acceptability of the air quality impacts belong to the applicant or to the agency? Based on the ATW discussions, it appeared that some Members agreed with AQD's position, while some Members apparently agreed with the ARC recommendation. Member's opinions and positions cannot be more clearly described because a vote was not taken.

The AQD believes that the consideration of this issue has been completed by the ATW and the agency, and that there is not sufficient support of the ARC recommendation. Therefore, no rule change is being proposed for this recommendation.

Draft Proposed Rule Changes:

None recommended.

A-1(4) Clean Fuels Exemption

ARC 12/23/11 Recommendation:
R 336.1225 should be amended and specifically include the following:
Exempt clean fuels such as natural gas, low sulfur #2 fuel oil, and non-chemically treated biofuels.

ATW Recommendation:
It is recommended that engines, turbines, boilers and process heaters burning solely natural gas, diesel fuel (#2 fuel oil), or biodiesel, of up to 100 MMBTU/hr, may be exempted from Rule 224 and Rule 225, provided that the effective stack height is at least 1.5 times the building height and the building setback is at least 100 feet from the property line. Sources not meeting the stack height or setback criteria may be determined to be exempt by the department on a case-by-case basis.

Degree of Consensus with this ATW Recommendation:
Unanimous support.

Summary of the Rationale for this ATW Recommendation:
To better inform the consideration of this issue, AQD staff developed a June 11, 2013, "Clean Fuels Discussion Paper" (**Appendix E**). Additionally, three other support documents were developed by the AQD to address this recommendation:

- Clean Fuels Technical Support Document – **Appendix F**
- Clean Fuels: Biodiesel Emission Factors and Ambient Impacts – **Appendix G**
- Clean Fuels: Emission Factors and Ambient Impacts for Wood, Natural Gas, and Diesel – **Appendix H**

The ATW discussed how this exemption would help streamline the permitting process and provide an incentive for companies to use relatively cleaner-burning fuels. There were initial questions about how broad the exemption should be, and there was a need to characterize the ambient air impacts and the level of public health protection if sources were exempted from Rule 225 review. Therefore, TAC emission factors were compiled, representative facility parameters were selected, and the ambient air impacts were evaluated using a conservative screening modeling and compared to health-based screening levels. TAC emission estimates and modeled impacts were compiled for engines, turbines, boilers, and process heaters, burning natural gas, low sulfur diesel, biodiesel, and non-chemically treated wood. For each fuel, process type and source size, the ambient air concentrations of TACs that exceeded their respective screening levels (ITSLs and IRSLs) were compiled and further evaluated. In addition to the modeling exercise for representative, hypothetical facilities, TAC emissions and modeled impacts for several actual sources ("case studies") were also evaluated. As a result of these exercises, the ATW and AQD were able to make informed decisions about exempting such sources from Rule 225 review in permitting. It should be noted that the Workgroup accounted for broad considerations, including the level of public health protection and the impetus to provide streamlining of the regulatory process for the relatively cleaner fuel options.

One Member indicated that the use of the screening modeling consistently over-predicts environmental impacts. Another Member emphasized that the modeling exercise utilized only individual emission units, and did not account for sources with multiple emission units.

The recommended exemptions will provide significant streamlining of the permitting process for qualifying facilities and provide an incentive for relatively cleaner fuels to be utilized, while not

endangering the public health. The recommendation does not exempt sources burning wood. The recommendation includes criteria for the stack height-to-building height ratio, and the building setback distance from the property line, which were considered reasonable and which mirrored the assumptions utilized in the modeling exercise. However, the Workgroup recommended that on a case-by-case basis the department could reasonably exempt a source that does not meet one or both of these latter criteria. The recommended exemption would supersede the AQD's variance that suspends enforcement of Rule 225 for certain natural gas combustion units, which AQD has been annually renewing since 2006.

Draft Proposed Rule Changes:

The proposed change is to add another exemption (d) to Rule 224 as follows:

R 336.1224 T-BACT requirement for new and modified source of air toxics; exemptions.

(2) The requirement for T-BACT in subrule (1) of this rule shall not apply to any of the following:

(d) Engines, turbines, boilers and process heaters burning solely natural gas, diesel fuel (#2 fuel oil), or biodiesel, of up to 100 MMBTU/hr, provided that the effective stack height is vertical and unobstructed and is at least 1.5 times the building height, and the building setback is at least 100 feet from the property line.

The same language is proposed to be added to Rule 226 as (e) to provide an exemption of these sources from the health-based screening level requirement of R 225 as follows:

R 336.1226 Exemptions from the health-based screening level requirement.

Rule 226. The health-based screening level requirement provided in R 336.1225(1) shall not apply to any of the following:

(e) Engines, turbines, boilers and process heaters burning solely natural gas, diesel fuel (#2 fuel oil), or biodiesel, of up to 100 MMBTU/hr, provided that the effective stack height is vertical and unobstructed and is at least 1.5 times the building height, and the building setback is at least 100 feet from the property line.

A-1(5) Pollution Control Projects Exemption

ARC 12/23/11 Recommendation:
R 336.1225 should be amended and specifically include the following:
Exempt pollution control projects for existing sources from the air toxic regulations.

ATW Recommendation:
Considering the significant regulatory streamlining steps being recommended by the ATW elsewhere in this Report, and those currently under development by the AQD's Permit Exemptions Workgroup, the ATW does not recommend additional specific pollution control projects for exemptions to provide significant additional streamlining.

Degree of Consensus with this ATW Recommendation:
Unanimous.

Summary of the Rationale for this ATW Recommendation:
Several examples were discussed for what could potentially qualify as a "pollution control project." Many ideas involved the installation of pollution control *equipment*, which is already exempted from permitting under Rule 285(f). Other ideas seem likely to not result in a meaningful change, and therefore would be exempted from permitting under other parts of Rule 285 or other existing exemptions (see the Rule 285 draft proposed rule changes under: A-1(2) Meaningful Change). Other examples went beyond what may qualify for an exemption under Rule 285, some of which may involve *projects* rather than *equipment*; for some ideas, it may be questionable if they are accurately characterized as "pollution control". Members generally found it to be challenging to identify some specific pollution control retrofits (beyond the existing exemptions) for which it makes no sense to require a Rule 225 review. It did not appear that there was a significant number of sources that would appropriately fall under a new exemption from Rule 225.

Members also recognized that the other issues being addressed by the ATW, and by the other active AQD workgroup on Permit Exemptions, would provide significant additional regulatory relief for various types of projects, including pollution control projects.

Draft Proposed Rule Changes:
None recommended.

A-1(6) The TAC List

ARC 12/23/11 Recommendation:
R 336.1225 should be amended and specifically include the following:
Limit the number of air toxics to the federal HAPs (Hazardous Air Pollutants) list.

ATW Recommendation:
In order to rationalize the list of TACs while still assuring protection of the public health, it is recommended that the AQD pursue development of rules to implement the approach described in the August 20, 2013 updated discussion paper to establish a defined list of TACs subject to Rule 225 (while otherwise retaining the authority to address other air toxics of concern on a case by case basis in a specific PTI application under a modified Rule 228), and with the authority to add and delete from the list based on the application of the same criteria described in the August 20, 2013 updated discussion paper for establishing the list (i.e., proposed additions would be carcinogens and air toxics that would have ITSLs equal to or lower than the 75th percentile SL cutoff values, that are reasonably anticipated to appear in a PTI application).

Rule development should also provide that the proposed initial TAC list and basis for each SL should be public noticed for comment. The rule will define the procedure for posting for public comment the initial list and initial SLs, any proposed additions/deletions to the TAC list, and any proposed changes to the SLs. Aggrieved parties should have the ability to request AQD to review the basis for a listing or a SL. Justifications for the SLs should be posted on the AQD web site. The justifications should indicate the date of the SL derivation, the algorithm used, the uncertainty factors used, a brief description of the key studies or information sources for the SL, and citations for those key studies and information sources.

The AQD should adopt rule language to give assurance that only reliable studies will be utilized in deriving screening levels, such as the following adaptation of the DEQ RRD's current rule definition for "Best available information" : "…means, when used in relation to a risk assessment or the development of screening levels, the most scientifically credible and relevant data available for a particular air contaminant. Such information may include, but is not limited to, any of the following:

(i) The peer reviewed scientific literature.

(ii) Information sources recognized by the risk assessment community, such as the integrated risk information system maintained by the USEPA or other scientifically reliable databases.

(iii) Other scientific studies acceptable to the department."

Degree of Consensus with this ATW Recommendation:
ATW discussions indicated a majority consensus support for this approach, although one Member agreed with reservation, one Member had mixed feelings (because sources subject to a MACT were not exempted), and two Members disagreed. The two disagreeing Members disagreed with the proposed exclusion from the TAC list those chemicals that currently have default-based ITSLs, and they also did not support the use of the 75th percentile values as cutoffs for ITSLs for the TAC list; they supported the current AQD policy and rule for setting a default ITSL for air toxics with inadequate toxicological data, and thus retaining those chemicals on the TAC list. One disagreeing Member clarified that the elimination of defaults without providing an alternate approach to ensure

protection of public health and the environment is not acceptable, and, the use of a 75th percentile cutoff seems arbitrary and may result in unacceptable exposures to non-TACs.

Summary of the Rationale for this ATW Recommendation:

The ATW developed the following goal statement for addressing this issue:

The TAC list includes the federal HAPs list and other air toxics that may be reasonably anticipated to occur in NSR permitted air emissions, and which warrant the evaluation of ambient air impacts in PTI applications in order to help ensure public health and environmental protection while promoting regulatory certainty and efficiency.

Following consideration of potential optional approaches and their pros and cons, staff and the ATW developed a "TAC List Issue Discussion Paper" (**Appendix I**), and staff provided an associated "Potential Defined TAC List" document (**Appendix J**). Staff also provided additional documents to inform the discussion: "Comparison of HAP and TAC Screening Level Lists" (**Appendix K**); "Benchmarking Survey of State Air Toxics Assessments in New Source Permitting" (**Appendix L**); and, "EPA Region 5 States Benchmarking Comparison Table" (**Appendix M**).

The recommended approach, as described in much greater detail in **Appendix I**, involves the establishment of a defined list of TACs, rather than the current open-ended TAC definition. This change will provide greater certainty and efficiency to the regulated community. Other states within EPA Region 5 (Ohio and Wisconsin) have defined TAC lists. The recommended procedure includes criteria for developing the initial list, and enables revisions to the list over time, with opportunities for public review and input. This approach will focus on the most relevant and important air toxic contaminants for Michigan's New Source Review Program and provide protection of the public health and the environment.

With a change to a defined TAC list, an issue that had careful consideration was the issue of non-TACs and the means for AQD to address them as appropriate in permitting, in order to ensure protection of the public health and the environment in case-specific situations. It was agreed that the non-TACs and the quantities of emissions should be identified by the applicant in their permit application (as is currently required by Rule 203(c)), and that the AQD should have internal procedures for prioritizing their assessment, as appropriate. It was further recommended that the AQD's authority to evaluate and potentially regulate non-TACs, as needed to ensure protection of the public health and the environment, should be provided in the revised Rule 228 (see the report section A-1(9) Rule 228).

Another topic addressed was the issue of listing specific chemicals versus groups of chemicals. The Workgroup favored the clarity of specific chemical listings rather than the use of some of the groups as in EPA's HAPs list (e.g., POM, glycol ethers). However, for the listing of certain metals it may be more appropriate for AQD to utilize a group listing.

Utilizing the criteria described above and in **Appendix I**, the defined TAC list is currently estimated to include approximately 756 TACs (**Appendix J**). This number is anticipated to change somewhat over time, as further chemical risk assessments are performed, which may result in some chemicals being added or removed from the list. The draft proposed rule changes below reflect the listing criteria identified in the discussion paper in **Appendix I**. These include the listing of air toxics that are emitted in Michigan and that are carcinogens or that have ITSLs at or below the 75th percentile level of the current distribution of the ITSLs. The Workgroup agreed to specifically list PFOS and PFOA as TACs because they are emerging contaminants of concern in Michigan, even

though they are not known to have appeared in a permitted air emission; AQD will therefore develop SLs for them and list them if they meet the listing criteria. The Workgroup agreed to retain the current TAC list exemption for certain sources of crystalline silica, although crystalline silica will be on the TAC list with an ITSL applicable to non-exempt sources only.

The ATW recommended requirements for AQD to provide for public review and comment on the initial proposed TAC list and the SL basis for the proposed listing, and for future proposed revisions to the TAC list. The ATW also unanimously recommended that future proposed SL changes should receive public review and comment before implementation by AQD. AQD had concerns that some permit reviews could be delayed if changes to SLs (increases or decreases) based on risk assessment updates could not be implemented prior to public review and comment. Members reiterated that AQD should not implement any proposed SL changes prior to public review, and that established SLs should apply in permit review until proposed changes (increases or decreases) have gone through the public review and comment process. Therefore, the draft proposed rules reflect this ATW recommendation, with a clarifying statement that established SLs apply during permit review even if AQD has proposed a SL change but has not completed the public review process. AQD should informally accept questions and comments on the basis for SLs at any time (as has been their practice).

The last paragraph of the ATW recommendation addresses the use of best available information. The AQD already has Rule 102(b) which defines best available information, and the language in this rule is similar to that in the above draft recommendation, except for the phrasing in the first sentence. Therefore, the phrasing of the first sentence of the current rule should be revised to be consistent with the recommendation, and the draft rule for the TAC list will simply refer to the use of “best available information.”

Several Members recommended, and AQD agreed, that the 41 exemptions to the TAC definition in Rule 120(f) should be carried forward as exemptions in the draft proposed rule. Some Members also recommended that the exemptions be expanded by including animal and plant materials used in human food products or dietary supplements. This latter recommendation was made late in the ATW process, and had only limited AQD evaluation and discussion at the final ATW meeting. After that meeting, AQD had further discussions with those Members, and agreeable language was developed (see draft proposed Rule 120(f)(iii)(E) below).

Draft Proposed Rule Changes:
The proposed rule changes associated with this recommendation are as follows:

R 336.1102 Definitions; B.
Rule 102. As used in these rules:
(b) "Best available information" means ~~data which serves as the basis for~~ **the most scientifically credible and relevant data available for a particular air contaminant in relation to** a risk assessment **or the development of screening levels**. Such information may be taken from the scientific literature or the Integrated Risk Information System database maintained by the United States Environmental Protection Agency, and from other databases, as appropriate. The term includes other pertinent studies or reports containing data which the department finds to be of adequate quality for use in the risk assessment.

R 336.1120 Definitions; T.
Rule 120. As used in these rules:
(f) "Toxic air contaminant" or "TAC" means any air contaminant for which there is no national ambient air quality standard and which **is known or reasonably anticipated to be emitted from a**

process or process unit within the state and which meets any of the following conditions based upon the best available information: ~~is or may become harmful to public health or the environment when present in the outdoor atmosphere in sufficient quantities and duration. For the purpose of this definition, all of the following substances shall not be considered to be toxic air contaminants:~~

(i) It is a carcinogen.

(ii) An ITSL derived pursuant to Rule 229(2) would be at or below any of the following values:

(A) 100 µg/m^3 with an annual averaging time.

(B) 522 µg/m^3 with a 24 hour averaging time.

(C) 2330 µg/m^3 with an 8 hour averaging time.

(D) 300 µg/m^3 with a 1 hour averaging time.

(iii) The following shall not be considered to be a toxic air contaminant:

(A) Acetylene.
(B) Aluminum metal dust.
(C) Aluminum oxide (nonfibrous forms).
(D) Ammonium sulfate.
(E) Animal or plant materials, including extracts and concentrates thereof, used as ingredients in food products or dietary supplements in accordance with applicable regulations of the U.S. Food and Drug Administration.
(F) Argon.
(G) Calcium carbonate.
(H) Calcium hydroxide.
(I) Calcium oxide.
(J) Calcium silicate.
(K) Calcium sulfate.
(L) Carbon dioxide.
(M) Carbon monoxide.
(N) Cellulose.
(O) Coal dust.
(P) Crystalline silica emissions from any of the following processes:
(1) Extraction and processing of all metallic or non-metallic minerals.
(2) Sand production, processing, and drying.
(3) Asphalt production.
(4) Concrete production.
(5) Glass and fiberglass manufacturing.
(6) Foundries.
(7) Foundry residual recovery activities.
(8) Any other process if the crystalline silica emissions are less than 10% of the total PM-10 emissions.
(Q) Emery.
(R) Ethane.
(S) Graphite (synthetic).
(T) Grain dust.
(U) Helium.
(V) Hydrogen.
(W) Iron oxide.
(X) Lead.
(Y) Liquefied petroleum gas (l.p.g.).
(Z) Methane.

(AA) Neon.
(BB) Nitrogen.
(CC) Nitrogen oxides.
(DD) Nuisance particulates.
(EE) Oxygen.
(FF) Ozone.
(GG) Perlite.
(HH) Portland cement.
(II) Propane.
(JJ) Silicon.
(KK) Starch.
(LL) Sucrose.
(MM) Sulfur dioxide.
(NN) Vegetable oil mist.
(OO) Water vapor.
(PP) Zinc metal dust.

R 336.1230 ~~Informational l~~ **L**ist**s** for **toxic air contaminants,** health-based screening levels**, toxic air contaminants emission rate reviews,** and T-BACT determinations.
Rule 230**(1)**. ~~For information purposes, t~~ **T**he department will maintain ~~up-to-date lists of~~ the following information and ~~will provide the information upon request~~ **make it available on the department's website**:
(a) **Toxic Air Contaminant names and** Chemical **A**bstract **S**ervice numbers and the basis for determining each of the following screening levels:
(i) Initial threshold screening levels reviewed by the department.
(ii) Initial and secondary risk-based screening levels reviewed by the department.
(iii) For (i) and (ii), the date of the screening level derivation, the algorithm used, the uncertainty factors used, a brief description of the best available information for the screening level, and citations for the key studies and information sources.
(b) Ambient concentrations for toxic air contaminants reviewed by the department under R 336.1226(d) and R 336.1228, the applicable chemical abstract service number, and the basis for any alternative concentration approved under these rules.
(c) T-BACT determinations reviewed by the department.

(2) The department shall establish the initial list of toxic air contaminants as follows:
(a) Within 30 days of the effective date of this rule, the department shall provide notice of an initial list of each air contaminant which it intends to regulate as a toxic air contaminant and any associated health-based screening levels for each air contaminant and accept comments on the list and the screening levels for a period of 60 days.
(b) Within 180 days following the receipt of comments and full consideration thereof, the department shall finalize and publish the list and the associated health-based screening levels together with a response to substantive comments received.

(3) After the initial list of toxic air contaminants is established in (2), the department may add or delete from the list by providing public notice of the proposed action and accepting comments for 30 days and thereafter posting on the department website the final decision and a response to substantive comments received.

(4) After the initial list of toxic air contaminants and health-based screening levels is established in (2), the department may make changes to the health-based screening levels by providing public notice of the proposed action and accepting comments for 30 days and

thereafter posting on the department website the final decision and a response to substantive comments received. Notwithstanding any proposed changes to health-based screening levels, established health-based screening levels remain applicable until this public review process is completed.

(5) The department shall maintain on the department website a list of air contaminants which it has determined not to regulate as a toxic air contaminant based on a screening level review.

A-1(7) Consistency of Exposure Limits With Other Nearby States

ARC 12/23/11 Recommendation:
R 336.1225 should be amended and specifically include the following:
A-1(7) Make the acceptable exposure limits consistent with other nearby states.

ATW Recommendation:
It is recommended that the AQD should be more consistent with other nearby states in deriving screening levels, by not utilizing a default screening level, by using a default annual averaging time rather than 24 hour averaging time for ITSLs based on EPA RfCs and RfDs, and by establishing acute screening levels to address concerns for acute toxicity.

Degree of Consensus with this ATW Recommendation:
ATW discussions indicated that most Members support all of the recommended changes, although two Members disagreed with the proposed elimination of the default-based ITSLs and with the accountability shifting to the Department for evaluating non-TACs. Those two Members supported the current AQD policy and rule for setting a default ITSL for air toxics with inadequate toxicological data.

Summary of the Rationale for this ATW Recommendation:
AQD staff developed a "Consistency with Other States" discussion paper (**Appendix N**). Additional relevant information is available in the staff documents, "Benchmarking Survey of State Air Toxics Assessments in New Source Permitting" (**Appendix L**), and "EPA Region 5 States Benchmarking Comparison Table" (**Appendix M**).

The ATW agreed that these recommended changes would bring Michigan more in alignment with the nearby states, although it was recognized that there are great differences between states' air toxics regulations, including their procedures for the development and application of health protective benchmarks.

Draft Proposed Rule Changes:
Draft proposed rule changes to implement the recommendations include a new Rule 233 for the development of acute ITSLs, a revision to Rule 229 to add reference to the new Rule 233, and changes to Rule 232 to eliminate the default ITSL and to change the default averaging time for the ITSLs that are based on the RfC or RfD methodologies. The proposed rule changes associated with this recommendation are as follows:

R 336.1229 Methodology for determining health-based screening levels.
Rule 229. (1) The initial and secondary risk screening levels for a carcinogen shall be determined by any of the following:
(a) The cancer risk assessment screening methodology contained in R 336.1231.
(b) The United States Environmental Protection Agency guidelines for carcinogen risk assessment, United States Environmental Protection Agency, 1986, as adopted by reference in R 336.1299.
(c) Any alternative cancer risk assessment methodology which can be demonstrated to the department to be more appropriate based on biological grounds and which is supported by the scientific data.
(2) The initial threshold screening level shall be determined by either of the following:
(a) The methodology for determining the initial threshold screening level contained in R 336.1232 **or R 336.1233**.

(b) Any alternative methodology to assess noncarcinogenic health effects that can be demonstrated to the department to be more appropriate based on toxicological grounds and that is supported by the scientific data.

R 336.1232 Methodology for determining initial threshold screening level. R 336.1232(1)(i) would need to be deleted.

~~(i) If an initial threshold screening level cannot be determined under the provisions of subdivision (a), (b), (c), (d), (e), (f), (g), or (h) of this subrule, then the initial threshold screening level = 0.1 ug/m³.~~
(2) The averaging times to be used for initial threshold screening levels are as follows:
(a) If the initial threshold screening level is derived from an occupational exposure level as in subrule (1)(c) of this rule, then the averaging time is 8 hours for initial threshold screening levels based on time-weighted average threshold limit values or recommended exposure levels and 1 hour for initial threshold screening levels based on ceiling threshold limit values or recommended exposure levels.
(b) If the initial threshold screening level is derived as in subrule (1)(a) and (b) of this rule, then the averaging time is ~~24 hours~~ **annual**.
(c) If the initial threshold screening level is derived as in subrule (1)(d), (e), (f), (g), **or** (h)~~, or (i)~~ of this rule, then the averaging time is annual.
(d) The ~~commission~~**department** may require shorter averaging times if necessary to provide adequate protection from the acute effects of a toxic air contaminant.

A new rule to enable the development of acute ITSLs is proposed:

R 336.1233 Methodology for determining initial threshold screening levels based on acute data.
Rule 233. (1) An ITSL based on acute data shall be determined by either of the following:

(a) From short-term studies, as follows:

$$\text{ITSL} = \frac{\text{POD}}{UF_H \times UF_A \times UF_L} \times \frac{\text{hours exposed}}{\text{AT}}$$

Where:
POD = Point of Departure
UF_H = a value from 1 to 10 for average human to sensitive human extrapolation
UF_A = a value from 1 to 10 for animal to human extrapolation
UF_L = a value from 1 to 10 for LOAEL to NOAEL extrapolation
AT = Averaging time of 1, 8 or 24 hours
The POD is defined as the human equivalent concentration of the any of the following:
NOAEL = no observed adverse effect level
LOAEL = lowest observed adverse effect level
BMDL = 95% lower confidence limit on the benchmark dose (BMD)
BMCL = 95% lower confidence limit on the benchmark concentration (BMC)
The BMD or BMC value is to be derived according to the Benchmark Dose Technical Guidance, United States Environmental Protection Agency, 2012. This standard is adopted by reference in R 336.1299.
Human equivalent concentration is defined as an exposure concentration for humans that has been adjusted for dosimetric differences between experimental animal species and humans to be equivalent to the exposure concentration associated with observed effects in the experimental animal species. If occupational human exposures are used for

extrapolation, the human equivalent concentration represents the equivalent human exposure concentration adjusted to a continuous basis.
(b) The ITSL may be determined on a case-by-case basis using a POD from repeated dose studies using any alternative methodology to assess acute health effects that can be demonstrated to the department to be more appropriate based on toxicological grounds and that is supported by the scientific data.
(2) The averaging times to be used for an acute initial threshold screening levels will be 1, 8 or 24 hours, as appropriate based on the data.

R 336.1299 Adoption of standards by reference.
Rule 299. The following standards are adopted in these rules by reference and are available as noted:
(d) "Benchmark Dose Technical Guidance," 2012, United States Environmental Protection Agency, Washington, DC 20460. Risk Assessment Forum, EPA/100/R-12/001. The documents can be viewed and/or printed at http://www.epa.gov/raf/publications/benchmarkdose.htm. Copies are available for inspection and purchase at the Air Quality Division, Department of Environmental Quality, 525 West Allegan Street, P.O. Box 30260, Lansing, Michigan 48909-7760, at a cost as of the time of adoption of these rules of (*to be determined*).

A-1(8) Stack Testing

ARC 12/23/11 Recommendation:
R 336.1225 should be amended and specifically include the following:
A-1(8) Stop requiring permit holders to conduct elaborate and costly stack tests to provide emissions research data, since the DEQ does not use this information for subsequent permit reviews.

ATW Recommendation:
The AQD has clarified that the need for stack testing requirements will be determined on a case-by-case basis for compliance demonstration, and will not be required when it is not warranted. For example, routine testing of asphalt plants is no longer warranted. Also, the AQD will work together with the EPA and the regulated community in further application of the ERT (emissions reporting tool) or other tools, to post stack test results on the AQD webpage in a searchable format by November 1, 2013.

Degree of Consensus with this ATW Recommendation:
Unanimous.

Summary of the Rationale for this ATW Recommendation:
AQD staff provided a document titled, “Testing Requirement in Permits to Install” (**Appendix O**). The document states that stack testing to demonstrate compliance is a core component of the program, and the need for stack testing will be determined on a case-by-case basis. AQD will not require stack testing if it is not warranted. This agreed upon language will be included in a department Policy and Procedure document. The AQD began posting stack test summary information on the AQD website on November 1, 2013. This will serve as a resource for AQD permit engineers and permit applicants to help minimize the number of repetitive stack tests for similar sources,

Draft Proposed Rule Changes:
None recommended.

A-1(9) Rule 228

ARC 12/23/11 Recommendation:
R 336.1225 should be amended and specifically include the following:
A-1(9) R 336.1228 should be rescinded. This rule allows the Air Quality Division to go beyond the requirements of the rule for any reason.

ATW Recommendation:
Rule 228 should be retained with modification, to read as follows:
The department may determine, on a case-by-case basis, that the maximum allowable emission rate determined in R 336.1224(1), R 336.1225(1), R 336.1225(2), or R 336.1225(3) does not provide adequate protection of human health or the environment. In this case, the department shall establish a maximum allowable emission rate considering relevant scientific information, such as exposure from routes of exposure other than direct inhalation, synergistic or additive effects from other toxic air contaminants, and effects on the environment. In performing these evaluations and determinations, the department shall utilize relevant environmental data, land use, and exposure scenarios, and reasonably anticipated environmental impacts and exposures from the proposed new or modified emission unit or units.

The DEQ should also have the authority under this rule to evaluate the emissions and impacts of non-TACs, and to limit emissions of non-TACs that are not criteria pollutants on a case-by-case basis as needed to prevent injurious effects to human health, based upon the findings of evaluations that take into account all relevant site-specific information and reasonable exposure scenarios. The Director should be the decision maker in such cases, taking into consideration presentations by the AQD and the permit applicant.

Degree of Consensus with this ATW Recommendation:
There was unanimous agreement to retain the current Rule 228 authority to address concerns for TACs, and with the added language emphasizing that the assessments and decisions shall rely on reasonable information and risk assessment approaches. There was no initial consensus on giving the AQD explicit authority in this rule to address non-TACs; some Members felt this was an important provision to ensure public health protection, while other Members were initially concerned that this could effectively circumvent the regulatory streamlining of the defined TAC list if this authority was broadly applied by the AQD. The concerns of the latter group of Members were addressed in January 2014 by the recommended rule language establishing the DEQ Director as the decision maker in such cases. With that change in the recommended rule language, the AQD believes that consensus was reached on all of the Rule 228 recommendations.

Summary of the Rationale for this ATW Recommendation:
AQD staff and the ATW developed a discussion paper on this issue (**Appendix P**). There was general agreement that this rule is an important rule for AQD to retain. Rule 228 enables the AQD to account for potential human health or environmental impacts, beyond the routine application of chemical-specific, inhalation-only human health screening levels. However, the rule language should be revised to make it clear that the Rule 228 evaluations and determinations should utilize relevant site-specific information and reasonable exposure scenarios.

The ATW and staff had considerable discussions about the explicit authority for the agency to limit emissions of non-TACs as needed to prevent injurious effects. Some Members were concerned that, if broadly applied, such authority negates the streamlining effect of limiting the TAC list and eliminating the default ITSL approach. Other Members felt strongly that Rule 228(2) should provide

the agency with explicit authority to protect the public health from non-TAC emissions when warranted by the data, without simply relying on the provisions of Rule 901(a). The proposed draft language in Rule 228(2) provides that specific authority while attempting to make it clear that it should not be applied as a frequent step to negate the streamlining of the rules, but only as a back-stop to prevent injurious human health effects.

Draft Proposed Rule Changes:
The proposed rule language for Rule 228 is as follows.

R 336.1228 Requirement for lower emission rate than required by T-BACT and health-based screening levels.

Rule 228. **(1)** The department may determine, on a case-by-case basis, that the maximum allowable emission rate determined in R 36.1224(1), R 336.1225(1), R 336.1225(2), or R 336.1225(3) ~~may~~ **does** not provide adequate protection of human health or the environment. In this case, the department shall establish a maximum allowable emission rate considering ~~all~~ relevant scientific information, such as exposure from routes of exposure other than direct inhalation, synergistic or additive effects from other toxic air contaminants, and effects on the environment. **In performing these evaluations and determinations, the department shall utilize relevant environmental data, land use, and exposure scenarios, and reasonably anticipated environmental impacts and exposures from the proposed new or modified emission unit or units.**
(2) The Director may determine on a case-by-case basis that an emission rate limitation is needed for a non-TAC air contaminant for which there is no national ambient air quality standard, in order to ensure that air emissions do not cause injurious effects to human health. The Director shall make this case-by-case determination subsequent to a presentation by the Air Quality Division and the permit applicant that utilizes relevant environmental data, land use, and exposure scenarios, and reasonably anticipated environmental impacts and exposures from the proposed new or modified emission unit or units. The department shall establish this emission rate consistent with the provisions of Rule 225, Rule 227, and Rule 229 or any other methodology determined by the department to be more appropriate after an evaluation conducted under Rule 228(1).

Additional Air Toxics Rules Issues

The ATW reviewed the staff-proposed additional rule changes (**Appendix Q**) designed to update the risk assessment methodologies to be consistent with current EPA guidance. The specific proposed draft rule changes have not yet been developed. The ATW conceptually agreed that such changes to the rules are appropriate.

APPENDIX A:

ATW MEMBERS

List of Air Toxics Workgroup (ATW) Members and MDEQ Support Staff

Dr. Stuart Batterman
Professor, University of Michigan
School of Public Health

Mr. John Caudell
Senior Environmental Engineer
FTC&H

Mr. James Clift
Policy Director
Michigan Environmental Council

Ms. Kim Essenmacher
Staff Environmental Engineer
General Motors Co.

Mr. Kory Groetsch
Toxicologist
Michigan Department of Community Health

Mr. David Gustafson*
Regulatory Affairs Leader
The Dow Chemical Company

Ms. Carrie Houtman
Regulatory Services Leader
The Dow Chemical Company

Mr. Steve Kohl
Partner
Warner Norcross & Judd LLP

Mr. Gregory Ryan
Senior Technological specialist
DTE Energy

Mr. Brad Venman
Senior Vice President, Corporate Quality Officer
NTH Consultants, Ltd.

MDEQ Staff

Joy Taylor Morgan
(Facilitator)
AQD

Robert Sills
(Lead Staff)
Toxics Unit Supervisor
AQD

Mary Ann Dolehanty
Permit Section Supervisor
AQD

Mike Depa
Toxicologist
AQD

Dave Fiedler
Regulatory Affairs Officer
DEQ

Mary Maupin
SIP Unit Supervisor
AQD

*Due to Mr. Gustafson's retirement, he stopped attending ATW meetings on June 19, 2013. Ms. Houtman replaced Mr. Gustafson as a workgroup member and started attending meetings on March 5, 2013.

Dr. Brad van Guilder, Organizing Representative, Beyond Coal Campaign, Sierra Club was originally an ATW member and participated in the first several ATW meetings until April 16, 2013. He did not participate further and was not involved in drafting the recommendations.

APPENDIX B:

ATW MEETING AGENDAS AND SUMMARIES

Agenda	MDEQ's Air Toxics Workgroup Meeting 1 December 3, 2012 2:00 PM to 5:00 PM Lillian Hatcher Conference Room Constitution Hall, 3rd North	
Agenda Topics		
	Facilitator: Joy Taylor Morgan	
2:00	Introductions	All
2:15	Welcome / Introductory Comments	Dan Wyant, DEQ Director Rob Nederhood, Department of Licensing and Regulatory Affairs (LARA)
2:30	Proposed Workgroup Charge: "*The Air Toxics Workgroup (ATW) of the Air Quality Division (AQD) will provide meaningful input to the AQD in addressing ORR Recommendation A-1 and other air toxics rule issues as identified by the ATW and AQD members. The ATW will help ensure that the rules are updated, streamlined, and not excessively burdensome on the regulated community while providing sufficient public health protection.*"	Lynn Fiedler, AQD Assistant Division Chief
2:45	Workgroup Role and Function	Lynn Fiedler
	Workgroup Operational Items	Joy Taylor Morgan
3:00	Overview of the Air Toxics Rules	Bob Sills, AQD Toxics Unit Supervisor
3:30	Break	
3:45	Previous AQD Air Toxics Rules Initiatives	Bob Sills
4:15	Workgroup Process and Priorities	Joy to lead discussion
4:45	Wrap-Up – Next Meeting	Joy Taylor Morgan
5:00	Adjourn	

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

DAN WYANT
DIRECTOR

Air Toxics Workgroup (ATW)
Meeting Summary
December 3, 2012

Members Present:

Stuart Batterman, U of M	John Caudell, Fishbeck Thompson Carr & Huber
Greg Ryan, DTE Energy	Steve Kohl, Warner Norcross & Judd
Brad Venman, NTH	Brad van Guilder, Sierra Club
Kim Essenmacher, GM	James Clift, MI Environmental Council
Kory Groetsch, MDCH	David Gustafson, Dow Chemical Co.
Bob Sills, AQD	Lynn Fiedler, AQD for Mary Ann Dolehanty, AQD
Joy Taylor Morgan, AQD, Facilitator	

Guests/observers present:

Dan Wyant, MDEQ Director	Jim Sygo, Deputy Director MDEQ
Mary Maupin, AQD	Mike Depa, AQD
Vince Hellwig, AQD Division Chief	Rob Nederhood, Deputy Director LARA,

The meeting was initiated with introductions. The ATW members also answered the question, "What do you think in your background will contribute to success in this process?" The ATW members' responses demonstrated that they collectively had well over one hundred years of experience and were knowledgeable in the following areas: respiratory therapy, toxicology, air permitting, engineering, air toxics research, chemical manufacturing, environmental policy and law, environmental advocacy, physics, public health and atmospheric modeling.

MDEQ Director Dan Wyant provided introductory comments; he welcomed the group and thanked them for volunteering to serve on the ATW. He stated that he will provide leadership for the ATW, and pointed out the MDEQ mission and the three guiding principles. The mission is, "The Michigan Department of Environmental Quality promotes wise management of Michigan's air, land, and water resources to support a sustainable environment, healthy communities, and vibrant economy." The three guiding principles are: 1) Be leaders in environmental stewardship; 2) Be partners in economic development, and; 3) Excel in customer service. He said that both the Governor and he believe that we can protect the environment as well as have a strong economy in our state and that they are both closely linked. He also mentioned that he is very interested in moving the ORR recommendations forward in a timely manner.

LARA Deputy Director Rob Nederhood followed and mentioned the role his department had in the process of providing the Office of Regulatory Reinvention (ORR) report to the Governor's office. He pointed out that when the environmental regulations were being evaluated one of the many factors they were to consider included the "health and safety benefits" of the rules. He said that the Governor recognizes the importance of getting stakeholders together to discuss the recommendations. He said that he hopes the ORR recommendations would be a priority, and that even though the ATW may have their differences he hopes the group can move quickly. He is also

interested in the ATW comparing the air toxics program to other states' programs. Mr. Nederhood said that the rules should provide certainty, regulatory predictability and transparency.

Assistant Division Chief Lynn Fiedler provided an overview and handout on the current steps to promulgate air rules. She said while there are many steps that the AQD must go through to get rules promulgated, the ATW would just be included in two steps in the process, which include convening a stakeholder workgroup and holding meetings to develop the rule concepts and/or language. She said that the ATW process should take between six and nine months, and while it won't be easy, it will be a very important process to undertake. She sees three important reasons why we need air toxics rules: 1) regulatory structure to address the issue; 2) certainty for companies, and; 3) health protection for the public. She said that while we do have specific recommendations from the Air Quality Subcommittee of the Environmental Advisory Rules (ARC) Committee, we need to work at developing specific rule language, which includes being very clear and transparent. Also, the ATW is not only limited to those ideas made by the Subcommittee.

Lynn Fiedler then led a discussion regarding the proposed charge. Following significant discussion with the ATW members, the group agreed to the following charge language:

> *The Air Toxics Workgroup (ATW) of the Air Quality Division (AQD) will provide meaningful input to the AQD in addressing ORR Recommendation A-1 and other air toxics rule issues as identified by the ATW and AQD members. The ATW will help ensure that the rules are updated, streamlined, protective of public health and not excessively burdensome. By August 1, 2013, the ATW shall have recommendations to the AQD."*

Joy Taylor Morgan presented the ground rules for the meetings, which the ATW agreed upon:

- Silence your cell phones.
- One person speaks at a time.
- Listen actively, with respect; please suppress side conversations.
- Participate to the fullest, please postpone texting or taking phone or email messages until break times.
- Divergent perspectives are welcome; our goal is not limited to agreement.
- Ask questions to clarify procedures or ideas.
- Think in new ways, break out of old patterns.
- Have great ideas by having many ideas.
- Build on the ideas of others - Hitchhiking, additions and remodeling are welcome.

Bob Sills then gave a two-part power point presentation that provided an overview of the current air toxics rules (Rules 224-232) and a historical perspective of the previous air toxics workgroup's reports and recommendations.

Some highlights of Bob's first talk on the current air toxics rules:

- The air toxics rules require that proposed emissions pass a control technology requirement and a health-based screening level (SL) requirement.
- Although the SL methodologies are in the rules, the health-based SLs are not promulgated in rules, which allow the Division more flexibility if they need to establish or update a SL.
- Approximately 1100 toxic air contaminant (TAC) SLs have already been developed.
- The air toxics rules only apply to new and modified sources, not existing sources (except when an applicant opts to meet the SRSL rather than the IRSL, in which case facility-wide emissions of that substance need to be accounted for).
- The air toxics rules complement the federal program, without being redundant.
- Rule 226(d) allows some exemptions from meeting the health-based SLs.
- Rule 227 – allows three ways to show compliance with the health-based SLs.
- Rule 228 – allows a case-by-case determination to require additional information beyond just meeting the health-based SL, beyond single-chemical and inhalation exposure only.
- Examples showed the range of air emission sources and air toxics, and how the rule requirements complement the federal requirements.

Highlights from the second part of the presentation, on the history of the program and the previous air toxics workgroups:

- In the 1970s, permit applicants were responsible for demonstrating the environmental acceptability of proposed air emissions, however, procedures and criteria were not available.
- In 1981, an advisory committee provided a report on a recommended framework for addressing air toxics in permitting.
- In 1989, another stakeholder committee proposed a set of rules for the regulation of air toxics emissions from proposed new and modified sources.
- In 1992, the air toxics rules were promulgated.
- In 1997, another stakeholder workgroup recommended improvements to the air toxics program.

In 1998, rule changes were promulgated and other steps were taken by the AQD to implement the 1997 recommendations.

Q and A

Some questions and discussions followed Bob's talk:

Question: Why a one in a million cancer risk target?
Answer: This was recommended by the 1989 committee, and promulgated in the 1992 air toxics rules, based on it being: 1) technically achievable; 2) an acceptably small risk, and; 3) it was coupled with a SRSL (1 in 100,000 lifetime risk) that was consistent with the water discharge permitting program (and now, also consistent with the clean-up program).

Question: So for an SRSL (that covers the entire plant), this really includes existing sources?
Answer: Yes, for that facility and for that carcinogen alone.

Question: Since health-based SLs are not promulgated, is there a predictability issue?
Answer: That has not been raised as a concern. The methodology is contained within the rules and is predictable. Screening levels can be changed quickly as appropriate, since they are not promulgated, and that has benefits.

Question: For Rule 228, because it is case-by-case, has the Division been sued on this rule?
Answer: No.

There is a concern that cumulative exposure is not being considered, nor are background concentrations. Also, multi-pollutant control is more effective and efficient. Rule 228 is very important because this allows for considering multiple pollutant exposure. Question: Do any other states consider multi-pollutant exposures?
Answer: Yes, there are a few examples. California does in their "hot spots" program, and Minnesota has a law requiring the characterization of cumulative air toxics risks for certain proposed sources in a part of Minneapolis. Some other states are believed to have some initiatives involving cumulative air toxics assessment.

Question: Shouldn't we be looking at how air toxics are regulated in other states nationally, and even internationally?
Answer: At least within the ORR process, only the Great Lakes states were considered because those are the states that compete the most with Michigan for businesses.

Question: What is the science to show that there is no harm (from cumulative impacts)?
Answer: Our approach has been that, when we have evidence of similar compounds with the same mode of action, in some cases we evaluate the emissions and impacts together. Examples are dioxin-like compounds and the carcinogenic PAHs. Other examples are seen by reviewing the footnotes of the SL list. This approach is generally limited to the project emissions. A more comprehensive assessment of cumulative impacts including background levels is relatively uncommon and has only occurred under Rule 228 and 226(d).

Question: Has Rule 228 ever resulted in a change in a permit decision?
Answer: The more detailed assessments that have been performed under Rule 228 have not resulted in a more restrictive permitted emission rate. However, the rule has been effective in providing additional information including deposition modeling, multi-pathway risk assessments, and cumulative impacts, and there may have been some impacts on T-BACT determinations which resulted in additional control technology being applied.

Question: If the ambient air impacts are over water bodies, are there higher allowable impacts than the SLs?
Answer: Not specified in the rules, but since that could result in lower exposure potential it would be relevant to account for that under Rule 226(d).

Question: What is the basis for the trace ITSL value of 0.1 µg/m^3?
Answer: Originally it was recommended at 0.04 µg/m^3 by the 1989 Air Toxics Policy Committee, based on a conservative estimate (5^{th} percentile) of the range of toxicities of chemicals. That was promulgated in the 1992 air toxics rules (with an annual averaging time). The issue was revisited by the 1997 Air Toxics Subcommittee, and recalculated as 0.1 µg/m^3 (annual averaging time). Similarly, it was intended to represent a conservative, low percentile (5^{th} to 10^{th} percentile) of the range of the available ITSL values. In 1998, the rule was changed from 0.04 µg/m^3 to 0.1 µg/m^3, based on the recommendation of the 1997 subcommittee.
Next, the workgroup process and priorities were briefly discussed.

Workgroup Process Decision
It was agreed that the workgroup would meet monthly (at least initially), and would start by addressing the air toxics rules recommendations contained within the ORR report.

Meeting summary prepared by: Joy Taylor Morgan, Facilitator 12-6-12

JTM:lh

Agenda	MDEQ's Air Toxics Workgroup Meeting 2 January 17, 2013 9:00 AM to 12:00 PM Joseph Sablich Conference Room Constitution Hall, 5th South	
Agenda Topics		
	Facilitator: Joy Taylor Morgan	
9:00	Introductions and Process Discussion	Joy to lead discussion
9:15	Overview of Air Toxics Programs in Other States and Discussion	Bob Sills, Toxics Unit Supervisor AQD
10:15	Break	
10:30	Overview of ORR Recommendations	Dave Fiedler, Regulatory Affairs Officer - MDEQ
11:00	Discussion of ORR Recommendations #1 and #8	Mark Mitchell, Unit Supervisor, Permit Section AQD
11:30	Additional ORR Recommendations Discussion	All
11:50	Wrap up – Next Meeting	Joy
12:00	Adjourn	

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

DAN WYANT
DIRECTOR

Air Toxics Workgroup (ATW) Meeting Summary
January 17, 2013

Members Present:

Stuart Batterman, U of M	John Caudell, Fishbeck Thompson Carr & Huber
Greg Ryan, DTE Energy	Steve Kohl, Warner Norcross & Judd
Brad Venman, NTH	Brad van Guilder, Sierra Club
Kim Essenmacher, GM	James Clift, MI Environmental Council
Kory Groetsch, MDCH	Bob Sills, AQD
Joy Taylor Morgan, AQD, Facilitator	Mark Mitchell, AQD for Mary Ann Dolehanty, AQD

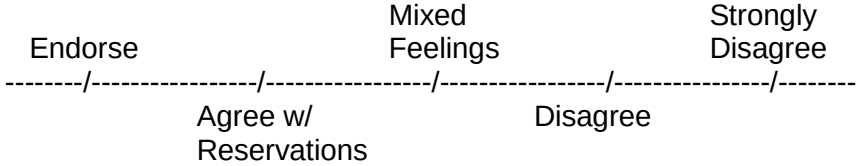
Members Absent:
David Gustafson, Dow Chemical Co.

Guests/Observers Present:

Mary Maupin, AQD	Mike Depa, AQD
Vince Hellwig, AQD Division Chief	Dave Fiedler, Regulatory Affairs Officer, MDEQ

The meeting was initiated with introductions. A new participant will be Dave Fiedler, MDEQ Regulatory Affairs Officer, as requested by the MDEQ Director. Joy initiated the meeting with a review of the agenda, a reminder for members to review the first meeting summary, and a review of the charge and ground rules. A ground rule was added, "plain speaking" to avoid the use of acronyms as much as possible. Joy introduced a decision-making tool called "gradients of agreement." She stated while we have a very diverse group of members with a wide array of expertise and opinions, which will make this process more robust and all-inclusive, it also could lead to difficulty in coming to consensus. This tool's intent is to show that consensus does not necessarily mean complete agreement when making a "consensus decision" and the goal is to get as high a level of agreement as necessary to move forward as a group. So, using this tool, consensus can mean the level of agreement necessary to keep a group moving forward. The steps in using this tool are: 1) Decide what level of agreement is necessary for "consensus;" 2) State the proposal; 3) Poll the workgroup; 4) Explain (as necessary) member's views and opinions; 5) Modify the proposal as necessary; and 6) Poll again, until the agreed upon level of agreement is attained.

The members agreed that this tool could be useful and that the level of agreement necessary would be at the "mixed feelings" or to the left of the scale before an issue could be agreed upon with "consensus" and moved forward.



Dave Fiedler's Presentation

Dave Fiedler provided the group with an overview of the ORR (Office of Regulatory Reinvention). He first provided some background on the ORR process and the formation of the Environmental Advisory Rules Committee (ARC) and mentioned that the members that also served on the Air Quality Subcommittee of ARC included John Caudell and Andy Such (co-chairs), James Clift, Brian Warner and David Gustafson. The Environmental ARC provided 77 recommendations to ORR that addressed all media. Dave mentioned that the DEQ has a "regulatory reinvention" web site (http://www.michigan.gov/deq/0,4561,7-135-3306_61248---,00.html) for tracking all Environmental ARC recommendations. To date, 30 recommendations have been completed and numerous rules (233) have been rescinded.

The air toxics rules recommendations, identified as A-1 in the ORR report, were made because individuals thought that the air toxics rules were outdated and in need of reform. There were also concerns that there might be redundancy with the federal program, delays in permitting and costs for stack testing. Dave went through each of the 9 air toxics rule recommendations that comprise A-1. The first recommendation states that the T-BACT requirement for VOCs in Rule 224 should be rescinded since it is also required in Rule 702. Dave said that VOCs were already exempt from Rule 224 so it appears that DEQ is already complying with this recommendation. More discussion of this issue ensued later in the meeting.

The second recommendation deals with limiting modification reviews to only those that would increase the Hazardous Air Index more than 10% above the permitted baseline. Dave mentioned that this recommendation is similar to the process of determining what is a meaningful change explained in a document developed by Jerry Avery in 1993 titled, "A Description of the New Air Toxic Permit Exemptions Relating to Pollution Prevention." This document explains how to calculate the Hazardous Potential for the existing and proposed change. If the proposed change is meaningful, then it would require a permit. An example of how to make this determination is found on page 3-19 of the "Permit to Install – Determining Applicability Guidebook".

The third recommendation states that if sources are subjected to the federal MACT (Maximum Achievable Control Technology) standards under the Clean Air Act (CAA), then they should be exempt from the air toxics rules. Rule 226(b) does exempt sources subject to a MACT which have had an EPA residual risk assessment after the MACT issuance [112(f)]. However, the exemption only applies to HAPs.

The fourth recommendation pertains to exempting sources that burn "clean fuels." Dave mentioned that not all fuel switches would require a permit to install.

The fifth recommendation states that pollution control projects should be exempt from the health based screening level requirements. Rule 285(f) exempts pollution control equipment from a permit to install requirement if the equipment itself does not generate a significant amount of criteria air pollutants or a meaningful quantity of toxic air contaminants (TACs).

The sixth recommendation limits the list of TACs to the HAP list. The HAP list is not an all-inclusive list of air toxics that may pose an unacceptable health risk.

Make the acceptable exposure limits consistent with the other states was the seventh recommendation. The AQD uses the occupational exposure limit for some TACs, like other states; but AQD will use the best available toxicity information for others. The eighth recommendation was concerned with costly stack tests, which were further discussed during the meeting. The last

recommendation is to rescind Rule 228. Dave mentioned that Rule 228 is intended to address more than one pollutant and routes of exposure other than inhalation, which is often the case in the environment; he said the rule is used sparingly.

A question was asked about whom in the Department ultimately needs to sign off on the recommended rule changes. The answer is Director Wyant. A question was also asked about whether or not the statute could be changed. The answer was that it could, and individuals would need to work with the state legislators and the DEQ legislative liaison to initiate this process.

Bob Sills – Discussion of Benchmarking

Bob Sills then provided a handout (which will be posted on the ATW web site) titled, "EPA Region 5 States Benchmarking Comparison Table." This handout pertains to recommendation number A-1 (7), which is to make the acceptable exposure limits consistent with other nearby states. Bob mentioned that we now have several documents on the ATW web site that summarize other state programs. One of those is titled, "Benchmarking of State Air Toxics Programs" that was assembled in 2010 that compares air toxics programs in all 50 states compiled by AQD. Some of the questions asked were: 1) Does your state go beyond the federal program? 2) What is the basis of your program? And 3) what air toxics are included?

They found that 30 states do something that goes beyond the federal program. In EPA Region 5 (which includes the states of MI, MN, WI, IL OH and IN), five of the states (all but IL) go beyond the federal program.

Also on the benchmarking link is a compilation of Region 5 state "Air Toxic Profiles" as requested by EPA Region 5. These reports, which were submitted to EPA in the fall of 2012, are the basis for Bob's handout. IN and IL have relatively limited regulatory programs for air toxics in permitting, while MI, MN, OH and WI have relatively extensive air toxics regulatory programs for permitting new/modified sources. MN and WI also perform air toxics risk assessments for existing sources of air toxics.

All states have exemptions. Some states have a discreet list of air toxics. No state in the region uses only the federal HAP (hazardous air pollutant) list. In MN, a statutory requirement drives cumulative risk assessments for certain proposed projects in part of Minneapolis. In OH, they can look at combined impacts from the same facility, but not background.

Bob gave a summary on how cumulative air toxics impacts are evaluated by States in the region. None of the states routinely perform cumulative risk assessments, with the exception of MN (for certain projects in an area of Minneapolis). Michigan and Ohio consider cumulative impacts in some cases. In Michigan, the DATI (Detroit Air Toxics Initiative) cumulative air toxics assessments were conducted in 2005 and 2010. All of the R5 states have evaluated cumulative air toxics risks via monitoring data or emissions inventories and modeling exercises [EPA's NATA (National Air Toxics Assessment) and School Air Toxics initiatives; Regional Air Impact Modeling Initiative (RAIMI)]. WI has a goal to reduce by fifty percent the number of people at a greater than one-in-one-million cancer risk from air toxics; their RAIMI studies have found that air toxics cancer risk is heavily driven by mobile sources.

Cancer and noncancer risk benchmarks also vary among states in the region. For MI, we have a default screening level of 0.1 $\mu g/m^3$ which is applied when even minimal toxicity data (LC50 or LD50 data) are absent; this is unique. When occupational exposure limits (OELs) are used to derive benchmarks, MI uses OEL/100; OH and WI use OEL/42.

Question/Answers

Q: What would trigger a review of an existing source?
A: Public interest or in OH, the school air toxics program drove many reviews of existing sources of manganese and other metals.

Q: For IN, they can consider any contaminant?
A: Yes. And, generally, all states seem to have a statute or rule that provides a public health protection "back stop" similar to the AQD's R. 901, even if more specific statutes or rules are lacking.

Q: How can you consider background?
A. Air toxics background levels can be characterized from monitoring data or, from EPA's NATA; background estimates were developed for some air toxics.

Q: What other states have cumulative exposure related programs?
A: Some include CA (hot spot program), NJ, NY and SC.

Q: What is WI doing to reduce risk?
A: One key driver is mobile source emissions; improvement comes from fuels changes and improved emission controls.

Q: Does WI conduct modeling?
A: Yes, and background is included.

Q: Does Part 55 of the statute or the rules under Part 55 set a cancer target risk level?
A: This is established in the Part 55 administrative rules at 10^{-6} (per chemical for a process) or 10^{-5} (per chemical for a facility). In Part 201 (the cleanup program), the statute has a 10^{-5} target risk level (per chemical), and the surface water discharge program also has a target risk level of 10^{-5}(per chemical). For MI, this is applied as a two-step process for existing facilities proposing a new process. First, they can demonstrate meeting the IRSL (10^{-6} risk per compound). If they exceed that, then a second step would be to demonstrate that the emissions of that compound from the entire facility can meet the SRSL (10^{-5} risk per compound). However, for ambient air impacts in industrial land use areas and public roads, they can have a tenfold higher impact (which is not to say there is 10 times more risk, since the exposure potential is much lower). This was developed by the 1997 air toxics workgroup.

Q: For the higher allowed impacts on roads, how is protection assured for residential exposure close to the roads?
A: The modeled impacts anywhere off the roads or outside of the industrial areas, including any nearby residential areas, do not qualify for the 10X higher allowed impacts. The modeling demonstration for compliance with R. 225 would make the distinction between the land uses and the applicable benchmarks.

Q: Does this apply to over water?
A: We don't have a specific rule that allows for that, as we do for roads and industrial areas, however, we could address the lower exposure potential over water as part of a R. 226(d) evaluation. Over water, there would be a lower chronic exposure potential, and under R. 226(d) we could also consider the acute exposure potential and any available acute health protective benchmarks.

Q: Are the averaging times different in all the states? This can significantly affect how stringent the screening levels are.
A: Yes, there are differences. For example, OH uses a one hour averaging time for all their benchmarks.

Mark Mitchell – Discussion of A-1 (1) and (8)

A-1(1)
Mark stated that when we get an application, those VOCs (all of which are TACs) are NOT subject to T-BACT, so he is not sure what the issue is with the recommendation. VOCs are not subject to T-BACT. As the recommendation is currently written, AQD is complying with the recommendation. A suggestion was to possibly change R. 224(2) (2)(c) to remove the word "only" or to possibly re-phrase TAC wording under 702 is not subject to R.224.

A few individuals who were involved with the ARC – Air Toxics Subcommittee thought that perhaps the recommendations were not worded correctly and that their actual intent was not properly communicated in writing.

Some discussion took place on how VOCs are currently regulated and addressed under R. 702. The issue seems to be more of a control technology issue.

Q: What kind of background information and data was gathered to demonstrate that these rules recommended for revision or to be rescinded were burdensome?
A: The recommendations were really complaint driven and the toxicological expertise was not at the table; there was an assumption that the recommendations would be vetted more in the future.

A-1(8)
Mark initiated a discussion on stack testing. He stated that some federal requirements do require stack testing. He disagrees that AQD does not use stack test data. Regarding conducting research, AQD tries to limit the amount of testing. Initially, AQD may require testing of a couple of facilities, but the testing is not continued. They do negotiate stack testing in permits. The issue in A-1(8) was addressing asphalt plants and Mark stated that we stopped asking for routine testing, and we will share that information with the ATW.

Mark stated that there is currently some concern with the limited emissions data (including toxics) for wood pellet manufacturers (there is a formaldehyde concern), and stack testing can address that. Also with engine test cells, stack testing may be needed in order to characterize emissions.

Discussion covered the difficulty of obtaining stack test data, and the lack of an available common template for test results, and the data are not available electronically.

Joy asked the Workgroup members to then prioritize the remaining recommendations by voting on their top two priorities. There were eight votes for A-1(4) and seven votes for A-1(5) and one vote for A-1(6).

A-1(4)
The ATW then began discussions about what constitutes a "clean fuel" and a "biofuel." The group generally agreed that natural gas fuels were "clean" with relatively little air toxics being emitted. A workgroup member wanted to see what other air regulations these sources would have to comply with (this was subsequently shared by Mark Mitchell).

There was some discussion around what are "biofuels," "ultra low sulfur" fuels and "#2 fuel oils." There was a comment that the EPA may have a good initial working definition for biofuels, in recent regulations.

Action Items to be Completed Prior to the Next ATW Meeting:

- John Caudell and Kim Essenmacher will review the previous notes and discussion from the ARC – Air Quality Subcommittee and draft what they think was their intent in recommendation A-1(1). (Because as written, the AQD is complying with this first recommendation.)

- Mark Mitchell will provide the group with the response to the Asphalt Pavement Association of Michigan (APAM) regarding stack testing (this document was posted to the ATW web site on 1/28/13.) Mark also committed to investigating what air regulations sources of natural gas combustion are subject to (this was sent out in a note to the ATW on 1/17/13.)

- Mark Mitchell and Bob Sills committed to investigating what air toxics are emitted from various fuels including low sulfur fuels.

- Brad Venman committed to sharing the definition of "biomass" contained in 40 CFR (this definition was sent to Joy 1/28/13.)

- Greg Ryan offered to contact Karen Kajiya-Mills, Supervisor Technical Programs Unit, AQD regarding developing a template for stack test data.

Meeting Summary prepared by: Joy Taylor Morgan, Facilitator 1-25-13
JTM:lh

Agenda	MDEQ's Air Toxics Workgroup Meeting 3 March 5, 2013 9:00 AM to 12:00 PM Lillian Hatcher Conference Room Constitution Hall, 3rd North	
Agenda Topics		
	Facilitator: Joy Taylor Morgan	
9:00	Discussion of A-1(1) and (8) (VOC and stack testing issue)	Mary Ann Dolehanty to Lead Discussion
9:30	Discussion of Recommendation A-1(4) (clean fuels issue)	Bob Sills to Lead Discussion
10:00	Discussion of Recommendation A-1(5) (pollution control project issue)	Mary Ann Dolehanty to Lead Discussion
10:30	BREAK	
10:45	Discussion of A-1 (6) (air toxics list)	Bob Sills to Lead Discussion
11:15	Discussion of A-1 (7) (follow other states)	,,
11:30	Discussion of Recommendations A-1(3) (Exempt Sources in MACT Category)	„
11:45	Discussion of Recommendations A-1(9) (Rule 228)	„
12:00	Adjourn	Joy

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

DAN WYANT
DIRECTOR

Air Toxics Workgroup (ATW)
Meeting Summary
March 5, 2013

Members Present:
Stuart Batterman, U of M
Greg Ryan, DTE Energy
Brad Venman, NTH
Kim Essenmacher, GM
Chris Bush for Kory Groetsch, MDCH
Carrie Houtman, Dow Chemical Co.
Joy Taylor Morgan, AQD, Facilitator
John Caudell, Fishbeck Thompson Carr & Huber
Steve Kohl, Warner Norcross & Judd
Brad van Guilder, Sierra Club (on telephone)
David Gustafson, Dow Chemical Co.
Bob Sills, AQD
Mary Ann Dolehanty, AQD

Members Absent:
James Clift, MI Environmental Council

Guests/Observers Present:
Mary Maupin, AQD
Jim Sygo, Deputy Director MDEQ
Mark Mitchell, AQD
Mike Depa, AQD
Dave Fiedler, Regulatory Affairs Officer, MDEQ

The meeting was initiated with introductions because of the ATW's soon-to-be-new member Carrie Houtman, who will be replacing David Gustafson upon his retirement in the next couple of months, and, Chris Bush was sitting in for Kory Groetsch. The group had no changes to the second meeting summary, so the meeting summary was finalized and placed on the ATW web page.

A-1(8)
The group began with the discussion of A-1(8), which is a recommendation to stop conducting elaborate and costly stack tests. One of the most significant sectors affected by this recommendation is the "hot mix asphalt plants." AQD staff addressed this issue previously by developing a paper titled, "Eliminating the Mandatory Testing Requirement for Toxic Air Contaminants for Hot Mix Asphalt Plants in Michigan," dated 6/1/2012. The group felt that this paper addressed the concern for this source sector. However, the Workgroup members (Members) sought a commitment that the AQD will not similarly require prolonged and expensive stack testing for other sectors (such as wood fired boilers). The AQD responded that they will continue to need to require stack testing in the future to verify emission estimates and compliance with permit limits, and that the data are used for those purposes.

Members also pointed out that the regulated community does not have access to stack test results across all sources tested in Michigan, other than the FOIA process, which seems to be an inefficient way to compile, review and utilize such data. They are interested in having the AQD develop a template for companies to electronically submit stack test results in a consistent manner, which can be compiled by the AQD, and made available to anyone.

The AQD agreed that increasing the accessibility of the data to outside parties was a good idea, but that the AQD didn't have the resources at this time to develop and implement the idea. The question was asked of Jim Sygo, who said that there is a concern for the resources it would require developing it. However, as long as the data entered are not retroactive and there is a specific template that people can follow, it may be reasonable; however, the State can't force facility representatives to complete and submit a stack test data template. He thought it may not be feasible to develop a useful database using a common template unless a statute or rule change made it a requirement to use the template.

Members were interested in presenting the stack testing template and database idea to Karen Kajiya-Mills (Supervisor of the AQD Technical Programs Unit) for her input. AQD staff and Greg Ryan will discuss it with her. Members will share what reporting systems other states may have developed.

A-1(1)

Recommendation A-1(1), which addresses Rule 224 and VOCs, was discussed next. AQD staff felt that as written, the AQD was complying with the recommendation. The Members felt that Rule 224 could be written more clearly to show that VOCs are exempt from T-BACT. AQD staff was amenable to the suggestion and will develop draft language.

A-1(4)

Recommendation A-1(4) regarding the exemption of clean fuels was next discussed. AQD staff presented a draft discussion paper titled, "Clean Fuels Discussion." Staff have begun conducting a modeling exercise to demonstrate what air toxics emissions from fuel combustion may be reasonably anticipated to have ambient air impacts above the ITSL or IRSL. Thus far, preliminary results are available for natural gas and diesel fuel. The Members were favorable to the approach outlined in the document to evaluate the fuels and better inform the Rule 225 exemption issue. AQD staff will continue further development of the document, and develop additional results including biofuels, to allow the Members to make a more informed recommendation.

A-1(5)

A discussion of recommendation A-1(5) regarding exemption of pollution control projects commenced. Mary Ann Dolehanty distributed two documents titled, "Chapter 7: Pollution Control Projects," which is from the now-outdated PSD workbook, and a copy of R. 285 "Permit to install exemptions: miscellaneous." On page four of the first document, it listed pollution control devices that are environmentally beneficial. Staff felt that the concept had merit, but that an appropriate definition of what would be regarded as a "pollution control project" was critical. It was noted that some pollution control equipment can result in an increase of a pollutant (ex. SCRs and ammonia). Projects that involve the addition of pollution control equipment but also involve a fuel switch greatly complicate the issue; one member agreed and recommended that fuel switches be excluded from the proposed exemption. The Members stated that it would be important to develop a definition of a "pollution control project;" staff will work with John Caudell and Steve Kohl on that.

A-1(6)

Discussion followed on recommendation A-1(6), which is to limit the number of air toxics to the federal HAP list. Bob Sills gave an overview of the current definition of Toxics Air Contaminants (TACs), which is an open-ended definition and includes 41 exemptions. He mentioned that Texas also has an open-ended definition and a list of more than 3,000 screening levels; they also have 12 toxicologists whereas the AQD has 3.5. Some states do only use the HAP list. A DEQ stakeholder workgroup visited this same issue in 1997 and recommended not to have a finite list of air toxics. It

was mentioned that the HAP list does not necessarily include the most toxic compounds, for example hydrochloric acid is on the HAP list, but sulfuric acid is not on the HAP list and is more toxic.

Members stated that a lot of front-end work must be done by applicants and consultants before a permit application is ever submitted, and often that effort is made more lengthy and onerous due to the current broad TAC definition. Most states have a defined list of regulated air toxics, such as Ohio. The current DEQ approach is overly broad and is a barrier to a complete permit application.

Members were also concerned that a relatively simple material change also made them go through an air toxics review. A Member mentioned that getting a screening level from Texas is much quicker than in Michigan and sometimes can occur within two days. The AQD usually develops screening levels in under two weeks, sometimes within two days; but, if key studies must be obtained and reviewed, that could take more time. AQD staff said that they process 450-500 permits each year and a new screening level is needed approximately once every two weeks.

A Member also mentioned that if HAPs are controlled, then often other air toxics of similar types will be controlled. There are a limited number of types of air pollution control, and they are effective on categories of compounds. A discussion took place on how a pollutant is added to a list, and most felt that this was important to have a mechanism to add or delete a pollutant from a list. Staff stated that, if the DEQ had a defined list, it would be important to retain the authority to address public health concerns for air toxics from a proposed process, even if the air toxics were not on the list. One Member mentioned that if there is a finite list and Rule 228 is rescinded, there is a major conflict. A suggestion was made to keep the 1,200 substances currently on the screening level list, but group them into different categories and possibly use surrogates for other pollutants.

Because the group had various views on this topic, and staff requested clearer direction on what approach(es) to pursue in the coming meetings, Joy suggested that they vote on three different options. The voting was conducted at the end of the meeting (see results below). The three options were:

1) Use the HAP list only;
2) Use the HAP list plus other substances, with a caveat to add/address other substances, and;
3) Status Quo.

A-1(7)

A discussion took place regarding recommendation A-1(7), which is to make the acceptable exposure limits consistent with other nearby states. Bob reminded Members of the different methods used by nearby states, some more protective, some not as protective. Members clarified the recommendation in the ORR report; the recommendation is to try to be consistent with other nearby states with regard to the methods used to develop the screening levels, and the resulting screening level values and averaging times. Staff indicated that AQD can develop more detailed comparisons of EPA Region 5 state air toxics risk assessment approaches, and is open to recommendations for rule changes to derive appropriate health-based screening levels. It was noted that the DEQ conservatively applies a 24-hour averaging time for RfC- and RfD-based ITSLs, which is not consistent with the EPA's application of RfCs in their assessments (they use an annual averaging time). It was also noted that DEQ applies a default ITSL of 0.1 $\mu g/m^3$ if data are lacking for SL development; other Region 5 states do not have a default approach, and Texas (TCEQ) applies a default of 2 $\mu g/m^3$. Staff stated that there is a fair level of consistency among states in the general hierarchy of data sources used to derive acute and chronic noncancer

benchmarks and cancer risk-based benchmarks, although there are some notable differences. Members requested that staff provide a more detailed comparison of the risk assessment methods used and the benchmarks derived, among the Region 5 states.

A-1(3)

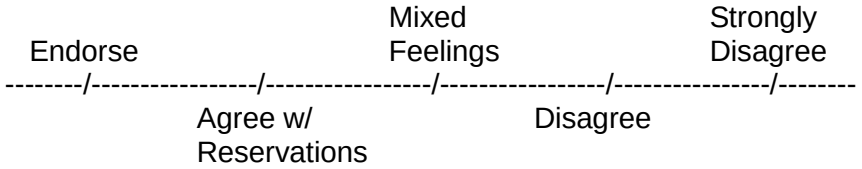
The group began discussion of this recommendation that sources that are subject to a MACT control technology standard should be exempt from R. 225. Some Members felt that if a MACT standard existed for a source that they should be exempt from R. 225. This raised the issue of how public health protection would be ensured by that approach, since control technology and health risk assessment are the two traditional pillars of air emission regulations. A Member suggested that Michigan could follow the North Carolina approach which, under their 2012 statute, places the burden on the Agency to determine if there is an "unacceptable risk to human health." It is unclear what weight of evidence the North Carolina agency needs in order to overcome the exemption by a finding of "unacceptable risk." One member stated that thus far, North Carolina has not found "unacceptable risk" after MACT application. However, it was also noted that under EPA's 112(f) residual risk assessments (Risk and Technology Review), the EPA has found elevated risks, and their assessments are based on modeling of actual (not allowed) emissions and impacts at the census block centroids (not fence line).

Due to a lack of time, the last item on the agenda (discussion on A-1(9) regarding R. 228) was tabled until the next meeting in April.

Gradients of Agreement Tool

The ATW used the "Gradients of Agreement" tool to help determine what the group was thinking in regards to whether or not the AQD should use a finite air toxics list. This tool's intent is to show that consensus does not necessarily mean complete agreement when making a "consensus decision" and the goal is to get as high a level of agreement as necessary to move forward as a group. So, using this tool, consensus can mean the level of agreement necessary to keep a group moving forward. The steps in using this tool are: 1) Decide what level of agree-ment is necessary for "consensus;" 2) State the proposal; 3) Poll the workgroup; 4) Explain (as necessary) member's views and opinions; 5) Modify the proposal as necessary; and 6) Poll again, until the agreed upon level of agreement is attained.

At the last meeting, the Members agreed that this tool could be useful and that the level of agreement necessary would be at the "mixed feelings" or to the left of the scale before an issue could be agreed upon with "consensus" and moved forward.



1) Use the HAP list only
2) Use the HAP list plus other substances, with a caveat to add/address other substances
3) Status Quo

The results were for option 1) HAPs list only:
1 vote for "Agree with Reservations"
5 votes for "Mixed Feelings"
3 votes for "Strongly Disagree"

For option 2) HAP list plus other substances with caveat to add
3 votes for "Endorse"
4 votes for "Agree with Reservations"
1 vote for "Mixed Feelings"
1 for "Strongly Disagree"

For option 3) Status quo:
3 votes were for "Endorse"
1 vote was for "Disagree"
5 votes were for "Strongly Disagree"

(These are the results with all but one member voting to date.)

Action Items to be Completed Prior to the Next ATW Meeting:

- The AQD will develop language to address A-1(8) that covers hot mix asphalt plants and investigate if a template for stack test data can be developed and utilized.
- John Caudell offered to share stack test templates from other states with the AQD.
- The AQD will draft a potential revision to Rule 224 to more clearly demonstrate that VOCs regulated under R. 702 are exempt from T-BACT.
- Mary Ann, John, Steve and David G. will develop a definition of "pollution control projects" and examples and appropriate boundaries for the definition (i.e., no increase of TACs.)
- AQD staff will continue development of the clean fuels document.
- The AQD will investigate how other states are able to add pollutants to their list and address unlisted substances in permit review.
- The AQD will compare the lists from Region 5 states and compare similar chemicals with these states to determine if the criteria are similar for deriving screening levels.
- John offered to provide emission factors for clean fuels.
- Steve Kohl offered to provide some draft rule language regarding A-1(3) MACT exemptions from R225.
- Greg Ryan and the AQD offered to contact Karen Kajiya-Mills, Supervisor, AQD Technical Programs Unit, regarding developing a template for stack test data.

Meeting Summary prepared by: Joy Taylor Morgan, Facilitator 3-6-13

Agenda	MDEQ's Air Toxics Workgroup Meeting 4 April 16, 2013 10:00 AM to 1:00 PM Lillian Hatcher Conference Room Constitution Hall, 3rd North	
Agenda Topics		
	Facilitator: Joy Taylor Morgan	
10:00	Discussion of EPA's Electronic Reporting Tool (ERT) [to address A-1(8)]	Karen Kajiya-Mills to Lead Discussion
10:15	Review Draft Language for A-1(8) and A-1(1) (Stack testing and VOC issue)	Mary Ann Dolehanty to Lead Discussion
10:30	Discussion of Recommendation A-1(4) (clean fuels issue)	Bob Sills to Lead Discussion
10:45	Review Draft Definition of "Pollution Control Projects" and Examples to Address A-1(5)	Mary Ann Dolehanty to Lead Discussion
11:20	BREAK	
11:30	Discussion of A-1 (6) (air toxics list) and A-1 (7) (follow other states)	Bob Sills to Lead Discussion
12:00	Discussion of Recommendations A-1(3) (Exempt Sources in MACT Category)	,,
12:30	Discussion of Recommendations A-1(9) (Rule 228)	„
12:45	Discussion of A-1(2) (Permit mod reviews > 10% hazard index)	„
1:00	Adjourn	Joy

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

DAN WYANT
DIRECTOR

Air Toxics Workgroup (ATW)
Meeting Summary
April 16, 2013

Members Present:
James Clift, MI Environmental Council
Greg Ryan, DTE Energy
Brad Venman, NTH
Kim Essenmacher, GM
Kory Groetsch, MDCH
Mary Ann Dolehanty, AQD
John Caudell, Fishbeck Thompson Carr & Huber
Steve Kohl, Warner Norcross & Judd (on phone)
Carrie Houtman, Dow Chemical Company
David Gustafson, Dow Chemical Company
Bob Sills, AQD
Joy Taylor Morgan, AQD, Facilitator

Members Absent:
Stuart Batterman, U of M and Brad van Guilder, Sierra Club

Guests/Observers Present:
Mary Maupin, AQD
Jim Sygo, Deputy Director, MDEQ
Karen Kajiya-Mills, AQD
Mike Depa, AQD
Vince Hellwig, Chief, AQD

The meeting began with the Facilitator asking the Workgroup members (Members) if they had any changes to the March meeting summary. There were none, so she said the summary would be finalized and placed on the ATW web site.

A-1(3): exemption for sources in a MACT category

She adjusted the agenda due to Members' schedules and the first item that was discussed was recommendation A-1(3). This is a recommendation to exempt sources from a toxics review if the sources are regulated under a maximum achievable control technology (MACT) source category standard. Bob Sills gave an overview of the issue and mentioned that Steve Kohl had shared a summary of the North Carolina rules that exempt sources if they are in a MACT category. Steve has said it is more of a policy issue. Bob and Vince mentioned that the burden would be shifted to AQD staff and away from the applicant, and this would pose a staffing and resource concern for this type of review. Vince mentioned that a MACT does not control for all toxics. Many of the MACT source categories are under reconsideration because of toxics review issues. Vince indicated that AQD does not have the staff to do the work and meet permit deadlines, and also, there is a concern that we would be more subject to challenge if we were evaluating our own work. Bob mentioned that under EPA's 112(f) residual risk review, EPA does evaluate toxic emissions based on a health review and not just control technology like a MACT. Control technology requirements do not ensure adequate public health protection. Residual risk reviews are conducted at least eight years after a MACT; only about 30 out of approximately 170 MACT sources have undergone a 112(f) assessment. A Member asked if additional control was required by EPA after the 112(f) review, and the answer was yes, in some cases. There was a concern by a Member that AQD reviews each individual pollutant, whereas EPA reviews surrogates for each individual air pollutant.

Bob mentioned that Michigan's toxics rules supplement and compliment the EPA rules; hazardous air pollutants (HAPs) are exempt from R 225 if there is a MACT and 112(f) assessment.
A Member commented that if it is a burden to the applicant to do a Rule 225 health evaluation to get a permit application submitted, then that same type of burden will be moved to the Department under this recommendation. And if resource constraints prevent the agency from doing the evaluation, no review is done, and then what? It was mentioned that if the TAC list was limited, this would allow companies some additional flexibility. A Member mentioned that the screening levels used for the risk assessment are very conservative and could be adjusted. Bob mentioned that we can efficiently show that emissions are safe if using the screening levels; if we used 226(d) and conduct a case-by-case review it can be time-consuming; however, we only conduct approximately two of those each year. This requires additional time and resources beyond only utilizing the screening levels. Vince gave an example of ethylene oxide sterilizers and if only relying on EPA regulations then no control would be required if we followed the MACT. However, the emissions of this carcinogen would not have been safe. A Member felt that for VOCs, it is not the same; if a MACT controls for the HAPs then the controls would control similar pollutants.

A Member stated that a health evaluation is needed so that we are not "blind" to the risks, and asked whether or not there was a demonstration that the air toxics rules were onerous? A Member answered that the regulations are onerous due to the time and resources involved in the permit application, and, due to stack testing requirements that may follow; the recommendation was based on trying to balance resources and economics.

Another Member mentioned that if the burden was shifted to AQD, and AQD had the resources to perform the evaluations, it may not speed up the permit process.

A Member mentioned that there might be a compromise for this recommendation depending on what happens with recommendation A-1(6) that addresses the TAC list. The Facilitator recommended that this discussion be tabled for now, until the Members can talk in more detail on A-1(6).

A-1(8) sub-issue: stack test reporting template

The Members then listened to Karen Kajiya-Mills, Supervisor of the AQD's Technical Programs Unit, discuss a reporting tool developed by EPA. Karen said that there is an Electronic Reporting Tool (ERT) that has been in existence since 2009. It allows for a central data exchange of stack test data. At present, only some facilities subject to a MACT are expected to report into the ERT; however, in the near future, EPA may expand the requirement to all NSPS sources. In Michigan there is only one company reporting, which is the Cobb Consumer Energy plant. One of the Members said that this is a very complicated system.

Vince mentioned that it cost $500K for a two page asbestos reporting program; AQD does not have the resources to develop any new stack test reporting database. Karen has an internal database which shows who reviews the stack tests, but no data is included. Karen said that all 114 data will even be included in the ERT eventually; AQD would not want to reinvent the wheel. John and Greg offered to develop a one page template that could be useful.

The Facilitator mentioned that the Members need to focus on completing the ORR recommendations by the August 1st deadline and that the development of a template, while useful, goes beyond the specific recommendation of A-1(8). She suggested that we focus on the costly stack test issue first and then we can work on the template after August 1st. Perhaps this group can work with EPA on improving the consistency of reporting and share a simple template form.

Since the ERT does exist and AQD does not have the resources to develop its own database then it seems to make sense to work together with EPA.

A-1(8): stack testing requirements in PTI

Mary Ann gave an overview of a two-page discussion paper that was intended to address A-1(8). The document states that stack testing to demonstrate compliance is a core component of the program, and the need for stack testing will be determined on a case-by-case basis. AQD will not require stack testing where it is not warranted. AQD will work with the regulated community on the development of a data submittal template.

The Members were mostly in agreement with this document and agreed to send changes to Joy.

A-1(1): T-BACT and VOCs

Mary Ann gave an overview of the one-page discussion paper to address A-1(1). She added some specific language, "including R36.1702 BACT," to clearly demonstrate that VOC emissions that are subject to Rule 702 are exempt from Rule 224.

All of the Members agreed with the language revision and a celebratory cheer resulted in the Members' first completed recommendation.

A-1(4): exempt clean fuels

The Members then began a discussion of the clean fuels issue. Mike Depa gave an overview of the most recent draft of the Clean Fuels Discussion paper that AQD staff developed. Wood and biodiesel were added to the document. With use of emission factors and algorithms, dispersion modeling was conducted and the impacts were determined at the fence line. The tables present the process type with the highest chemical-specific emission factors and the pollutants with modeled impacts that exceed screening level values. The document also describes the margin of safety and conservative aspects of the exercise, which is important for the interpretation of the public health significance of SL exceedance for both carcinogens and noncarcinogens. A discussion followed of what level of conservatism is used in the review, and the critical effects of various pollutants such as whether a pollutant is an irritant or carcinogen. A Member noted that typically the only air toxics approaching SLs are arsenic and chromium; a question was asked as to whether chromium emissions were all assumed to be chromium 6; they were not. The Members also agreed to not tackle fuel switches under this recommendation. While biodiesels were reviewed a Member mentioned that in the ORR recommendations "non-chemically treated biofuels" were listed. Biofuels is a much broader category.

Members discussed that the overall intent of the recommendation was to create a regulatory incentive for companies to move more toward relatively cleaner fuels, by removing barriers imposed by the required air toxics assessment in PTI applications. The modeled impact tables represent the breadth of air toxics that have emission factors for each of the fuels, and the magnitude of SL exceedance with the modeling assumptions. SL exceedance does not necessarily indicate unacceptability of exemptions, but it does inform risk management decision-making, and it may support establishing some limitations or criteria for qualifying for an exemption.

Members asked that additional information be provided on the rating of the emission factors and the range of emission factors when multiple factors were found for the same process and chemical. Mike stated that he generally selected the highest emission factor available, and they could range

over orders of magnitude. He also focused the exercise on uncontrolled emission factors; it was pointed out that in many cases such sources would have emission controls and would be subject to regulations such as the RICE rule. Mike also noted that the modeling and meteorology were conservative. A Member asked if AQD staff could conduct spot checks for actual clean fuel permits issued, to help indicate how the results of the modeling exercise compare to actual permitting scenarios and real-world ambient air impacts. AQD agreed to do that. The range of fuels evaluated thus far (natural gas, diesel, wood, and biodiesel) was generally considered to be sufficient; biodiesel types vary greatly, and perhaps the air toxics emissions data availability may limit the scope to soy and animal biodiesel fuel types. A Member noted that the IRSL is a de minimis risk level, and, some health benchmarks used may be even below levels found in indoor air. AQD staff will gather additional information to provide in a technical support document for the "Clean Fuels Discussion Paper."

A-1(5): exempt pollution control projects

A discussion of recommendation A-1(5) regarding exemption of pollution control projects commenced. Mary Ann Dolehanty mentioned that Rule 285 already allows for pollution control project exemptions. For sources that don't meet that exemption from needing a permit, we could evaluate if they should be exempted from R 225.

John Caudell handed out a draft definition of a pollution control project that included modifications including a change to cleaner fuels, replacing fuel oil with natural gas and a "meaningful change" in raw material.

Mary Ann mentioned that EPA will not be approving AQD's SIP because of Rule 285's interpretation of "meaningful change" (from a historical memo written by a former AQD employee) under Rule 285(b); however, the concept may still be appropriate for a R 225 exemption. There may be good examples where a R 225 review makes no sense, depending on the proposed technology involved in the permit application.

A Member asked what would be exempt, the response was: a baghouse, dry sorbent injection, acid gas control, sorbent control, mercury control, raw material substitution, etc. A Member gave the example of changing from a cyclone to a baghouse under a MACT requirement; the result would be increased PM control, and changes in gas flow; if this is beneficial, would a R 225 review be appropriate?.

The Facilitator asked if John Caudell would be willing to lead the effort to develop an issue paper on the topic of "pollution control projects" that may be exempted from R 225. He agreed to do so.

A-1(6): the TAC list

Discussion followed on recommendation A-1(6), which is to limit the number of air toxics to the federal HAP list. Bob Sills gave an overview of the "TAC List" discussion paper he developed. He developed a "goal statement" to follow ORR's recommendation to allow better focus, with guiding concepts. The Members generally agreed with these. He suggested that we could establish a defined TAC list, but have the capability to add or delete pollutants on this list. If the pollutants are not on the list, the regulated community should still have to disclose what they are emitting; the AQD could potentially evaluate the impacts and ensure public health protection.

One Member said they were fine with the approach and another said they still preferred the "status quo", as in, no list of TACs. A question was how does one defend a list?

Bob walked Members through the document. He mentioned that not all HAPs may be relevant to Michigan, and could be excluded from our TAC list. He thought it made sense to include all the carcinogens, but perhaps not those pollutants where there was a default screening level established due to a lack of useful toxicity data (there are 287 of these default TACs). Bob also presented the possibility of using a cut-off value when considering the range of ITSLs. If for example, the 75th percentile of the distribution of ITSLs was used as a cut-off value, together with the other criteria, the result would be approximately 639 TACs. A question was asked about using surrogate compounds, and Bob mentioned that it may be appropriate to use surrogate compounds for assessing control technology effectiveness, but it does not make sense for using that approach broadly for toxicology assessments because structurally similar chemicals can differ greatly in toxicity. A Member commented that it was critical that the Division be able to easily add pollutants to the TAC list in a timely manner. Another Member was concerned with having a list because agencies typically do not have the resources to add or delete from the list. And, some might switch to using an unlisted chemical even though it is not a safer alternative (it just lacks toxicity data). Another Member disagreed with this activity generally occurring.

The Facilitator asked Members to send her revisions in track changes on the "TAC List" Discussion paper. AQD will further develop this approach, including providing Members with a list of air toxics that would be listed as TACs or unlisted under this methodology, with the basis for listing or not listing.

Due to a lack of time, the last items on the agenda were tabled until the next meeting in May. This includes: issue A-1(7) (follow other states); A-1(9) (Rule 228) and A-1(2) (permit modification reviews >10% hazard index).

Action Items to be Completed Prior to the Next ATW Meeting:

• John Caudell and Greg Ryan offered to develop a stack test template and share with the Members.
• Members agreed to review the A-1(8) write up and send any revisions in track changes to Joy.
• AQD staff will provide additional technical details for the Clean Fuels Discussion Paper.
• John Caudell will lead the effort with Carrie and Brad Venman on developing an issue paper on "pollution control projects."
• Members are to review the "TAC List" Discussion paper and send comments to Joy. AQD will further develop a draft list of TACs.

Meeting Summary prepared by: Joy Taylor Morgan, Facilitator, May 16, 2013.

Agenda	MDEQ's Air Toxics Workgroup Meeting 5 May 15, 2013 9:00 AM to 12:00 PM Lillian Hatcher Conference Room Constitution Hall, 3rd North	
Agenda Topics		
	Facilitator: Joy Taylor Morgan	
9:00	Discussion of Recommendations A-1(9) (Rule 228)	Bob Sills to Lead Discussion
9:45	Discussion of A-1(2) (Permit mod reviews > 10% hazard index)	"
10:00	Review Draft Definition of "Pollution Control Projects" and Examples to Address A-1(5)	Carrie Houtman to Lead Discussion
10:45	Discussion of A-1 (6) (air toxics list) and A-1 (7) (follow other states)	Bob Sills to Lead Discussion
11:15	Discussion of Recommendation A-1(4) (clean fuels issue)	Mike Depa to Lead Discussion
11:45	Discussion of Recommendations A-1(3) (Exempt Sources in MACT Category)	Joy to Lead Discussion
	Confirm Recommendations for A-1(8) Stack test Issue/Next Meeting	"
12:00	Adjourn	Joy

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

DAN WYANT
DIRECTOR

Air Toxics Workgroup (ATW)
Meeting Summary
May 15, 2013

Members Present:
James Clift, MI Environmental Council
Steve Kohl, Warner Norcross & Judd
Carrie Houtman, Dow Chemical (phone)
Kim Essenmacher, GM
Kory Groetsch, MDCH
Andy Such, MMA for John Caudell, FTC&H
Bob Sills, AQD
Brad Venman, NTH
David Gustafson, Dow Chemical (phone)
Mark Mitchell for Mary Ann Dolehanty, AQD
Joy Taylor Morgan, AQD, Facilitator

Members Absent:
Brad van Guilder, Sierra Club
Greg Ryan, DTE Energy

Guests/Observers Present:
Mike Depa, AQD

The meeting began with the Facilitator asking the Workgroup members (Members) if they had any changes to the April meeting summary. A Member wanted more time to review the meeting summary before it was finalized and placed on the ATW web site. The Facilitator also reminded the Members of the August 1st deadline they were under, which was also announced by Lynn Fiedler, Assistant Division Chief, AQD at the previous Air Advisory Council meeting.

Some discussion took place on the revision of Rule 901. Rule 901 is an AQD rule that reads, "Notwithstanding the provisions of any other department rule, a person shall not cause or permit the emission of an air contaminant or water vapor in quantities that cause, alone or in reaction with other air contaminants, either of the following:

(a) Injurious effects to human health or safety, animal life, plant life of significant economic value, or property.

(b) Unreasonable interference with the comfortable enjoyment of life and property."

The AQD is not planning to change the language of Rule 901; however, the application of the rule in permitting has changed. Rule 901 will be used to address nuisance and particulate issues as permit conditions, as opposed to a wider application that has occurred historically.

A-1 (9) Rule 228

Discussion of Rule 228 began; the ORR committee had recommended that it be rescinded. AQD management did not concur with this recommendation because of the importance of this rule and advised the Members to consider a compromise. Bob Sills went over an issue paper that he developed on Rule 228, which included a list of permit applications where the Rule has been used.

It is a limited list of sources and pollutants and is not widely used. Bob stated that the Rule is used to help address three types of issues that are not adequately addressed by the chemical-specific screening levels: 1) indirect exposure pathways, which allows staff to review exposure from routes other than only inhalation from primarily persistent, bioaccumulative and toxic (PBT) pollutants; 2) enabling the review of potential interactive effects of multiple pollutants; and 3) evaluating environmental effects, because the AQD program is supposed to be protective of both environmental effects and public health.

Bob stated that the Rule provides the AQD with two basic types of authority: 1) authority to ask the applicant to provide some additional information relevant to the above issues; and 2) authority to require a lower allowable emission rate to provide adequate protection; however, the AQD has never used the risk assessment findings to require a lower emission rate.

The AQD thinks that the rule has been very helpful, especially in controversial settings, in developing the information needed to help assure the public that proposed air emissions will not be harmful. AQD management thinks the rule is very beneficial to the agency and the public, as well as the applicant. It enables the Department to withstand complaints; we would be more vulnerable to criticism and would not be able to answer questions adequately without the additional review. If the regulated community has a concern that the Rule gives the AQD too much discretionary authority, then AQD management has suggested that Rule 228, decisions could be elevated to the Director level.

One of the Members thought that Rule 228 is often used as a public relations tool, not necessarily as an emission reduction tool. Also, the applicant and the AQD both generally double-check the modeling results, so Rule 228 isn't really mandating additional information that the AQD could not have developed on its own.

There was some discussion that followed about some of the types of facilities (e.g., coal-fired power plants, cement kilns) and the types of pollutants reviewed, which have included mercury, dioxin and lead (although not a TAC).

A Member asked if there was a level of comfort to not do more modeling of pollutants since modeling has been conducted for a number of facilities. Bob responded that there is not a level of comfort because every case is very site specific and varies with the pollutants, facility controls, surrounding geography, etc.

One Member commented that the rule does not provide the source with the notice upfront, so he thought that leaving it up to the Director's decision would be preferable. One member commented that the use of Rule 228 as a backstop to other regulatory requirements does make sense, but that the burden of the assessment should fall on the agency. Another Member asked who gets the benefit of the rule; there was agreement that the public, the agency and the applicant all benefit from the appropriate use of Rule 228.

Another Member mentioned that if we didn't have Rule 228, then there could be regulatory authority under MEPA, with the burden placed on the applicant. Another Member disliked the MEPA approach. A different Member mentioned that they (as an applicant) would be conducting the modeling anyway as a check and balance. Staff mentioned that AQD staff works cooperatively with the applicant if a multi-pathway or other type of R228 risk assessment is conducted.

Andy Such mentioned that there is a potential for AQD to abuse their authority under the Rule; the agency should engage in discussion and explanation with the applicant and provide them with a

choice. He wanted to circulate the document to the MMA members to review it and will get back to the AQD with comments. Mr. Such recognized the public outreach benefit of the Rule, and mentioned that elevating the decision to the Director level may be OK.
A Member stated that while the Rule 228 assessments have been called "heightened" risk assessments; these really are not true risk assessments, but screening reviews.

The Facilitator said that it appears that there is general agreement on elevating the decision for applying Rule 228 to the Director level; however, the Members should review the discussion paper in detail and the other Members not in attendance also need to review the document.

A-1(2) Permit Modification Reviews – 10% Hazard Index

Discussion began on this recommendation, which mirrors the historical (1993) paper by a former AQD employee that is used by many companies and AQD district offices. This paper describes how to interpret a meaningful change to help determine when a permit to install is required (if a change in air toxics emissions dose not result in more than a 10% increase in hazard potential, then it would not be a meaningful change). At the last meeting it was mentioned that the EPA is not supportive of the undefined term "meaningful" in the Part 2 Rules, with regard to PSD and criteria pollutants. However, the approach could be utilized for TACs, if it was defined. Because the air toxics rules are not part of the State Implementation Plan (SIP), the EPA has no role in reviewing the air toxics rules or an exemption from those rules based on however the agency defines a "meaningful" change in air toxics emissions.

There was a discussion about how the 10% is determined, and in particular, what is the baseline that is used. It was stated that the baseline can continue to change so it is difficult to know what the original baseline was. A Member mentioned that it does not make sense to compare an increase of all chemicals equally as they can have very different effects. Another Member stated that they are concerned with losing the Rule 285(b) exemption should the AQD determine that it is inappropriately vague. The Rule provides additional flexibility when changing paint, as an example within the auto industry.

Another Member asked whether or not a company's use of the exemption could be reviewed every five years during the ROP process. There were also concerns expressed that with a 10% increase allowed under the exemption, the increase could be due to a more toxic compound, thresholds could be exceeded, or multiple increments of 10% increases could be compounded. Also, there was a comment that the goal should be a reduction in emissions, not an exempt increase in emissions.

The Members said they would like AQD to draft some language to try to address this recommendation.

A-1(5) Pollution Control Projects

Carrie Houtman gave an overview of the summary of what pollution control projects could be defined to include. Several comments were made by Members that they thought the definition of what could be defined as a pollution control project was too broad, such as solar panels, etc. The Members thought the definition should focus more on devices (such as a wet scrubber) versus a project within the definition. The Facilitator recommended that comments on the definition of pollution control projects, with a focus on devices should be sent directly to Carrie Houtman.

AQD staff reminded the Members that under Rule 285, pollution control equipment can be installed without a permit. Members mentioned that if installation of new pollution control equipment could result in a new TAC being emitted then that should be reviewed (ex. SCRs and ammonia).

A-1(6): the TAC list

Discussion followed on recommendation A-1(6), which is to limit the number of air toxics. Bob Sills gave an update to the document since the last meeting. Some Members had made some suggested changes at the last meeting which he made. No additional comments were received from Members via email, as requested.

Bob mentioned that there was an error that was corrected in the spread sheet, and other adjustments as described in the Discussion Paper Update, and as a result the draft proposed list of TACs has changed from 639 to 750.

Bob mentioned that a couple of pollutants were added to the draft list that was emerging chemicals (PFOA and PFOS); there was general agreement that it makes sense to include them in the TAC list. A Member said if the chemical is a PBT, then it should be added to the list.

A Member questioned the 75th percentile of the distribution of ITSLs as a cut-off value. This Member said that it is an arbitrary value, and the emission rate and ambient impact are not being considered. Bob agreed that the 75th percentile was somewhat arbitrarily selected, but that it appeared reasonable. It is unclear how data on overall chemical usage/production or historical statewide air emissions should be used to refine the draft TAC list.

A Member said it does not make sense that some screening levels for metals can exceed the NAAQS; occupational exposure limits are not appropriate to use because they do not adequately protect the public. There was agreement that if a defined TAC list is adopted, there should still be back stops to address unlisted air toxics, such as the language in Rule 228 and additional authorities in the rules.

One Member wondered why we should take any pollutant off the current TAC list; we should just leave them all on the list. Why not use 100% rather than a 75% cutoff for the distribution of ITSLs? Bob stated that a review of the draft TAC list indicates that relatively low toxicity noncarcinogenic substances would be unlisted because their ITSLs are above the 75th percentile; however, they could still be addressed as necessary via the back stops.

Another Member asked again about the surrogate issue. Bob reiterated from the last meeting that it does not make sense for using that approach broadly for toxicology assessments because structurally similar chemicals can differ greatly in toxicity.

A different Member asked about methyl isocyanate. It is not on the draft TAC list because it has not been reviewed for permitting in Michigan and therefore does not have a SL. However, it does appear (as “isocyanate compounds”) in the Table 20 list of high concern toxic air contaminants (of Rule 226), and, it was the toxicant in the Bhopal tragedy and it has been emitted in other states. There was general agreement to add it to the TAC list.

Another Member emphasized that there should be a more efficient way for the agency to add pollutants to the TAC list, other than the rule making process which takes way too long. The agency should develop a proposed rule with a methodology for listing additional TACs, providing stakeholders an opportunity to comment on that methodology during rulemaking.

A-1(7) Follow Other States

A very brief discussion occurred on this issue as time was running out. Bob mentioned that, based on our discussion paper and the limited workgroup discussion thus far, there appear to be two

steps in our current methodology that could have support for change in order to be more consistent with other states in Region 5. One would be not utilizing a default value (which would make Michigan consistent with the other Region 5 states, and all other states except Texas). The other issue is the averaging time (AT) applied to ITSLs that are based on Reference Concentrations (RfCs) and Reference Doses (RfDs). The air toxics rules, established in 1992, specify a default AT of 24 hours, which is conservative. Other states and the EPA (when applying RfCs as benchmarks for comparison to monitored or modeled ambient air levels) have used annual averaging. In the past, the AQD has routinely applied 24-hour averaging except in specific cases, when an annual AT is more appropriate (as allowed under Rule 229) or when staff are able to establish both acute and chronic screening levels for a chemical based on the toxicological data.

Two Members said that it made sense to control for potential spikes in ambient levels via an acute screening level, coupled with a chronic screening level. There was general agreement that the default ITSL approach may be eliminated.

Due to a lack of time, the last items on the agenda were tabled until the next meeting in June. This includes: issue A-1(4) (clean fuels issue); A-1(3) (Exempt sources in MACT category) and A-1(8) (Stack testing requirements in PTI).

The Facilitator mentioned that the Members should be prepared to vote on A-1(8) as no additional comments have been received and AQD staff think it has been resolved.

Action Items to be Completed Prior to the Next ATW Meeting:

Comments on A-1(9) Rule 228 to Joy by May 30th.
Comments on A-1(5) Pollution Control Projects should be sent to Carrie Houtman by May 30th.
Comments on the TAC list A-1(6) Issue Paper is due to Joy by May 30th.
AQD staff to draft language to address the 10% permit modification issue to address A-1(2).

Action Items From Past Meetings that Still Need to be Completed:

- John Caudell and Greg Ryan offered to develop a stack test template and share with the Members.

Meeting Summary prepared by: Joy Taylor Morgan, Facilitator
May 23, 2013.

Agenda	MDEQ's Air Toxics Workgroup Meeting 6 June 19, 2013 9:00 AM to 12:00 PM Coleman Young Conference Room Constitution Hall, 6th South	
Agenda Topics		
	Facilitator: Joy Taylor Morgan	
9:00	Vote on Recommendation for A-1(8) Stack Test Issue	Joy to Lead
9:15	Discuss and Vote on Recommendation A-1(9) (Rule 228)	Joy to Lead
9:30	Discussion of Recommendation A-1(4) (clean fuels issue)	Bob and Mary Ann to Lead Discussion
10:00	Review Draft Definition of "Pollution Control Projects" and Examples to Address A-1(5)	Carrie Houtman to Lead Discussion
10:30	Discussion of A-1 (6) (air toxics list) and A-1 (7) (follow other states) Possible Voting on A-1(6) & (7)	Bob Sills to Lead Discussion
11:15	Discussion of A-1(2) (Permit mod reviews > 10% hazard index)	Bob Sills to Lead Discussion
11:45	Discussion of Recommendations A-1(3) (Exempt Sources in MACT Category)	Joy to Lead Discussion
12:00	Adjourn	Joy

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

DAN WYANT
DIRECTOR

Air Toxics Workgroup (ATW)
Meeting Summary
June 19, 2013

Members Present:

James Clift, MI Environmental Council
Steve Kohl, Warner Norcross & Judd
Kim Essenmacher, GM
Kory Groetsch, MDCH
Joy Taylor Morgan, AQD, Facilitator
Bob Sills, AQD
Brad Venman, NTH
Mary Ann Dolehanty, AQD
Greg Ryan, DTE Energy
Stuart Batterman, UM
Carrie Houtman, Dow Chemical Company (on telephone)
John Caudell, Fishbeck Thompson Carr & Huber

Members Absent:

Brad van Guilder, Sierra Club

Guests/Observers Present:

Vince Hellwig, AQD Chief; Mike Depa, AQD; Dave Fiedler, Regulatory Affairs Officer, DEQ; Mary Maupin, SIP Unit Supervisor; Breanna Bukowski, SIP Unit.

The meeting began with the Facilitator asking the Workgroup members (Members) if they had any changes to the May meeting summary. Members wanted more time to review the meeting summary before being finalized and being placed on the ATW web site. The Facilitator also reminded the Members of the August 1st deadline they are under, and that the workgroup should focus on process and methodology to agree on and not necessarily on specific rule language so that the group can finish by their deadline.

A-1(8) Stack Testing

The Facilitator began with a discussion and summary of A-1(8) and presented a proposed draft recommendation based on the discussions with Members at the last several meetings. After going through a few edits, the following language was agreed to by the Members:

> The AQD has clarified that the need for stack testing requirements will be determined on a case-by-case basis for compliance demonstration, and will not be required when it is not warranted. For example, routine testing of asphalt plants is no longer warranted. Also, the AQD will work together with EPA and the regulated community in further application of the ERT (emissions reporting tool) or other tools, to post stack test results on the AQD web page in a searchable format by X date.

This draft recommendation addresses the two key issues: when to require stack testing, and, providing a database as a resource tool. DEQ staff agreed to investigate if the resources could be allocated to develop and post a database on the AQD website, and what deadline could be considered, for discussion at the next meeting in July.

A Member asked how this DEQ intention would be memorialized, besides the ATW meeting summary. It was discussed that it could be implemented as an AQD Policy and Procedure. Members recognized that the development of a workable stack test database places a significant resource demand on AQD, but they emphasized that it should be a goal, and that initial steps should be taken. A member noted that the regulated community should also contribute to this effort, by entering data into the database.

A-1 (9) Rule 228

The Facilitator presented a proposed draft recommendation, based on previous meeting discussions:

> Rule 228 should be retained with modification: the decision of when to apply the rule should be with the MDEQ Director and the language in the rule should change from "The department may determine, on a case-by-case basis…" to, "The Director may determine, on a case-by-case basis…". The AQD should work cooperatively with applicants in discussing the specific need and focus for additional risk assessment information, and be flexible in sharing the burden of developing the additional information.

Some Members felt that in addition to the issue being elevated to the Director level, the rule language should provide additional boundaries on how the rule is applied. Additionally, one Member shared language redrafting Rule 228, to which another Member said that the language was too specific and they could not support it as written. The Facilitator requested that if any other Member wanted to develop different language for Rule 228, then that could be developed and shared prior to the July meeting for discussion at that meeting. One Member commented that Rule 228 was critical for use as a back stop, and the agency has an obligation to use this rule to adequately protect public health.

There was also discussion on the reliability of data utilized in the screening risk assessments. A Member suggested using a paper by Klimisch et al., 1997 (by BASF), which recommends using in assessments only studies with a reliability rating of 1 or 2. They stated that the UNEP and EPA have adopted that ranking system for their assessments. A Member said that the Klimisch paper was not the best system as it down grades peer reviewed literature to second class and it makes no sense to elevate lab reports to a higher level; just because a paper documents "GLP" (good laboratory practices) it is not impressive and often inadequate.

One Member said that Rule 228 had an effect in the pre-application phase, by getting applicants to consider what emission rate to propose in their application that would be as low as reasonably possible and would be hopefully approvable. However, the member added that some applicants dislike the lack of certainty in how the R 228 assessments will be conducted and what levels of impact will be approvable. One Member stated that *actual* exposures should be evaluated, while another Member stated that *potential* levels of exposure are more appropriate for such evaluations. DEQ staff stated that when Rule 228 has been applied, reasonable exposure scenarios are utilized that are specific to the source to be permitted. For example, local environmental data are utilized, such as actual contaminant data in local fish, air or water, when available.

A-1(6): the TAC list

The Facilitator presented a proposed draft recommendation, based on past meetings and discussions that the Members could possibly agree on:

> The AQD should pursue the approach described in the May 13, 2013 draft discussion paper to establish a defined list of TACs subject to R 225, with the authority to address other air

toxics of concern in a specific PTI application, and with the authority to add and delete from the list based on the application of the same criteria described in the May 13, 2013 discussion paper for establishing the list (i.e., proposed additions would be carcinogens and air toxics that would have ITSLs lower than the 75th %tile, that are reasonably anticipated to appear in a PTI application). The proposed TAC list should be specified in proposed rules for public comment. The proposed rules should also specify a procedure for posting for public comment any proposed additions or deletions to the list, and after considering the public comment, the agency should have the authority to immediately implement those changes prior to rulemaking to make the list changes in the rules. The initial TAC list should consist of approximately 750 air toxics, as listed in the May 13, 2013 list, with some adjustments, such as the addition of some additional PBTs as justifiable and methyl isocyanate, as discussed at the May 15, 2013 ATW meeting.

A couple of Members stated they felt the number of 750 was too large. Other Members did not agree; they reminded the Workgroup that the current list is infinity, and there are over 80,000 chemicals in commerce. From that perspective, 750 was actually a small number. A couple of Members pointed out that other states have a list closer to 300 or 400, but then it was noted that other states have unlimited lists. One Member suggested that TACs could be dropped off the list if the screening level was at 200 $\mu g/m^3$ or greater. This value was suggested because it is included in Rule 224 (as one of several criteria). One Member commented that this might be close to the 80^{th} percentile in the distribution of all ITSL values (without regard to averaging times). Another Member said that the HAPs list and other states' lists of air toxics include chemical groups, and if the chemicals in our draft list were grouped together in categories (i.e., POM), then the list would be much smaller than 750. Staff noted that the focus has been on developing a valid methodology for establishing a defined list of TACs, and to attempt to build ATW consensus on that approach; any misgivings about the resulting number of TACs should involve consensus building for an alternative approach. Utilizing "group" names can make a list seem smaller than it actually is, but it reduces clarity and certainty with the list. Bob Sills was invited to discuss the TAC list issue with MMA at their next meeting on July 10^{th}.

A Member mentioned that when LARA and members of the original ORR Environmental Committee recently met with the Director, it was noted that some groups that represent Michigan Manufacturing may not agree with three issues. These are the TAC list of 750 substances, Rule 228, the list of TAC exemptions (such as a pollution control project definition) and other issues that the Member could not recall.

The Klimish paper's ranking scheme was discussed further. Some Members felt this paper's approach to ranking studies was important. DEQ staff and some Members had concerns with the paper's approach, and, that the approach seemed like an additional task that may not be needed. Staff felt that the issue may not warrant additional ATW meeting time for further discussion. Staff stated that they only use "reliable" study data to support SLs, and a justification document citing the key studies and showing the SL calculations is available upon request for each SL. Staff receives requests for specific SL justifications every few weeks, and provides them as pdf documents.

A related issue raised by a Member is that public comment should be accepted for not only the proposed TAC list, but also on the basis for the SLs. Staff agreed that some basic information can be provided along with the proposed TAC list for public comment, along with the public's ability to obtain specific SL justification documents. The Member also noted that some in the regulated community would like to have a more formal mechanism to force AQD to review SLs. Staff responded that AQD's long-held practice has been to accept and address comments, requests,

additional toxicity studies, or alternative ways of interpreting key studies, and AQD has revised SLs as appropriate based on those requests.

The group agreed to revisit the TAC list issue at the next meeting, after the briefing for MMA.

A-1(7) Follow Other States

The Facilitator presented a proposed draft recommendation, based on past meetings and discussions:

> The AQD should be more consistent with other nearby states in deriving screening levels, by not utilizing a default screening level, by using a default annual averaging time rather than 24 hour averaging time for ITSLs based on EPA RfCs and RfDs, and by establishing acute screening levels to address concerns for acute toxicity.

Staff stated that although all state's programs vary, these changes are scientifically defensible and would make DEQ more consistent with other states. There was some discussion as to how this would be implemented, but there was general agreement and the Facilitator was able to check this recommendation off as being completed.

A-1(5) Pollution Control Projects

Carrie Houtman gave a revised overview of the summary of what pollution control projects could be defined to include. Several comments were made by Members that they were not clear with what was being presented and they wanted specific examples.

What was presented:

> A *Pollution Control Project* as identified in rule (*air toxics exemption citation*) means that a project meeting the following is exempt from Toxics review provided the installation of equipment or implementation of the project causes no appreciable change in the quality, nature or quantity of emissions:

1. The installation of pollution control equipment as specified in Rule____.
2. The addition of internal or external air pollution control equipment to an existing stationary source to comply with a new state or federal air quality regulation.
3. Construction of a facility or implementation of a project subject to a MACT standard.
4. Replacing a currently permitted raw material for an existing stationary source with a raw material.
5. Installing equipment that repurposes a material from waste into a product, raw material, or intermediate.
6. Installation or modification of equipment that reduces the likelihood of opening of pressure relief devices, and/or reduces fugitive emissions, and/or decreases the likelihood or frequency of shutdowns of process equipment where such shutdowns generate emissions which are not associated with normal operation.
7. Installation of larger vessels, which allows for the consolidation of two or more vessels if the consolidation results in an overall reduction in the number of emission points and potential to emit.

The Workgroup agreed to delete bullet number five. There was significant discussion regarding bullet number four and Members mentioned that this seemed like too broad of an exemption. It was suggested that we could use the "meaningful change" (10% criteria) to exempt some of these projects. Members stated that examples are needed for #4, 6, and 7 to better understand the situations proposed for exemption. It was noted that #6 could refer to projects designed to prevent malfunctions, which are already exempt under the Part 2 rules and which are covered in Malfunction Abatement Plans. Bullet #3 seems to mirror one of the ORR report's recommendations to exempt from R 225 any source subject to a MACT; this is being discussed separately. A Member said that the ORR committee's intent was to exempt older sources that had never undergone R 225 review, but which are making modifications under a MACT requirement and are thus currently subject to R 225 review. Bob Sills noted that the 1989 Air Toxics Policy Committee recommended that AQD should first start with the regulation of air toxics emissions from new and modified sources, and later address existing sources as they make modifications or as a separate initiative.

A-1(4) Clean Energy

There was very limited time to discuss the revised discussion paper. However, there was general agreement with the suggestion that engines, turbines, boilers, and process heaters burning solely natural gas, diesel fuel (#2 fuel oil), or biodiesel, of up to 100 MMBTU/hr, may be exempted from R 225, provided that the stack height is at least 1.5 times the building height.

A couple Members wanted more time to review the clean fuels discussion paper prior to the next meeting.

Action Items to be Completed Prior to the Next ATW Meeting:

- Members will send Joy any comments on the May 15th meeting summary by June 21st.
- Members may develop proposed R 228 language for distribution and discussion at the next meeting.
- Comments on A-1(5) Pollution Control Projects with examples should be sent to Carrie Houtman by July 17th.
- Bob Sills will attend the MMA meeting on July 10th to brief them on the ATW progress to date on the TAC list issue.
- John Caudell to develop alternative approach to the TAC list discussion paper, if no agreement occurs after the MMA meeting, by July 17th.
- Members will review the Clean Fuels Discussion Paper in time for the July 24th meeting.

Action Items From Past Meetings that Still Need to be Completed:

- John Caudell and Greg Ryan offered to develop a stack test template and share with the Members.

Meeting Summary prepared by: Joy Taylor Morgan, Facilitator, and Bob Sills.
July 3, 2013.

Agenda	MDEQ's Air Toxics Workgroup Meeting 7 July 24, 2013 1:00 PM to 4:00 PM Lillian Hatcher Conference Room Constitution Hall, 3rd North	
Agenda Topics		
	Facilitator: Joy Taylor Morgan	
1:00	Discussion of A-1 (6) (air toxics list) and Voting on A-1(6)	Joy to Lead
1:30	Discuss and Vote on Recommendation A-1(9) (Rule 228)	Joy to Lead
2:00	Discussion and Voting on Recommendation A-1(4) (clean fuels issue)	"
2:30	Discussion of A-1(2) (Permit mod reviews > 10% hazard index)	Bob Sills to Lead Discussion
3:00	Review Draft Definition of "Pollution Control Projects" and Examples to Address A-1(5) Vote on A-1(5)	Joy and Carrie to Lead Discussion
3:30	Discussion of Recommendations A-1(3) (Exempt Sources in MACT Category)	Joy to Lead Discussion
4:00	Adjourn	Joy

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

DAN WYANT
DIRECTOR

Air Toxics Workgroup (ATW)
Meeting Summary
July 24, 2013

Members Present:

James Clift, MI Environmental Council
Steve Kohl, Warner Norcross & Judd
Carrie Houtman, Dow Chemical Co.
Mary Ann Dolehanty, AQD
Greg Ryan, DTE Energy
Joy Taylor Morgan, AQD, Facilitator
Bob Sills, AQD
Brad Venman, NTH
Kim Essenmacher, GM
Kory Groetsch, MDCH
Stuart Batterman, UM
John Caudell, Fishbeck Thompson Carr & Huber

Members Absent:

Brad van Guilder, Sierra Club

Guests/Observers Present:

Jim Sygo, DEQ Deputy Director; Andy Such, Michigan Manufacturers Association; Mike Depa, AQD; Dave Fiedler, Regulatory Affairs Officer, DEQ; Caitlin Nagler, DEQ Student Intern, Office of Environmental Assistance; and Mary Maupin, AQD, SIP Unit Supervisor

Summary

The meeting began with the Facilitator asking the Workgroup members (Members) if they had any changes to the June meeting summary. Members did not have any additional changes to what was e-mailed to the Facilitator, so she said they will be finalized and posted on the ATW web site. The Facilitator also reminded the Members of the August 1st deadline they are under, which means only one more meeting, and that the workgroup should focus on process and methodology to agree on and not necessarily on specific rule language so that the group can finish by their deadline. The Facilitator stated that Staff intends to develop a single all-inclusive report to memorialize the Workgroup's discussions and recommendations, including all of the discussion papers and meeting summaries. The Workgroup agreed that this would help guide AQD through the rulemaking process, and serve as a valuable future resource document. AQD will provide the Members with a draft for review and comment, after the August 1st Workgroup meeting.

Dave Fiedler introduced Caitlin Nagler, the DEQ student intern who will be helping develop a Best Practices document for DEQ stakeholder groups. The Facilitator will be meeting with her soon to discuss the ATW process.

The Facilitator asked if there were any changes to the agenda, and there was a suggestion to end with the TAC list discussion, so the first topic discussed was Clean Fuels, Issue A-1(4).

A-1(4) Clean Fuels Issue

The Facilitator reminded the Workgroup that they still had to agree on the language for a recommendation for A-1(4). The Members said they did review the proposed language again, and after discussion, agreed on

the following language. They felt it would be appropriate to add a criterion of a setback of at least 100 feet from the building to the property line, along with some flexibility by adding the sentence, "Sources not meeting the stack height or fenceline criteria can be reviewed on a case by case basis." A Member stated that regulatory requirements for the criteria pollutants, particularly NOx and SOx, are an effective backstop, and that these three fuels that are proposed for the exemption are the relatively clean ones. The agreed upon recommendation is as follows:

> It is recommended that engines, turbines, boilers, and process heaters burning solely natural gas, diesel fuel (#2 fuel oil), or biodiesel, of up to 100 MMBTU/hr, may be exempted from R 224 and 225, provided that the effective stack height is at least 1.5 times the building height and the building setback from the property line is at least 100 feet. Sources not meeting the stack height or setback criteria can be reviewed on a case-by-case basis.

A Member noted that the rule language should include additional appropriate details, including that the qualifying stack should be vertical and unobstructed. Another Member suggested that the exemption could have a sunset clause, triggering a reassessment of the exemption after some time period. A Member asked that the Workgroup report emphasize that the Workgroup's rationale accounted for broad considerations, including the level of public health protection and the impetus to provide streamlining of the regulatory process for the relatively cleaner fuel options.

A Member asked for clarification of whether this exemption would apply to R 224 as well as R 225, and recommended that the exemption apply to both. AQD staff responded that the emissions from these sources would largely be exempted from R 224 anyway because R 702 would apply, so the AQD may be agreeable to the rationale for exempting these sources from R 224 as well as R 225.

A-1(8) Stack Testing

Discussion followed-up on the Workgroup request that stack test results should be posted on the AQD web page. The AQD members said that this was discussed internally, and that the stack test summaries could be posted to the website starting by November 1, 2013. Therefore, this deadline was added to the Workgroup recommendation language that was previously agreed upon:

> The AQD has clarified that the need for stack testing requirements will be determined on a case-by-case basis for compliance demonstration, and will not be required when it is not warranted. For example, routine testing of asphalt plants is no longer warranted. Also, the AQD will work together with EPA and the regulated community in further application of the ERT (emissions reporting tool) or other tools, and will post stack test results on the AQD web page in a searchable format by November 1, 2013.

A-1 (9) Rule 228

The Facilitator presented a proposed draft recommendation, based on previous meeting discussions. After deliberations about the language, the following language was agreed upon by the Members:

> Rule 228 should be retained with modification:
>
> > Rule 228.
> > The department may determine on a case-by-case basis, that the maximum allowable emission rate determined in R 36.1224(1), R 336.1225(1), R 336.1225(2), or R336.1225(3) does not provide adequate protection of human health or the environment. In making these evaluations and determinations, the department shall utilize relevant environmental data, land use, and exposure scenarios, and reasonably anticipated environmental impacts and

exposures from the proposed new or modified emission unit or units, in performing these evaluations and determinations. In this case, the department shall establish a maximum allowable emission rate considering relevant scientific information, such as exposure from routes of exposure other than direct inhalation, synergistic or additive effects from other toxic air contaminants, and effects on the environment.

A member noted that the function of R 228 as a "backstop" to address certain issues can also provide the needed backstop for the "TAC List" issue by enabling the agency to address non-TACs as necessary.

A-1(5) Pollution Control Projects

The Workgroup discussed the list again, as shared by Carrie Houtman.

What was presented:

A *Pollution Control Project* as identified in rule (*air toxics exemption citation*) means that a project meeting the following is exempt from Toxics review, provided the installation of equipment or implementation of the project causes no appreciable change in the quality, nature or quantity of emissions:

8. The installation of pollution control equipment as specified in Rule 285.
9. The addition of internal or external air pollution control equipment to an existing stationary source to comply with a new state or federal air quality regulation.
10. Construction of a facility or implementation of a project subject to a MACT standard.
11. ~~Replacing a currently permitted raw material for an existing stationary source with a raw material.~~
12. ~~Installing equipment that repurposes a material from waste into a product, raw material, or intermediate.~~
13. ~~13.~~11. Installation or modification of equipment that reduces the likelihood of opening of pressure relief devices, and/or reduces fugitive emissions, and/or decreases the likelihood or frequency of shutdowns of process equipment where such shutdowns generate emissions which are not associated with normal operation.
14. ~~14.~~12. Installation of larger vessels which allows for the consolidation of two or more vessels if the consolidation results in an overall reduction in the number of emission points and potential to emit.

In addition to deleting bullet number five, agreed upon during the last meeting, the Workgroup also agreed on deleting bullet number four.

Members reiterated that it remains challenging to identify some specific pollution control retrofits (beyond the exemptions of Rule 285) for which it makes no sense to do a toxics review. Some Members wanted examples for specific bullets, Examples were given for #2 as a halide device to comply with a MACT, for #5 (old #7) a blow over tank. A general example suggested was the addition of dry lime sorbent. One Member felt that grandfathered sources should not be exempted from a toxics review, if just undertaking a pollution control project.

It was mentioned that Rule 285 does not specify projects, it just says installation of equipment. It was agreed to table the discussion of this issue until there is further development and agreement on the other issues

which could provide regulatory relief for some pollution control projects, including the "meaningful change" issue and the emerging recommendations of the Permit Exemptions Workgroup.

A-1(3)
Exempt sources that are identified in a MACT source category.

There was some discussion, but Members were reminded that the AQD Division Chief said that this recommended change in policy would be very problematic and AQD did not support it. Members recalled an earlier discussion about how the culture in Michigan regarding air toxics emissions calls for the DEQ to be able to reassure the public that the permitted source is safe for the public health and the environment. An exemption that would relieve applicants from having to make this demonstration in their permit application, based on a federal control technology requirement only, would place the agency in a very difficult position.

Andy Such suggested that further discussion on this issue is not warranted, given that there is an impasse. The Members and the Facilitator agreed.

A-1(2) Meaningful Change

Bob Sills gave an overview of the June 14, 2013 "Meaningful Change Discussion Paper" (available on the ATW web site). He said this document refers to the "Avery Memo" that has been utilized as a policy and procedure since 1993 for the AQD in determining if process changes may be exempted from permitting. In previous Workgroup discussions to frame the issue, Members requested that staff develop a proposal for their consideration. The draft discussion paper includes a proposed definition of "meaningful increase in the quantity of the emission" and "meaningful change in the quality and nature" that could be added to the Part 2 Rules to provide better certainty and transparency. This could be accompanied by an AQD Policy and Procedure document, which would provide further details and examples of the methodology. The draft discussion paper attempts to address the concerns that had been expressed by some Members regarding the "floating baseline" with the historical application of the Avery memo, and the application of the Hazard Potential (HP) calculation to very dissimilar air toxics. In the ensuing discussion, staff were asked to provide more details and revisions as soon as possible, for further consideration. One Member wanted to make sure that it is clear that there is no additivity accounted for in the procedure, and only the single highest HPs are compared in the calculation. The issue was then tabled until the next meeting.

A-1(6): the TAC list

Andy Such, MMA thanked Bob Sills for giving a presentation to MMA members on 7/10/13. He said they support the approach for having a defined list, and the listing of specific chemicals rather than groups is supported by MMA members. He said that agreement on the methodology is more important than the final number. He said he also would like to have the SL justifications to be placed on the AQD web page. Mr. Such said going thru the rule making process to make changes to the TAC list is a concern; this process would be too slow. But, the ability to comment on the list is important. After the initial proposed TAC list and rules receive public comment and are finalized, he suggested that a quarterly or twice/year review of the proposed changes to the TAC list and to the SLs would suffice to allow public review.

One Member mentioned this approach was similar to a draft rule that he shared with AQD, which will be circulated to the Members. That draft rule did not include the TAC list in the rule itself; the TAC list would be published on the AQD web site, as recommended by Members.
DEQ participants thought that it would be feasible to place the SL justifications on the AQD web site.

One Member expressed concern over staff only having 30 days to review a new chemical. A different Member said the review should not have to be done within 30 days. A Member indicated agreement with the

concept of a formal public comment process on the TAC list and the SLs, but concern that non-TACs may not be adequately evaluated in permit review.

It was agreed that this issue needed more discussion at the next meeting.

Action Items to be Completed Prior to the Next ATW Meeting:

- Bob will provide additional information on the Meaningful Change issue for the 8/1/13 meeting.
- The TAC list draft rule language from Steve Kohl will be distributed for review and discussion at the 8/1/13 meeting.
- Members will review the TAC list and Meaningful Change Discussion Papers.

Meeting Summary prepared by: Joy Taylor Morgan, Facilitator, and Bob Sills, August 8, 2013.

Agenda	MDEQ's Air Toxics Workgroup Meeting 8 August 1, 2013 9:00 AM to noon Joseph Sablich Conference Room Constitution Hall, 5th South	
Agenda Topics		
	Facilitator: Joy Taylor Morgan	
9:00	Discussion of A-1(2) (Permit mod reviews > 10% hazard index) (Meaningful Change Issue) and Voting on A-1(2)	Joy and Bob to Lead
10:00	Discussion of A-1 (6) (air toxics list) and Voting on A-1(6)	Joy to Lead
11:00	Review Draft Definition of "Pollution Control Projects" and Examples to Address A-1(5) Vote on A-1(5)	Joy and Carrie to Lead Discussion
11:30	Other Air Toxics Rule Issues (As time allows)	Bob Sills to Lead Discussion
Noon	Adjourn	Joy

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

DAN WYANT
DIRECTOR

Air Toxics Workgroup (ATW)
Meeting Summary
August 1, 2013

Members Present:
James Clift, MI Environmental Council
Kim Essenmacher, GM
Kory Groetsch, MDCH
Stuart Batterman, UM
Joy Taylor Morgan, AQD, Facilitator
Steve Kohl, Warner Norcross & Judd (phone)
Bob Sills, AQD
Brad Venman, NTH
Carrie Houtman, Dow Chemical Co. (phone)
Greg Ryan, DTE Energy
John Caudell, Fishbeck Thompson Carr & Huber
Cindy Smith, AQD, Permit Unit Supervisor for Mary Ann Dolehanty

Members Absent:
Mary Ann Dolehanty, DEQ and Brad van Guilder, Sierra Club

Guests/Observers Present:
Andy Such, Michigan Manufacturers Association; Mike Depa, AQD; Teresa Seidel, AQD Supervisor of Field Operations; Tracey McDonald, AQD, SIP Unit; Mary Maupin, AQD, SIP Unit Supervisor; Erica Wolf, SIP Unit; and Chris Flaga, Toxics Unit Supervisor of Remediation and Redevelopment Division.

Summary

The meeting began with the Facilitator informing the Members that Bob Sills gave an ATW summary presentation to MEC members on July 31, 2013 and that his power point will be posted to the ATW Web Site. The Facilitator said that although 8/1/13 was the deadline in their official charge, she had heard from some Members that they would like some additional time to review the draft discussion papers. They would like to see as detailed language as possible before they could vote and agree on the last remaining issues. The Facilitator stated that she had spoken with AQD management and they agreed that another meeting could be held, but that the meeting process should end by 10/1/13. The Workgroup was agreeable to this proposal. Therefore, another meeting will be scheduled for September to discuss the draft final Workgroup report, draft rule language, and final recommendations.

Andy Such then stated that his members were not comfortable voting on language that is not specific, similar to what the rule language might actually look like. The Facilitator said that the Workgroup should be able to accomplish this and thought they should first start discussing the A-1(2) Meaningful Change recommendation.

A-1(2) Meaningful Change

The Facilitator began the discussion by presenting the summary language that was shared with the group in an email prior to the meeting.

Bob then gave an overview of the 7/30/13 Meaningful Change updated draft Discussion Paper. Although the ORR report recommendation was for an exemption from toxics analysis (R 225) for permitting relatively

small changes in air toxics emissions at existing sources that are not "meaningful," it is the opinion of the AQD staff and at least some of the Members that the most effective program streamlining would be to clarify and support the Rule 285 exemption from permitting for such circumstances. If that can be accomplished and the R 285 exemption process is retained, then a separate exemption from R 225 would not be particularly needed for streamlining the permitting program. Bob reiterated that AQD supports clarifying and retaining the R 285 meaningful change exemption for air toxics, with some adjustments and with the addition of key definitions in the rules. The criteria pollutant aspects of the R 285 exemption need to be worked out between AQD and EPA, and are outside the scope of this Workgroup.

The 7/30/13 redraft of the discussion paper proposes to focus on only the future listed TACs in the proposed change in emissions, although a baseline Hazard Potential (HP) can be based on non-TACs as well as TACs. Further, it is proposed that changes that may have occurred in SLs since the baseline HP was established should not affect the validity of that baseline HP. This and other circumstances are shown in Examples that have been added to the discussion paper. It is also proposed that carcinogens and noncarcinogens be kept separate in the HP comparison procedure. Members stated that they needed more time to review the redraft and the Examples, and some Members were interested in evaluating more data and situations. One Member thought that additivity should be accounted for in the HP for compounds with a common mode of action.

Bob mentioned that we are getting AQD District staff review and input on the approach, since the AQD district inspectors will be the staff that primarily utilize the rule and will be responsible for evaluating compliance. Therefore the draft definitions for the rules, and an accompanying AQD Policy and Procedure should be very clear, for staff as well as the regulated community.

In the Discussion Paper it describes that there will not be a floating baseline, and no grandfathering will be allowed. For example, it is proposed that if a permit was issued before the air toxics rules were promulgated on 4/17/92, then those air toxics emissions cannot be relied on by the source for establishing the baseline for an HP calculation for the R 285 exemption.

For the evaluation of a "Meaningful change in the quantity and nature," a Member stated a concern that if a baseline is set for a chemical and SL, and then that SL is subsequently reduced, then a proposed process change could be inappropriately exempted based on comparison to that old higher SL. Since the level of protectiveness is not current, the Member reasoned, then the reliance on that baseline is not legitimate and the exempted HP increase could actually be much greater than 10%. Bob stated that he did not believe that the HP calculation procedure would have that unintended result. The emission estimates that form the basis for the baseline permit application and review establish a level of acceptability under the air toxics rules. When a proposed change is considered, the HP comparison is utilized as a surrogate for modeling. Even if the SL used in the baseline situation has decreased, the original SL and modeling assessment still relates the emission rate to an acceptable impact. This finding should mean that the baseline HP is still legitimate, even if the SL has since been lowered. However, this needs to be better explored in detail in some examples, so that all can see how it would work and ensure that the HP comparison appropriately limits exemptions to small increases.

For the evaluation of a "Meaningful increase in the quantity of the emission," a Member asked how this would work if the substance had a change in the SL over time. For example, if the SL decreased significantly, it does not seem appropriate to allow an exemption for up to a 10% increase in the emission rate. Bob said that would be a concern, and we haven't yet developed examples to show how it should be handled; that will be done next for Workgroup review. Another Member asked if we could run an example using xylene, which has had a significant SL change.

The HP was described as being different from a hazard index or hazard quotient, and, the units in the calculations should be consistent but otherwise are not really meaningful. The HP does not relate to a

specific level of hazard or risk; it is simply the ratio between the emission rate and the SL for a specific emission.

A Member had a concern that companies could perform their own meaningful change calculations and take the exemption without DEQ review or approval. Another Member noted that companies do so at their own risk of retroactive enforcement, and they do get inspected, therefore there is a strong incentive for companies to apply the exemption carefully and correctly, and there is a potential check by DEQ.

A Member suggested that AQD could provide a standard template for performing the meaningful change calculations, to promote consistency and clarity. Another Member suggested that the rules should contain as much detail as possible, therefore reducing the remaining details to appear in a Policy and Procedure document.

The proposed definition of the key terms stated that a change that is not meaningful should not cause an exceedance of odor thresholds in the ambient air, among other things. Bob stated that the process changes could result in odor issues, and we might not find out about the odor issue until it is a problem. The proposal does not include calculating an HP for odors. Inclusion of this language raised concerns for several Members. It was mentioned that a lot of compounds don't have published odor threshold data. Further complicating this, unexpected chemical reactions or transformations could cause odor problems. Several Members disagreed with involving odor assessment as a regulatory tool in permitting, including exemptions from permitting; R 901 addresses odor problems, and exemptions do not allow a public nuisance. The Workgroup agreed that the odor language should be removed from the proposed definitions that would appear in the rules, but that the Policy and Procedures document should state that odors could potentially be an issue with the process changes, that odor impacts should be considered as appropriate, and that R 901 would apply.

It was suggested that DEQ staff develop a table for the "Meaningful Change Discussion Paper" that summarized the examples, HP and risk or SL to help understand the issues.

The language with the generally agreed upon changes at the meeting was as follows: (without yet having a formal consensus vote on the recommendation)

A-1(2) Meaningful Change

> "The ATW recommends that the AQD clarify Rule 285 permit exemptions for relatively small changes in air toxics emissions for existing processes by adopting the definitions and procedures described in the July 30, 2013 ATW discussion paper on this issue.

Additional detail for A-1(2):
These small changes in air toxics emissions will be considered a change that is less than "meaningful". Both a "meaningful increase in the quantity of the emission" and a "meaningful change in the quality and nature" of emissions will be defined in the AQD's Part 2 Rules. The proposed definitions continue the AQD policy and practice of considering air toxics emission increases or hazard potential (HP) increases of less than 10% as not meaningful for purposes of the Rule 285 exemption. A policy and procedure document should clarify that the applicant shall consider odor impacts as appropriate.

> **"Meaningful increase in the quantity of the emission"** means an increase in the potential to emit (hourly averaging time) of a toxic air contaminant that is 10% or greater compared to a baseline potential to emit, or which causes an exceedance of a permit limit. The baseline is the potential to emit established in an approved PTI application on or after 4/17/92 that has not been voided or revoked, unless it has been voided due to incorporation into a renewable operating permit.

> **"Meaningful change in the quality and nature"** means a change in the toxic air contaminants emitted that results in an increase in the cancer or noncancer hazard potential that is 10% or greater, or which causes an exceedance of a permit limit. The hazard potential is the value calculated for each toxic air contaminant involved in the proposed change, before and after the proposed change, and it is the potential to emit (hourly averaging time) divided by the IRSL or the adjusted annual ITSL, for each toxic air contaminant and screening level involved in the proposed change. The adjusted annual ITSL is the ITSL that has been adjusted as needed to an annual averaging time utilizing averaging time conversion factors in accordance with the models and procedures in 40 C.F.R 51.160(f) and Appendix W adopted by reference in R 336.1299. The percent increase in the hazard potential is determined from the highest cancer and noncancer hazard potential before and after the proposed change. The potential to emit before the proposed change is the baseline potential to emit established in an approved PTI application on or after 4/17/92 that has not been voided or revoked, unless it has been voided due to incorporation into a renewable operating permit."

A-1(6) TAC List

The Facilitator presented three summary paragraphs that were distributed by email prior to the meeting for discussion. The proposed draft recommendation language was discussed and modified as follows:

> "In order to rationalize the list of TACs while still assuring protection of the public health, it is recommended that the AQD pursue development of rules to implement the approach described in the May 13, 2013 draft discussion paper to establish a defined list of TACs subject to R 225, (while otherwise retaining the authority to address other air toxics of concern on a case by case basis in a specific PTI application under a modified R 228), and with the authority to add and delete from the list based on the application of the same criteria described in the May 13, 2013 discussion paper for establishing the list (i.e., proposed additions would be carcinogens and air toxics that would have ITSLs lower than the 75th %tile SL cutoff values that are reasonably anticipated to appear in a PTI application.
>
> Rule development will also provide that the proposed initial TAC list and basis for each SL should be public noticed for comment. The rule will define the procedure for posting for public comment the initial list and initial SLs, any proposed additions/deletions to the TAC list, and any proposed changes to the SLs. The agency should have the authority to immediately implement those changes prior to public comment (as necessary to address significant issues in permit applications while not slowing down the permitting process). Aggrieved parties should have the ability to request AQD to review the basis for a listing or an SL. Justifications for the SLs should be posted on the AQD web site. The justifications should indicate the date of the SL derivation, the algorithm used, the uncertainty factors used, a brief description of the key studies or information sources for the SL, and citations for those key studies and information sources."
> The AQD should adopt rule language to give assurance that only reliable studies will be utilized in deriving screening levels, such as the following adaptation of the DEQ RRD's current rule definition for "Best available information," which "…means, when used in relation to a risk assessment or the development of screening levels, the most scientifically credible and relevant data available for a particular air contaminant. Such information may include, but is not limited to, any of the following:
>
> (iv) The peer reviewed scientific literature.
> (v) Information sources recognized by the risk assessment community, such as the integrated risk information system maintained by the USEPA or other scientifically reliable databases.
> (vi) Other scientific studies acceptable to the department."

Regarding the last paragraph, a Member stated that the overall approach seems backwards, to remove over

250 TACs (with default ITSLs) from the list, and to require much scientific evidence for listing. That Member supports the status quo with the retention of the default SLs and the listing of those air toxics. Another Member also had a concern that the proposed TAC list excluded substances with default ITSLs. The Facilitator noted that this comment on the default value would affect the previous agreed upon language for recommendation A-1(7) (AQD should be consistent with nearby states). Another Member pointed out that this is a huge philosophical issue: whether something should be regulated when there is no evidence of harm; such regulation would be arbitrary because there is no rational basis for regulation. Other Members felt that, in the absence of sufficient chemical-specific toxicity data, decisions on whether to regulate substances should consider persistence, bioaccumulation, hazards, listing by other agencies, or structure-activity relationships. Staff responded that substances will be evaluated using the best available information, whether they appear on the TAC list or using the authority under R 228 for non-TACs. A Member agreed that permit applications would continue to identify all air contaminants in proposed emissions, and the AQD would retain authority to safeguard the public health for non-TACs.

A Member distributed draft rule language that included a provision for a contested case review. AQD staff asked if that was considered an important provision, given that there are other ways for parties to interact with AQD to resolve issues. The Member reiterated that it was important to the regulated community to have a formal process to contest agency determinations, outside of when the agency applies it in a permitting action, and that the environmental community may also want that provision. The provision may be rarely utilized, but it would create an incentive for the agency to listen to a legitimate technical argument.

A Member asked if the 75th percentile cutoff criterion for the TAC list could be coupled with an emission rate, because high emissions could raise concerns even if ITSLs are relatively high. Staff responded that it did not seem feasible to do that for the list creation; however, AQD can develop internal procedures to help ensure that proposed emissions of non-TACs in permit applications will be assessed in view of their emission rates. The Member questioned the application of the 75th percentile cutoff for ITSLs with a 1-hour averaging time, because the cutoff seems relatively low (300 µg/m^3) and the number of substances is relatively small; perhaps the TAC list should be more inclusive of this group. Staff responded that this group presumably has a relatively lower ITSL distribution because it is a relatively more acutely toxic subset of the substances that have TLV occupational exposure levels. Staff will re-evaluate this group of 1-hour ITSLs and present findings to the Workgroup with a recommendation.

A Member's draft rule language was discussed with regard to the "fast backstop" issue for addressing non-TACs in permit review. It was explained the Member's draft rule language for the TAC list does not include a provision for that, because it will be included in R 228.

A consensus vote was postponed until the September meeting.

There was some discussion as to whether or not the ATW charge was met, which is:

> *The Air Toxics Workgroup (ATW) of the Air Quality Division (AQD) will provide meaningful input to the AQD in addressing ORR Recommendation A-1 and other air toxics rule issues as identified by the ATW and AQD members. The ATW will help ensure that the rules are updated, streamlined, protective of public health and not excessively burdensome. By August 1, 2013 the ATW shall have recommendations to the AQD."*

The Members felt that the first part of the charge has been met and that meaningful input has been provided on all of the ORR report's air toxics recommendations. However, they felt that they would need to see specific rule language before they could provide final recommendations.

A-1(5) Pollution Control Projects

The Workgroup agreed that this topic overlaps with the meaningful change and the TAC list issues, and the exemptions being evaluated by the AQD Permit Exemptions Workgroup. Therefore, this issue is in a "holding pattern" pending resolution of the other issues, and, staff and this Workgroup should coordinate with the Permit Exemptions Workgroup.

Action Items to be Completed Prior to the Next ATW Meeting

- Workgroup Members will review the updated "Meaningful Change Discussion Paper" and submit specific examples, as appropriate.
- Bob will add more meaningful change example to the Discussion Paper, utilizing xylene, and add more detail to all examples.
- The AQD will develop a table for the "Meaningful Change Discussion Paper" that summarized the examples, HP and risk or SL to help understand the issues.
- The Facilitator will send out meeting summaries of the July and August meetings.
- A final meeting in September will be scheduled.
- A draft summary report will be developed by Joy and Bob and sent out before the September meeting.
- The Exemptions Workgroup will be contacted for coordination.

Meeting Summary prepared by: Joy Taylor Morgan, Facilitator, and Bob Sills; August 12, 2013.

Agenda	MDEQ's Air Toxics Workgroup Meeting 9 September 25, 2013 9:00 AM to noon Art Iverson Conference Room Constitution Hall, 3rd South	
Agenda Topics		
	Facilitator: Joy Taylor Morgan	
9:00	Consistent with Nearby States A-1(7) and Voting on A-1(7)	Joy to Lead Discussion
9:30	Discussion of A-1(2) (Meaningful Change Issue) and Voting on A-1(2)	Joy and Bob to Lead
10:00	Discussion of A-1 (6) (air toxics list) and Voting on A-1(6)	Joy to Lead
10:30	Review Draft Definition of "Pollution Control Projects" and Examples to Address A-1(5) Vote on A-1(5)	Joy to Lead
10:45	Other Air Toxics Rule Issues	Bob Sills to Lead Discussion
11:15	Draft Final Report Input	Joy to Lead
Noon	Adjourn	Joy

APPENDIX C:

AIR TOXICS RULES OVERVIEW AND PREVIOUS AIR TOXICS RULES INITIATIVES (PPT)

MDEQ-AQD Air Toxics Rules Overview and Previous AQD Air Toxics Rules Initiatives

December 3, 2012
Air Toxics Workgroup 1st Meeting
Robert Sills, AQD Toxics Unit Supervisor

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Presentation Format

- Air Toxics Rules Overview
- Q & A

BREAK

- Previous AQD Air Toxics Rules Initiatives
- Q & A

2

1. Air Toxics Rules Overview

OUTLINE:

- Overview of State and Federal programs
- NREPA and Key Definitions
- Permit To Install (PTI) New Source Review (NSR)
- Permit Exemptions
- Air Toxics Rules: R224-232
- Health-Based Screening Levels (SLs)
- Demonstrating Compliance with the SLs

3

Michigan's Program (Rules 224 – 232)

- Applies to new or modified processes
- Technology Requirement
  - Reasonably achievable based on:
    - Economic Impact
    - Energy Impact
    - Environmental Impact
  - Specific exemptions, including federal program
- Health Risk Assessment - Screening Levels
  - SLs apply to all areas with public access (ambient air)
  - Higher cancer-based SLs for industrial property
  - Levels developed by toxicologists based upon methodology in the rules
  - Specific exemptions, including federal program & small quantities of non-carcinogens

4

Federal Program (Section 112 of Clean Air Act)

- Applies to new and existing sources
- List of 187 Hazardous Air Pollutants (HAPs)
- Technology Requirements
  - 170 specific standards developed since 1990
  - Case-by-Case Technology Determination for sources of HAPs greater than 10 TPY of a HAP or 25 TPY total HAPs
- Health Assessments
  - 32 source category Assessment Reviews for HAPs completed since 1990
  - Remainder of categories not yet completed

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What are Air Toxics?

State program:

- Toxic air contaminants (TACs) are defined as any substance which may be harmful at some concentration and duration, excluding 41 substances which either have national air quality standards (ozone, lead, SO_2, NO_2, PM, CO) or which are relatively nontoxic.
- (Air Pollution Control Rules, Part 55 of NREPA; Rule 336.1120(f))
- AQD has set health-based screening levels for approx. 1100 TACs.

Federal program: EPA CAAA of 1990 identifies 187 HAPs (chemicals or chemical groups)

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NREPA and Key Definitions

Natural Resource and Environmental Protection Act (NREPA) Act 451 of the Public Acts of 1994

- Part 55: Air Pollution Control
- "Air Contaminant": dust, fume, gas, mist, odor, smoke, vapor, or any combination thereof.
- "Air Pollution": outdoor air contaminants in quantities, conditions, and durations that are or can become injurious to human health, welfare, animal life, plant life, or property in MI; excludes worker health/safety, normal farming operations. For modes of transportation, not to be inconsistent with federal regulations.

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NREPA and Key Definitions

- Section 5505: The department shall promulgate rules to establish a permit to install program, applicable to each new or modified process or process equipment that emits or may emit an air contaminant.
- Section 5508: If a source is subject to a control technology standard for air toxics under the Clean Air Act (112d), then they are not subject to the State control technology requirement (T-BACT). If a source is subject to a federal residual risk standard (112f), then they are not subject to the State's SLs for the federal hazardous air pollutants (HAPs; n=187).
- T-BACT: Best available control technology for toxics

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NREPA and Key Definitions

- Section 5510: MDEQ may deny a permit to install if the source would violate Part 55 of NREPA or rules promulgated under Part 55, or if it presents or may present an imminent and substantial endanger-ment to human health, safety, or welfare, or the environment.
- Section 5512: MDEQ shall promulgate rules for controlling or prohibiting air pollution.

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Permit To Install (PTI) New Source Review (NSR): Key Definitions

- "Carcinogen"(Rule 103(c)): evidence of increased incidence of tumors in at least one well-conducted animal bioassay or human epidemiology study.
- "Initial Risk Screening Level" (Rule 109(c)) (IRSL): carcinogen ambient air concentration with an estimated lifetime cancer risk of 1 in 1 million.
- "Secondary Risk Screening Level" (Rule 119(c)) (SRSL): carcinogen ambient air concentration with an estimated lifetime cancer risk of 1 in 100,000.

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Permit To Install (PTI) New Source Review (NSR): Key Definitions

- "Initial Threshold Screening Level" (Rule 109(d)) (ITSL): an ambient air concentration that is used to evaluate noncarcinogenic health effects, as determined by Rules 229 and 232.
- "Toxic Air Contaminant" (Rule 120(f)) (TAC): any air contaminant which is or may become harmful to the public health or environment when present in the outdoor air in sufficient quantities and duration, excluding 41 listed substances (includes the 6 EPA criteria pollutants, relatively low toxicity or low concern substances).

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Permits to Install (PTI) and Permit Exemptions

- "Permit to Install" (Rule 116(f)): A permit authorizing the construction, installation, relocation, or alteration of any process, fuel-burning, refuse-burning, or control equipment.
- Permit to Install Exemptions: Rules 278-290 describe a variety of processes or situations that are not required to have a Permit to Install (and are therefore exempt from the air toxics rules, etc.). The AQD is initiating a stakeholder workgroup to review these rules.

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Air Toxics Rules: R224-232

- R224 = T-BACT requirement (Best Available Control Technology for Toxics)

Exemptions from the T-BACT requirement

- Units with a federal CAA standard (112(d)), 112(g), 112(j))
- Small emissions of TACs with relatively low potency
- VOC emission sources which must comply with Rule 702 (Best Available Control Technology (BACT))

ORR RECOMMENDATION: RESCIND PART OF R224: VOCs and R702

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Air Toxics Rules: R224-232

- R225: Health-based SL requirement. TAC emissions from a proposed new or modified emission unit or units cannot have a maximum predicted ambient impact (PAI) exceeding an ITSL or IRSL. If an IRSL cannot be met, a SRSL cannot be exceeded based on facility-wide emissions. Impacts on roads and industrial property can be 10X the IRSL or SRSL.

ORR RECOMMENDATIONS: SEVERAL FOR R225

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Air Toxics Rules: R224-232, cont'd

R226: Exemptions from the R225 SL requirement:

- Small quantity TAC emissions (excludes carcinogens and high concern noncarc.)
- HAPs from emission units subject to a federal residual risk-based MACT standard (CAA 112(f))
- Air toxics emissions regulated by EPA by 11/14/90
- TAC emissions that are demonstrated (case-by-case) to not cause or contribute to injurious effects or unreasonable aesthetic effects (i.e., R901), considering all relevant scientific information (R226(d)).

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Complimentary Programs

	Federal Program		Michigan Program	
Federal Technology Standard, Federal Health Assessment Done	**Tech Std**	**Health Std for HAPS**		**Health Std for Non HAPS**
Federal Technology Standard, No Health Assessment	**Tech Std**			**Health Std for all TACs**
No Federal Technology Standard, No Federal Health Assessment			**Tech Std**	**Health Std for All TACs**

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Air Toxics Rules: R224-232, cont'd

- R227: Demonstration of compliance with SLs, using any 1 of 3 approaches:
  - Use the Allowable Emission Rate (AER) algorithms
  - Use the Ambient Impact Ratio (AIR) matrix
  - Use the current air dispersion models (AERSCREEN, SCREEN3 or AERMOD) and the maximum hourly emission rate

For intermittent emissions, the average emission rate may be used, within limits.

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Air Toxics Rules: R224-232, cont'd

R228: Requirement for lower emission rate than required by T-BACT and SLs

- On a case-by-case basis, the department may determine a lower maximum allowable emission rate in order to ensure adequate protection of human health or the environment, considering all relevant scientific information, such as atmospheric deposition, indirect routes of exposure, or additive effects.
- This authority has been used to request some applicants to include deposition modeling or multipathway risk assessment information in their applications, and for staff to perform further evaluations for the public and the decision-maker.

ORR RECOMMENDATION: RESCIND R228

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Air Toxics Rules: R224-232, cont'd

R229: Methodology for determining SLs

- SLs shall be determined by the methodologies in Rules 231-232, or, alternative methods that are more appropriate as supported by the scientific data.

R230: Informational lists for the SLs and Rule 226(d) reviews for exemptions

R231: Cancer risk assessment methodology; ann. AT

R232: ITSL methodology; ATs of 1 hr, 8 hrs, 24 hrs, or annual

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SL List:

- includes ITSLs, IRSLs, and SRSLs
- Some chemicals have primary and secondary ITSLs (with different averaging times)
- Footnotes appear at end of the SL list

CAS No.	Chemical	note	1° ITSL (ug/m3)	ITSL Avg	2° ITSL (ug/m3)	ITSL Avg	IRSL (ug/m3)	SRSL (ug/m3)	IRSL Avg Time
7782-50-5	chlorine	13	0.3	annual	500	8 hr			
10049-04-4	chlorine dioxide		0.2	24 hr					
302-22-7	chlormadinone acetate		0.1	annual					
108-90-7	chlorobenzene		70	24 hr					
74-97-5	chlorobromomethane		10600	8 hr					
57-15-8	chlorobutanol		0.1	annual					
124-48-1	chlorodibromomethane						0.04	0.4	annual
75-45-6	chlorodifluoromethane		50000	24 hr					
668-45-1	chlorofluorobenzonitrile		0.1	annual					
67-66-3	chloroform						0.4	4	annual

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SL list Footnotes

- Footnote 13: This chemical has two ITSLs with different averaging times. Ambient air impacts cannot exceed either ITSL. Both ITSLs also apply for determinations of permit to install exemptions under R336.1290 (Rule 290).

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Chemicals Under Review as of 11/1/12

- updated monthly; on AQD air toxics website; sent out monthly to listserve

Date Initiated	Chemical	CAS#	Staff Contact
3/1/2012	Tetrahydrofuran	109-99-9	Mike Depa
3/26/2012	Di(2-ethylhexyl)phthalate	117-81-7	Doreen Lehner
3/26/2012	2,4-Toluene diisocyanate	584-84-9	Mike Depa
3/26/2012	Toluene diisocyanate (mixed isomers)	26471-62-5	Mike Depa
5/24/2012	Phenol	108-95-2	Cathy Simon
5/24/2012	Phosphorus	7723-14-0	Bob Sills
7/3/2012	Methyl chloride	74-87-3	Doreen Lehner
7/10/2012	Propyl bromide	106-94-5	Mike Depa
7/23/2012	Dibenzofuran	132-64-9	Doreen Lehner
7/23/2012	Phenanthrene	85-01-8	Mike Depa
7/31/2012	Styrene	100-42-5	Mike Depa
8/27/2012	Methanol	67-56-1	Cathy Simon
9/21/2012	Chlorobenzene	108-90-7	Cathy Simon

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Benchmarking
State Air Toxics Programs

- 30 States, including Michigan, have developed and implemented state air toxics requirements in their air permitting programs.
- State programs evaluate and regulate air toxics emissions and dispersion in their permit reviews, based on public health exposure concerns. These programs are intended to provide some assurance of public health protection by ensuring that air concentrations are kept at safe levels.
- State program details vary widely

ORR: be consistent with nearby states

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Permitting Questions

From the Public

- Is it safe for my children?
- Would you live here?

From the Companies

- What are the limits we must meet?
- Will you support our project?

Both groups want certainty and assurance.

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Is It Safe?
Common (paraphrased) comments:

- "This community already has a high rate of ___ . The facility would exacerbate the problem."
- "Our children would be forcibly exposed to the toxic brew spewed from the smokestacks."
- "The mercury would further contaminate the fish that we eat and harm fetal development for future generations."
- "Look at the long list of toxic chemicals to be put in the air we breathe. That can't be safe."
- "We are all getting asthma and cancer from the air pollution."

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Some Facility Examples

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Rubber Gasket Manufacturing

- Process installed without a permit
- Emission point was 40 ft from house
- No federal requirements
- Small emission source: < 1 ton/yr
- Highly toxic emissions
- Air Quality Division staff provided technical support to company throughout the permitting process

Once permitted, both company and resident will be assured that emissions will be safe

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Rubber Gasket Manufacturing
43 Air Toxics Emitted

Including these carcinogens:

- ***1,3-Butadiene***
- ***Benzene***
- ***Cumene***
- ***Methylene Chloride***
- ***Naphthalene***
- ***Styrene***
- ***1,4 Dichlorobenzene***
- ***Propylene Oxide***
- 2- Chloro-1,3-Butadiene
- ***Benzidine***
- ***Acetaldehyde***
- ***Carbon Tetrachloride***
- ***Chloromethane***
- ***Epichlorohydrin***
- ***Ethylbenzene***
- ***Hexachlorobutadiene***
- ***Isophorone***
- ***Pentachlorophenol***
- ***Bis(2-Ethylhexyl)phthalate***

HAPs are shown in bold *italics*.

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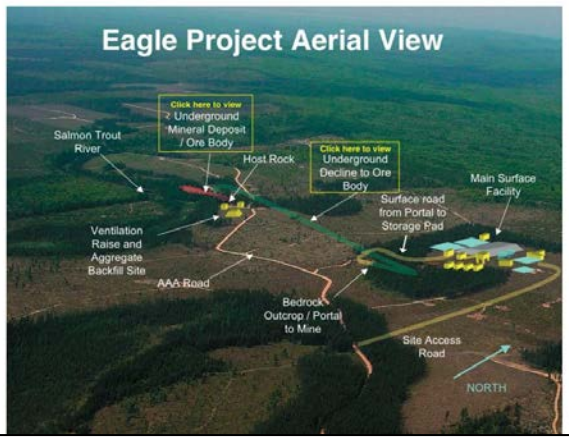
Kennecott Mine



30

Kennecott Air Permit

- No federal air toxics requirements
- Small source of air emissions
- Highly controversial
- Air permit was issued

Administrative Law Judge

Based on air rules, including Air Toxics Rules

- Found it did not pollute, impair, or destroy, including ambient air and deposition impacts
- Affirmed permit approval

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Kennecott Mine
7 Air Toxics Emitted

Carcinogens	Non-Carcinogens
Arsenic	Ammonia
Nickel	***Cobalt***
	Copper
	Manganese
	Sulfuric acid

HAPs are shown in bold *italics*.

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Marathon Refinery Expansion

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Marathon Refinery Expansion

- $1.8 Billion Expansion
- Largest private project in history of Detroit
- Federal Technology Requirements applied
- No federal health risk assessment
- Highly controversial
- Permit issued
- Permit was not appealed

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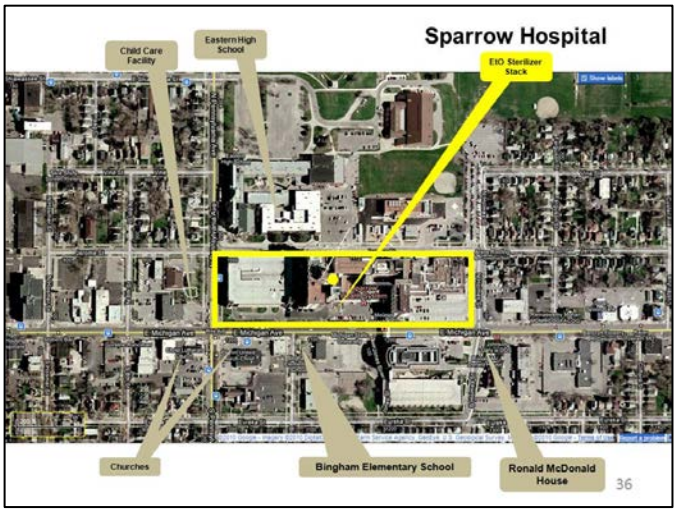
Marathon Refinery Expansion
88 Air Toxics Emitted
Including these carcinogens:

- ***1,3-Butadiene***
- ***Benzene***
- Gasoline
- ***Naphthalene***
- ***Carbonyl Sulfide***
- ***Arsenic***
- ***Chrysene***
- ***Dichlorobenzene***
- ***Formaldehyde***
- ***Chromium VI***
- ***Naphthalene***
- ***Nickel***
- ***Acetaldehyde***
- ***7,12-Dimethylbenz(a)anthracene***
- ***Benzo(a)anthracene***
- ***Benzo(a)pyrene***
- ***Benzo(b)fluoranthene***
- ***Benzo(g,h,i)fluoranthene***
- ***Beryllium***
- ***Cadmium***
- ***Dibenzo(a,h)anthracene***
- ***Indeno(1,2,3-cd)pyrene***
- ***Polycyclic aromatic hydrocarbons***
- ***3-Methylchloranthrene***

HAPs are shown in bold *italics*.

35



36

Ethylene Oxide (EtO)

- Known human carcinogen
- Mutagenic
- Irritating to eyes, nose & throat
- Causes toxicity to the nervous system & reproductive system
- Designated by EPA as one of the 33 air toxics presenting greatest threat to public health in urban areas

37

Federal Requirements

- Technology Standards for commercial and hospital sterilizers
- Does not require control
- Health risk assessment done for *commercial* sterilizers only (emissions of 10 tons/year or more)
- No health risk assessment done for *hospital* incinerators. Sparrow uses < 1 TPY EtO.

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Michigan's Experience

- Permitting EtO sterilizers since 1979
- EtO sterilizers located next to homes, schools, & child care facilities
- Hospital configurations often have air intakes & EtO exhausts co-located which reintroduces EtO into the hospitals
- Cancer risks from uncontrolled EtO sterilizers is **1 in 1,000** for nearby residents (100 – 1000 times higher than what is considered "safe")
- 1997 General Permit developed - requires add-on control (99.9% reduction in emissions)
- 28 General Permits issued – Average time 8 days

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Answers to the Permitting Questions

From the Public	From the Companies
▪ Is it safe for my children? **YES**	▪ What are the limits we must meet? **LEVELS ARE READILY AVAILABLE**
▪ Would you live here? **YES**	▪ Will you support our project? **YES**

Michigan's Air Toxics Program in concert with the federal program provides certainty and assurance.

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Questions?

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2. Previous AQD Air Toxics Rules Initiatives

The AQD air toxics program has a long history of utilizing stakeholder workgroup input to develop and revise the program.

The current initiative is the next step in the process.

We can benefit from an understanding of how and why the program evolved to its current form.

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1981 Final Report of the Special Air Advisory Committee (SAAC) to the MI Air Pollution Control Commission

- "A Proposed Framework for Processing Air Quality Permit Applications for New Emission sources of Non-Criteria Pollutants."
- SAAC members were from academia and industry (Dow Chemical, Upjohn).
- Charge: determine if a problem exists with regard to air emissions of non-criteria pollutants; if so, make recommendations.

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SAAC (1981) recommendations

- It is prudent to develop some guidelines (regardless of whether or not a "problem" can be argued to exist)
- Calculate acceptable ambient concentrations (AAC) of air toxics using occupational Threshold Limit Values (TLVs) or a toxicity model
- Perform dispersion modeling to calculate stack limits
- Apply framework to new sources only
- Supplement existing federal or state regulations; don't duplicate

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SAAC (1981) recommendations

- For a continuous emission source, 2.4% of the TLV is an appropriate AAC beyond applicant's boundary (i.e., TLV/42)
- Impacts of intermittent emissions should not exceed 10% of the TLV in any 8 hr workday, and never (1 hr or less) exceed 80% of the TLV
- If lacking a TLV, use a toxicity model and the best available mammalian toxicity data
- If modeled impact exceeds the AAC (NOT rigid values), initiate discussions; there may be adequate concern to deny the permit.

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SAAC (1981) recommendations

- For each chemical substance, there is a limit to the concentration that can be inhaled without producing biological effects
- Did not recommend a discrete set of air toxics for regulation
- In cases where the toxicity database is minimal, the AACs are not rigorously defensible from a purely scientific point of view

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SAAC (1981) recommendations

- Air toxics emission impacts that are 0.04 µg/m3 or less can be considered "trace" and be exempt from requirements for toxicity data
- A dilution factor matrix screens sources that may require dispersion modeling
- Emissions of carcinogens should be handled on a case-by-case basis; utilize an expert panel. An acceptable cancer risk target was not discussed.

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Final Report of the Michigan Air Toxics Policy Committee (MATPC) (1989)

A Proposed Strategy for Processing Air Quality Permit Applications for New Emission Sources of Toxic Air Pollutants

- Impetus: increasing awareness and concern for air toxics emissions, shortcomings of the federal program, and the MI system for review was not in rules.
- Charge: develop a strategy/rules to control and abate air toxics emissions from new and existing sources in MI.
- Members: academia, industry, MDPH, MEC, MCC, SEMCOG, MMA, WCHD

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MATPC (1989) Recommendations

- Focus *first* on new/modified sources
- Strategy should include requirements for both control technology and health assessment
- Some sources should be exempted from the rules and the permitting process
- The control technology requirement (T-BACT) should apply to all air toxics except 41; conditions for exemptions
- The health assessment requirement should apply to a large discrete list composed of available lists (n~ 1200), plus other contaminants of concern at a specific site.

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MATPC (1989) Recommendations

- Acceptable cancer risk targets: 1E-6 (IRSL); 1E-5 (SRSL) (based on demonstrated achievability, and, acceptability per AQD and APCC)
- Provisions for case-by-case analysis; screening methods may not provide for adequate protection, or, may be overly protective.
- Methods for deriving SLs.
- Trace concept: default ITSL = 0.04 µg/m3
- Intermittent emissions: averaging.

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MATPC (1989) Recommendations

- SLs ≠ ambient standards
  - Ambient standard : levels above considered safe, levels below considered unsafe.
  - SLs should be protective of public health, and allow the regulatory process to proceed. SLs are regulatory tools; not exact lines.
- ITSLs from occupational exposure levels (OELs): OEL/100.
- Recommended use of EPA's uncertainty factors (UFs) and modifying factors (MFs), and methods to derive ITSLs from limited data.

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Air Toxics Rule Development

- AQD's air toxics rules promulgated on 4/17/92
  - Complemented the air toxics regulatory program of the 1990 Clean Air Act Amendments (CAAA)
  - Adopted the recommendations of the 1989 MATPC report, with the notable exception of the list of air toxics subject to the health based risk assessment.

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Air Toxics Rule Development

- Draft rules with the "list of lists" defining the air toxics subject to the health risk assessment requirement (1200+), plus other air toxics on a case-specific basis, did not provide the certainty desired by the regulated community (based on comments received on the draft rules).
- Final rules (with industry support): health risk assessment for all TACs; informational lists of SLs for TACs; establish a Scientific Advisory Panel to review and make recommendations on the TAC SLs.
- The SAP (1992-1996) provided key guidance to AQD on several TAC issues. They did not recommend restricting the TAC list.

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Air Toxics Subcommittee (1997)

- "A New Regulatory Framework for Control of Toxic Air Pollutants"
- The ATPC was established by AQD and the AQD's Air Advisory Group (AAG) in 1995, as a subcommittee of the AAG.
- Members from AQD, industry, consulting, Wayne County, SEMCOG, and a citizen rep.
- Charge: to provide AQD with advice on air quality policy related issues that have raised concerns.

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Air Toxics Subcommittee (1997)

- Evaluated concerns with the air toxics rules:
  1. Should the health risk assessment be based on a finite list of compounds?
  2. Appropriateness of exposure assumptions and other assumptions used in the health screening analysis
  3. Should the AQD provide lists of chemicals for which the toxics review is only partially completed or under current review?
  4. Development of a SL outside of permit review
  5. Should applicants be required or allowed to propose a new/revised SL?
  6. How to define best available data for SLs
  7. Use mutagenicity data to establish UFs and SLs?
  8. Conformance with the federal CAA (T-BACT)

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ATS (1997) Recommendations

1. Should the health risk assessment be based on a finite list of compounds? No, but take other steps (next slide)
2. Exposure assumptions and other assumptions used in the health screening analysis. See slide for Recommendations.
3. Should the AQD provide lists of chemicals for which the toxics review is only partially completed or under current review? Yes (done)
4. Development of a SL outside of permit review? Yes. (worked into AQD's prioritization for new/updated SLs)
5. Should applicants be required or allowed to propose a new/revised SL? Yes, allowed (not required).
6. How to define best available data for SLs. Use EPA guidance.
7. Use mutagenicity data to establish UFs and SLs? No.
8. Conformance with the federal CAA (T-BACT). Yes (done).

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ATS (1997) Recommendations

1. Should the health risk assessment be based on a finite list of compounds?

A finite list is not recommended (i.e., no change).

Establish a "de minimis" exemption from the SL requirement for low emissions of non-high concern noncarcinogens (done; R226a).

Establish a new AER matrix (done; R227(1)(a)).

Replace the Dilution Factor Matrix with the AIR matrix (done; R227(1)(b)).

Do a "hot spots" study of SW Detroit (done; AQD's DATI studies of 2005 and 2010; EPA's NATA studies)

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ATS (1997) Recommendations

2. Exposure assumptions and other assumptions used in the health screening analysis.

Industrial areas should have 10-fold higher IRSLs and SRSLs. (done; R225(3); plus public roads)

Change default ITSL from 0.04 to 0.1 µg/m3 (done; R232(1)(i)).

Clarify case-by-case approaches (R228, R226(d)). Summary of R226(d) decisions available; criteria for conducting R228 assessments not available.

AQD should evaluate possible expansion of industrial scenario assumptions for noncarcinogens (done on a case-by-case under R226(d)).

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Questions?

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ORR Environmental ARC (2011)

Air Quality Subcommittee: Air Toxics Rules recommendations (paraphrased):

1. Rescind part of R224 (T-BACT): VOCs and R702
2. Limit R225 to modifications with >10% increase in Hazard Index
3. Exempt from R225 sources with MACTs
4. Exempt from R225 clean fuels
5. Exempt from R225 pollution control projects
6. Limit R225 to the HAPs list
7. Make R225 limits consistent with other states
8. R225 should not be used to require stack tests as emissions research
9. Rescind R228

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APPENDIX D:

MEANINGFUL CHANGE DISCUSSION PAPER

Air Toxics Workgroup (ATW)
Discussion Paper: Limit Permit Modification Reviews to Changes That Are Meaningful
January 15, 2014 Final Draft with revisions based on Members' comments

ORR (2011) Report Recommendation A-1(2):

R 336.1225 should be amended and specifically include the following:
Limit permit modification reviews to those increases in a Hazard Index exceeding 10% above the previously permitted baseline.

ATW Discussion

Discussion of this issue began at the May 15, 2013 ATW meeting. The idea is that Permit to Install applications and reviews would be more streamlined and staff resources would be conserved if previously permitted processes were exempted from R 225 when a company was proposing process changes involving only very minor changes in air toxics emissions. Although the exemption is not proposed to be limited to certain types of operations, the exemption would be particularly beneficial to painting/coating operations, which commonly undergo consumer-driven changes in suppliers or formulations typically involving relatively minor changes in air toxics emissions.

The ORR report recommendation mirrors an existing procedure that has been utilized by companies and AQD for numerous years to determine if a change may be exempt from the requirement to obtain a Permit to Install (PTI). Rule 285(b) and 285(c) state that a PTI is not required for:

"(b) Changes in a process or process equipment which do not involve installing, constructing, or reconstructing an emission unit and which do not involve any ***meaningful change in the quality and nature or any meaningful increase in the quantity*** *of the emission of an* ***air contaminant*** *therefrom.*
Examples of such changes in a process or process equipment include the following:
(i) Change in the supplier or formulation of similar raw materials, fuels, or paints and other coatings.
(ii) Change in the sequence of the process.
(iii) Change in the method of raw material addition.
(iv) Change in the method of product packaging.
(v) Change in process operating parameters.
(vi) Installation of a floating roof on an open top petroleum storage tank.
(vii) Replacement of a fuel burner in a boiler with an equally or more thermally efficient burner.
(viii) Lengthening a paint drying oven to provide additional curing time.

(c) Changes in a process or process equipment which do not involve installing, constructing, or reconstructing an emission unit and which involve a ***meaningful change in the quality and nature, or a meaningful increase in the quantity****, of the*

*emission of an **air contaminant** resulting from any of the following:*
(i) Changes in the supplier or supply of the same type of virgin fuel, such as coal, no. 2 fuel oil, no. 6 fuel oil, or natural gas.
(ii) Changes in the location, within the storage area, or configuration of a material storage pile or material handling equipment.
(iii) Changes in a process or process equipment to the extent that such changes do not alter the quality and nature, or increase the quantity, of the emission of the air contaminant beyond the level which has been described in and allowed by an approved permit to install, permit to operate, or order of the department." (emphasis added)

Additionally, Rule 285(f) exempts pollution control projects that do not generate a, "…**meaningful quantity of toxics air contaminants**." This is slightly different phrasing than found in R 285(b) and (c).

However, the terms "meaningful change in the quality and nature", "meaningful increase in the quantity", and "meaningful quantity of toxic air contaminants" are not defined in the Statute (NREPA) or in the Rules. The above Rules refer to "air contaminants", which is a general term that includes the six EPA criteria pollutants and air toxics. With regard to criteria pollutants, EPA has objected to the use of these undefined terms in the Rules, as part of the State Implementation Plan (SIP). With regard to the State-only air toxics rules, companies and AQD have utilized a paper presented at an AWMA conference (Avery, 1993; also contained in MDEQ (2005) as Appendix G) that describes a method for determining if a change in air toxics emissions is "meaningful" or not, for Rules 285(b) and (c). It is important to note that the 1993 Avery document was a result of numerous meetings and discussions with Michigan's automobile manufacturers. Market demand can be very difficult to predict, so the industry as a whole needed to implement a reasonable system to make coating substitutions quickly enough to meet consumer demands, while at the same time addressing the Permit to Install (Rule 201) requirements.

This method involves calculating the highest "Hazard Potential (HP)" for the *baseline* condition, which is calculated as the hourly potential to emit (PTE; pounds per hour, pph) divided by the IRSL or ITSL ($\mu g/m^3$, with the averaging time adjusted to annual, as needed). For the *proposed* condition, the HP is also calculated for each of the air toxics in a similar way. The change in HP is then calculated as the percent increase in HP from the baseline condition to the proposed condition. If there is an increase of 10% or greater, the change may be considered meaningful, and if the change is less than 10% then the change may be considered not meaningful, according to Avery (1993). Avery (1993) also states that proposed increases should be compared to the federal significant emission rates (based on potential to emit on an annual basis); any increase that is 10% or more of those rates should be considered meaningful. All relevant scientific information, including odoriferousness, effects on the environment, and non-inhalation routes of exposure should also be considered (Avery, 1993). In the example calculations provided, one example involved the calculation of the HP based on odor thresholds; the other examples involved air toxics screening levels (ITSLs and IRSLs) (Avery, 1993).

The ATW discussion noted that the meaningful change methodology of Avery (1993) also appears in the MDEQ (2005) report, "Permit to Install – Determining Applicability Guidebook" (*the Guidebook*). The Guidebook describes the method for determining if there is a *meaningful change in the **nature** of an air contaminant*, as a seven-step process:

1. Identify the TACs (for both the existing operation and proposed modification)
2. Calculate hourly potential to emit (PTE) (in pph)
3. Identify screening levels (ITSLs and IRSLs)
4. Calculate adjusted annual screening levels (all ITSLs with 1-, 8-, and 24-hour averaging times are converted to adjusted annual average ITSLs, using the SCREEN3 model conversion factors (1-hr AT/75; 8-hr AT/18; 24-hr AT/10))
5. Calculate Hazard Potential (HP) (hourly PTE ÷ IRSL or adjusted annual average ITSL)
6. Find TAC with highest HP (for both the existing operation and proposed modification)
7. Determine the percent change in HP (a 10% increase in HP is the criterion for "meaningful")

It should be noted that these steps do not mention the other relevant scientific information to consider, as mentioned in the Avery (1993) paper (odor thresholds; non-inhalation exposure; effects on the environment).

The Guidebook also describes the same general approach to determining if there is a *meaningful increase in the **quantity** of an air contaminant* (based on a criterion of a 10% increase). The examples provided in the Guidebook indicate that, **regardless of the HP calculations**, a proposed change **is exempt** from needing a PTI if it passes the Rule 278 requirements and is included under another specific exemption (e.g., Rule 286(e)); and, it is **not exempt** under R 285 if the proposed increase would exceed a permit limit (e.g., a VOC hourly emission rate limit).

Although EPA is not supportive of the undefined term "meaningful" in the Part 2 Rules with regard to the SIP and criteria pollutants, the approach should continue to be utilized for TACs if it is more appropriately defined in the Rules. Because the air toxics rules are not part of the SIP, EPA has no legal basis for reviewing Michigan's air toxics rules or an exemption from those rules based on however the DEQ defines a "meaningful" change in air toxics emissions.

The ATW initially discussed how the 10% is determined, and in particular, what is the baseline that is used. It was stated that, in historical practice by at least some parties, the baseline for a process can change outside of the permitting process (as allowed under R 285), so it can be difficult to know what the original baseline was. A Member mentioned that it does not make sense to compare an increase of all chemicals equally as they can have very different effects. Another Member stated that they are concerned with losing the R 285 exemption should AQD determine that it is inappropriately vague. There were also concerns expressed that with a 10% increase allowed under the exemption: the increase could be due to a more toxic compound; thresholds could be exceeded; and, multiple increments of 10% increases could potentially be compounded. Also, there was a comment that the goal should be a reduction in emissions, not an exempt increase in emissions. A Member thought that substances in a proposed emission that have a common mode of action should be evaluated cumulatively. Some Members also expressed a concern that, if the agency were to adopt a restricted list of TACs, then companies may be allowed

to make changes to non-TACs without obtaining a permit for the modification, if that is regarded as non-meaningful under R285. Members also expressed concern for how the procedures would handle instances when a chemical's SLs changed over time, between the time when the baseline was established and when there is a proposed change, for either the *proposed increase in the quantity* situation or the *proposed change in the quality and nature* situation. After these initial ATW discussions, the Members said they would like AQD to draft language to try to address this recommendation, and, provide detailed examples showing how the procedure would appropriately operate under the various circumstances that may be encountered.

AQD Discussion and Proposal

The concept that some "small" change, or increase, in air toxics emissions may be acceptable and exempted from requiring a permit, has been allowed under R 285 since 1992 (over 20 years). This is similar in principle to the assessment of proposed new/increased criteria pollutant emissions in areas that are modeled to exceed a NAAQS standard; such emissions of criteria pollutants are deemed as not causing *or contributing to* a NAAQS exceedance if the modeled impacts are below "significant impact levels (SILs)"; the various SILs vary from about 1-5% of the NAAQS.

AQD's position is that the key definitions for implementing R 285 should be in the Rules. The use of the currently available method for air toxics, as it appears in guidance documents (Avery, 1993; MDEQ, 2005), is not sustainable because the key terms are undefined in the rules and the procedure does not appear in the rules or in a DEQ Policy and Procedure. While addressing the EPA's objections to Rule 285 regarding the criteria pollutants is outside the scope of the ATW, the ATW can recommend an approach for air toxics.

AQD proposes that certain key elements of the available guidance (Avery, 1993; MDEQ, 2005) be developed into proposed Rules defining the key terms. Some aspects of the available guidance are proposed to be modified due to concerns of some ATW Members and AQD staff. Once promulgated as Rules, the definitions would be applied to R 285, for air toxics only. The greatest benefit for regulatory streamlining would be to clarify the key terms and enable the continued use of the R 285 exemption from needing a Permit to Install. If that can be accomplished, then there does not appear to be a significant additional benefit (in terms of easier or faster permit application development or approval) in developing a new Rule that would provide an exemption from R 225 for proposed changes that do require a permit (i.e., for proposed modifications that do not qualify for an exemption from needing a PTI under Rule 285 or any other exemption Rule). The Members generally agreed on that point.

Permit exemptions are designed to allow a person to install and operate an exempt process and to make certain changes to existing processes and process equipment without having to receive prior approval from the AQD. It should be noted that companies have the responsibility to maintain records to demonstrate compliance with any permit exemption rule being utilized. With regard to the exemptions addressed in this discussion paper, the relevant records would include the baseline and proposed PTE and the baseline SLs and the SLs for the proposed change. The AQD does not have a formal approval process for exemptions. That being noted, companies in Michigan are left

assuming all the risk of non-compliance because they do not receive any written supporting confirmation from AQD with respect to routine, minor changes that appear to be exempt from the air permitting process.

The proposed key definitions (which would appear in the Part 2 Rules) are:

"Meaningful change in the quality and nature" means a change in the toxic air contaminants emitted that results in an increase in the cancer or noncancer hazard potential that is 10% or greater, or which causes an exceedance of a permit limit. The hazard potential is the value calculated for each toxic air contaminant involved in the proposed change, before and after the proposed change, and it is the potential to emit (hourly averaging time) divided by the IRSL or the adjusted annual ITSL, for each toxic air contaminant and screening level involved in the proposed change. The adjusted annual ITSL is the ITSL that has been adjusted as needed to an annual averaging time utilizing averaging time conversion factors in accordance with the models and procedures in 40 C.F.R 51.160(f) and Appendix W adopted by reference in R 336.1299. The percent increase in the hazard potential is determined from the highest cancer and noncancer hazard potential before and after the proposed change. The potential to emit before the proposed change is the baseline potential to emit established in an approved PTI application on or after 4/17/92 that has not been voided or revoked, unless it has been voided due to incorporation into a renewable operating permit.

"Meaningful increase in the quantity of the emission" means an increase in the potential to emit (hourly averaging time) of a toxic air contaminant that is 10% or greater compared to a baseline potential to emit, or which results in an increase in the cancer or noncancer hazard potential that is 10% or greater, or which causes an exceedance of a permit limit. The baseline is the potential to emit established in an approved PTI application on or after 4/17/92 that has not been voided or revoked, unless it has been voided due to incorporation into a renewable operating permit.

It should be noted that the term "potential to emit" (PTE) is already defined in AQD's Rule 116(m).

The proposed definitions continue the AQD policy and practice of considering air toxics emission increases or hazard potential (HP) increases of less than 10% as not meaningful for purposes of the Rule 285 exemption. However, the definitions make clear that proposed changes are not exempt if they would result in the exceedance of a current permit emission limit (such as VOCs, or specific TACs), even if the increase in a TAC emission or in the HP is less than 10%. Furthermore, carcinogenic and noncarcinogenic effect-based SLs should be segregated from each other, not mixed together as in the current guidance. Many air toxics have IRSLs and ITSLs, and some have two ITSLs; the draft language makes clear that an HP must be calculated for all SLs. As a consequence of the segregation of carcinogenic and noncarcinogenic effects, if a proposed emission involves both an ITSL and an IRSL then a baseline would be needed for each in order to perform the HP calculation for each and to potentially qualify for the exemption. The draft definitions also continue the practice of converting ITSLs to adjusted annual average ITSLs using the EPA scaling factors (in the AERSCREEN guidance; EPA, 2011), despite the reservations of at

least one Member about the accuracy of those conversion factors; the practice is proposed to continue due to a lack of a more appropriate method. AQD modelers recommend the AT conversion factors in AERSCREEN over those in SCREEN3, because they are believed to be more accurate (Haywood, personal communication).

The proposed language indicates that the baseline for the HP calculation is a "fixed" baseline. This clarifies that it will not be allowable to change the baseline (i.e., have a "floating" baseline) outside of PTI review, a practice that could potentially result in the aggregation of HP increases over multiple rounds of process changes. A "floating" baseline could also contribute to confusion over how the % change in HP should be properly calculated.

The proposed language also makes reference to the date of the promulgation of the air toxics rules on April 17, 1992. This is intended to prevent the grandfathering of sources that have never undergone PTI review subject to the air toxics rules. Prior to this date, the level of air toxics assessment was inconsistent with current practices and should not be relied upon as providing assurance that air toxics emissions and impacts were sufficiently protective of public health.

As noted by one Member, there is a significant link between the "meaningful change" issue and the proposed restricted TAC list. If the ATW recommends that the AQD adopt a defined list of TACs, and if AQD proceeds to adopt that approach, that will have ramifications on how Rule 285 is applied under the proposed definitions. The key issue is, should non-TACs be accounted for in the HP calculation. If they are not, then the exemption would be more "streamlined", and, it may encourage some companies to switch to the use / emission of non-TACs. If that occurs to some extent, it may be viewed by some as generally good for the environment; for others it may raise significant concerns. Some Members felt that companies using the exemption would be involved in proposed process changes due to changes in product specifications or suppliers, and not in a deliberate effort to avoid permitting when changing to more toxic substances that are non-TACs. Staff feels that the procedures under a defined TAC list could still involve agency review of emissions of non-TACs, with potential placement on the TAC list if the listing criteria are met. Therefore, in the proposal, and as demonstrated in the examples in **Attachment 1**, only the listed TACs are accounted for in the HP calculations for the "proposed" scenario. However, a baseline HP remains legitimate even if it was based on a chemical that is not a listed TAC at the time of the proposed change.

A Member suggested that the HP calculation should account for the cumulative emissions and HP for substances that operate via the same mode of action. That has not been done before nor was it considered in the application of the Avery (1993) procedure, and a definitive process to complete that undertaking was not proposed by the Member raising this issue. Accounting for potential cumulative air toxics impacts has never been done during permit reviews under R 225 (although cumulative air toxics impacts have been assessed by staff under R 228, in a few limited cases). Therefore, this is not currently proposed. Example 1-8 in **Attachment 1** demonstrates the issue.

With the historical implementation of the Rule 285 exemption, as well as under the proposed definitions, there is reliance on whatever SLs are "current" at that point in time. It is recognized

that screening levels can change over time. For example, permitted emissions may have accounted for noncarcinogenic effects (ITSLs) in the permit application and review, while more recently one of the substances has been identified and regulated as a carcinogen. Or, an ITSL may have been changed to a more or less stringent value due to recalculation based on better data. Permits to Install do not expire, and permitted air toxics emissions are not re-visited according to any schedule or based on emerging toxicological data and SL changes. A PTI reflects a level of public health protection that is approvable at the time of the permit issuance. The AQD believes that the examples in the attachments sufficiently address these issues and demonstrate that the HP comparisons can help ensure public health protection despite changes that may occur to SLs over time.

The initial draft language for "meaningful increase in the quantity of the emission" that was discussed with the Workgroup did not address the issue of a change in the SL over time. One Member stated that leaving that possibility unaddressed could allow an exemption if the increase in PTE is less than 10%, even though the SL has decreased over time, which seems inappropriate. Staff agreed to evaluate and address this concern. Staff also saw a need to address cases where a permitted emission accounted for an ITSL (the only SL available at that time), but since that time an IRSL has been established. Therefore, the revised definition appearing in the present discussion paper update includes the phrase, "…or which results in an increase in the cancer or noncancer hazard potential that is 10% or greater…". Under this revised language, an increase in the PTE of less than 10% will still be not meaningful as long as the chemical has not had a change in the SL over time, or if the SL has increased. However, if the SL has decreased over time, then the HP calculation is used to determine if there has been a meaningful increase in the HP. If the chemical's "baseline" accounted for only an ITSL but there is now an IRSL, then there is no cancer baseline established and the exemption cannot be used.

The Workgroup also considered draft definitions for the key terms that tentatively included reference to odor concerns associated with proposed changes. Some Members expressed concerns about this. Staff stated that there could be odor threshold issues with such process changes, and often we might not find out about the odor issue until it is a problem. However, the initial proposed definitions did not call for calculating an HP for odors. Several Members disagreed with involving odor assessment as a regulatory tool in permitting, including exemptions from permitting. They reasoned that Rule 901 addresses odor problems, and exemptions do not allow a public nuisance. The Workgroup agreed that the odor language should be removed from the proposed definitions that would appear in the rules, but that a Policy and Procedures document could state that odors may potentially be an issue with the process changes, and that odor impacts should be considered as appropriate, consistent with the recent AQD Policy Guidance concerning when Rule 901 would apply.

Example calculations

Attachment 1 provides examples of how the above procedure and definition of "meaningful change in the quality and nature" would be implemented. **Attachment 2** provides examples of how the above procedure and definition of "meaningful change in the quantity of the emission" would be implemented. Some key points include:

1. The baseline HP can remain legitimate even if the HP driver is based on a SL that has changed over time. If the chemical which had the change in the SL appears in both the baseline and in the proposed scenario, then the current SL should be used in the HP calculation for the proposed scenario only.
2. The baseline is "fixed", not "floating".
3. The promulgation date of the air toxics rules in 1992 serves as a breakpoint to prevent grandfathering.
4. A focus on only the listed TACs for the proposed scenarios would be consistent with the adoption of a defined TAC list and the permitting process while still providing a reasonable assurance of public health protection.

The HP calculations require conversion of ITSLs that do not have annual ATs to "adjusted annual average ITSLs". The documentation for both the AERSCREEN and the SCREEN3 models provide conversion factors that relate the 1-hr AT modeled impacts to the associated annual AT impacts. The two sets of conversion factors are somewhat different. Staff prefers the use of the AERSCREEN conversion factors only, for consistency and because they are believed to be more accurate (Haywood, personal communication). Table 1 below provides those AERSCREEN conversion factors, and Table 2 provides the associated conversion factors to convert ITSLs with 8 hr and 24 hr ATs to adjusted annual average ITSLs for use in the HP calculations. Tables 3 and 4 provide a summary of the issues evaluated in the examples in Attachments 1 and 2.

Table 1. Averaging time conversion factors in AERSCREEN (EPA, 2011).

Conversion	Conversion factor
1 hr to 8 hr impacts	0.90
1 hr to 24 hr impacts	0.60
1 hr to annual impacts	0.10

Table 2. Averaging time conversion factors for use in HP calculations

Conversion to adjusted	Calculation, based on AERSCREEN factors	Conversion factor to convert ITSL to adjusted annual average ITSL for HP calculations
1 hr AT ITSL to annual	0.1	0.1
8 hr AT ITSL to annual	0.1 ÷ 0.9	0.11
24 hr AT ITSL to annual	0.1 ÷ 0.6	0.17

Table 3. List of the examples of "Meaningful change in the quality and nature" assessments in Attachment 1.

Ex. #	Summary
1-1	Proposed substitution of a baseline carcinogen with a carcinogen.
1-2	Proposed substitution of a baseline noncarcinogen with noncarcinogens; the baseline ITSL has decreased over time.
1-3	Proposed substitution of a baseline carcinogen with a noncarcinogen.
1-4	Grandfathered process proposed for a process change.
1-5	Proposed substitution of a baseline noncarcinogen with a noncarcinogen; the baseline ITSL has increased over time.

1-6	Proposed change from baseline noncarcinogens to a non-TAC.
1-7	Multiple rounds of exemptions over time; baseline is “fixed”, not “floating”.
1-8	Proposed addition of noncarcinogens with the same mode of action; potential concern for cumulative impacts.

Table 4. List of the examples of "Meaningful increase in the quantity of the emissions" assessments in Attachment 2.

Ex. #	Summary
2-1	Proposed increase in the quantity of the emission of a TAC.
2-2	Proposed increase in the quantity of emission of a TAC; the IRSL has decreased over time.
2-3	Proposed increase in the quantity of emission of xylene; the ITSL has had multiple changes over time.

References

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Attachment 1. Examples of Draft Methodology for:
"Meaningful Changes in the Quality and Nature" of the Emission of an Air Contaminant
August 22, 2013 Draft

Based on the methodology and definitions in the August 22, 2013 Updated Draft Discussion Paper on this issue, the following examples illustrate how the method would work. Even if not explicitly stated in these examples, the HP calculations are all appropriately based upon the potential to emit (PTE), and the noncarcinogenicity HPs are all based on adjusted annual averaging times (ATs). As described in the methodology and definitions, an HP is calculated for each chemical and SL in the baseline and future process scenarios. The HP is the PTE divided by the IRSL or ITSL (adjusted to annual AT). HPs for carcinogenic and noncarcinogenic effects are kept separate. Only the highest HP for each scenario (baseline and proposed) is then compared. If the change in HP is less than a 10% increase, then the change is not "meaningful" regarding the air toxics under Rule 285. The following examples focus on the HP calculation and whether or not the change in HP is meaningful or not; as discussed in the methodology and definitions, an exceedance of a permit limit can also trigger a meaningful change in TACs.

Example 1-1: Substitution of a baseline TAC carcinogen with a proposed TAC carcinogen.
Baseline and Proposal: Carcinogen A had an IRSL of 1 µg/m^3 (annual AT) and a potential to emit (PTE) of 0.01 pounds per hour (PPH), according to a 1993 permit application that underwent permit review and resulted in permit issuance without a limit for this substance. Today, that IRSL is the same value. It is proposed that carcinogen A be replaced by carcinogen B, with an IRSL of 0.08 µg/m^3 and a potential to emit of 0.001 PPH.

Assessment: The baseline was established by permit application and review after the air toxics rules were promulgated on 4/17/92, and an IRSL was in place at that time. Therefore, the emission rate was approvable at that time. The baseline HP is the hourly PTE ÷ the IRSL; the baseline HP = 0.01. The proposed HP is 0.0125. The proposed change represents a 25% increase in the HP. This change is "meaningful" and is not exempt from permitting. It may be noted that the baseline modeled impact was twice the IRSL; the source was approvable because the impact did not exceed the SRSL (10 µg/m^3). Although the baseline impact was only 20% of the SRSL, the comparison of the proposed HP to the baseline HP does not give "credit" for a baseline modeled impact that is far below the SL.

% Increase in HP = [(0.0125 - 0.01) ÷ 0.01] X 100 = 25% increase in HP

Chemical	PTE (pph)	Modeled impact µg/m^3 (AT)	IRSL (µg/m^3)	ITSL (µg/m^3)	AT	ITSL AT conver-sion factor	Adjusted annual AT ITSL	HP (PTE÷ IRSL or annual ITSL)
Baseline:								
A	0.01	2. (ann.)	1.					0.01
Proposed:								
B	0.001		0.08					0.0125

Example 1-2: Substitution of baseline noncarcinogens with a proposed emission of different noncarcinogens; the baseline ITSL has decreased over time.

Baseline and Proposal: Three VOC noncarcinogens were listed in a permit application for a process in 2005. The permit application was approved with a limit on total VOCs, but with no limit on these specific VOCs. The company now proposes to change from these VOCs to a different single VOC in the process. The permit limit for total VOCs will not be exceeded. The baseline was established with a highest HP value of 10. In 2008, the ITSL for the HP driver substance had a 10-fold decrease in the ITSL (annual average), and based on the *current* ITSLs for all baseline VOCs, the highest HP value is 100. The proposed VOC has a HP value of 15.

Assessment: The baseline HP remains at 10, despite the change over time of the ITSL for the HP driver. Therefore, the proposed change represents a 50% increase in the baseline HP, which is meaningful; it would not be exempt from permitting.

% Increase in HP = [(15 - 10) ÷ 10] X 100 = 50% increase in HP

It may be noted that a recalculation of the baseline HP using the current, lower ITSL for chemical A would result in a much higher HP (100), and the proposed HP (15) is lower than that. However, as stated above, the baseline HP is established at the time of the baseline permit application and review; it does not change over time if the SLs change. It is reasonable that this proposed change should not be exempted and should require a permit application, because the 2005 SL, PTE, and dispersion characteristics that were approvable in 2005, coupled with an increase of 50% in the HP, suggest that the proposed emissions would be "meaningful". It would not be appropriate to recalculate a higher baseline HP based on the SL change, re-set the baseline for the HP comparison outside of any permit review, and potentially conclude that this proposed HP is not meaningful.

Chemical	PTE (pph)	Modeled impact µg/m^3 (AT)	IRSL (µg/m^3)	ITSL (µg/m^3)	ITSL AT	ITSL AT conver-sion factor	Adjusted annual AT ITSL	HP (PTE÷ IRSL or annual ITSL)
Baseline (2005):								
A	100	10 (ann.)		10	annual	1	10	10
B	0.5	0.5 (8 hr)		500	8 hr	0.11	55	0.009
C	0.1	0.5 (1 hr)		10	1 hr	0.1	1	0.1
(Change in ITSL A in 2008, shown here only for demonstration purposes):								
(A)	(100)			(1)	(annual)	(1)	(1)	(100)
Proposed:								
D	10			3.9	24 hr	0.17	0.66	15

Example 1-3: Substitution of a baseline carcinogen with a proposed noncarcinogen.
Baseline and Proposal: The baseline involved 3 carcinogens only, with a highest carcinogenicity HP of 10. The proposal is to replace those with one noncarcinogen, with a noncarcinogenicity HP of 10.

Assessment: Although the HPs seem to suggest that this particular proposal may be approvable under Rule 225, the methodology does not allow calculations of HP change between carcinogens and noncarcinogens. The proposed change is not exempt from permitting. This is appropriate because cancer and noncancer hazards and risks are distinctly different and are managed differently in the air toxics regulatory program. For example, a carcinogen HP would be calculated based on the PTE and the IRSL, while a permit review may find acceptability of impacts based on compliance with the SRSL and up-to-tenfold higher allowable impacts on industrial property or public roadways. This does not relate readily to an assessment of meaningful change involving noncarcinogens. In the table below, it may be noted that the modeled impact for the baseline was 1 µg/m^3, which is 100 times higher than the IRSL (0.01 µg/m^3); this was approvable because the SRSL was used and the impacts exceeding the SRSL were on industrial property or roadways and did not exceed the SRSL by more than 10.

Chemical	**PTE (pph)**	**Modeled impact µg/m^3 (AT)**	**IRSL (µg/m^3)**	**ITSL (µg/m^3)**	**ITSL AT**	**ITSL AT conver-sion factor**	**Adjusted annual AT ITSL**	**HP (PTE÷ IRSL or annual ITSL)**
Baseline:								
A	0.1	1. (ann.)	0.01					10
B	0.01	0.1(ann.)	0.1					0.1
C	0.01	0.1(ann.)	1					0.01
Proposed:								
D	10			1	annual	1	1	10

Example 1-4: Grandfathered process proposed for a process change.
Baseline and Proposal: The process at this source has not undergone a permit review since the air toxics rules were promulgated on 4/17/92. They propose to replace a mixture that could be calculated to have a carcinogen HP of 10 and a noncarcinogen HP of 15 (based on the present-day IRSL and ITSL, respectively) with a mixture that has no carcinogens and a noncarcinogen HP of 10.

Assessment: Since a baseline was not established via permit review under the air toxics rules, it cannot be assumed that the historical or the proposed emissions provide the level of public health protection established under the air toxics rules. In other words, the acceptability of the historical emissions and impacts, based on the air toxics rules' benchmarks of acceptability, is unclear. Therefore, there is no benchmark HP established, and the proposed change is not exempt from permitting.

Chemical	**PTE (pph)**	**Modeled impact µg/m^3 (AT)**	**IRSL (µg/m^3)**	**ITSL (µg/m^3)**	**ITSL AT**	**ITSL AT conver-sion factor**	**Adjusted annual AT ITSL**	**HP (PTE÷ IRSL or annual ITSL)**
Historical:								
A	10	Accept-ability unclear	1					(10? cannot establish baseline)
B	165			100	8 hr	0.11	11	(15? cannot establish baseline)
Proposed:								
C	50			5	annual	1	5	10

Example 1-5: Substitution of a baseline noncarcinogen with a proposed noncarcinogen; the baseline ITSL has increased over time.

Baseline and Proposal: A baseline was established in a 2000 permit application, which resulted in permit limits for each of the air toxics. The 2 noncarcinogens had a highest HP of 100, posed by chemical A. Since that time (in 2010), the ITSL has increased by a factor of 10; as a result, the HP using that current ITSL *could* be recalculated to be 10. The proposed change would involve 2 different noncarcinogens, with a highest HP of 109.

Assessment: This proposed change represents a 9% increase in the baseline HP (from 100 to 109). This is not meaningful; it meets the exemption from permitting for air toxics. This finding is notwithstanding the now-lower HP (10) that *could* be calculated for the baseline emission of chemical A using the current ITSL (which, if compared to the proposed emission, would seem to result in a "meaningful" 990% increase in the HP). The finding of a non-meaningful change is reasonable, because the SL value, emission rate and dispersion modeling that were reviewed in 2000 for the baseline permit application determined that the emission was approvable (i.e., the ITSL value was not exceeded); those relationships still indicate that the proposed change would not be meaningful. In other words, if modeling were to be performed for chemicals C and D, there is presumptive evidence that it would pass modeling, in this case. Generally, at worse, the ITSL would not be expected to be exceeded by 10% or more if the increase in HP is less than 10%. The baseline established in 2000 is still valid, even though the ITSL for chemical A has increased over time.

% Increase in HP = [(109 - 100) ÷ 100] X 100 = 9% increase

Chemical	PTE (pph)	Modeled impact µg/m^3 (AT)	IRSL (µg/m^3)	ITSL (µg/m^3)	ITSL AT	ITSL AT conver-sion factor	Adjusted annual AT ITSL	HP (PTE÷ IRSL or annual ITSL)
Baseline:								
A	20	0.15(ann)		0.2	annual	1	0.2	100
B	10	20 (8 hr)		20	8 hr	0.11	2.2	4.5
(Change in ITSL A in 2010, shown here only for demonstration purposes):								
A	(20)			(2)	(annual)	(1)	(2)	(10)
Proposed:								
C	109			1	annual	1	1	109
D	300			300	1 hr	0.1	30	10

Example 1-6: Baseline is for a non-TAC.
Baseline and Proposal: In 2005 a coating process was permitted, including three noncarcinogenic TACs, with a permit limit for total VOCs. In 2015, the company proposes to change coatings, which would result in five different noncarcinogenic VOCs. They would not exceed their VOC permit limit. The baseline HP is 10, based on a compound that is not a listed TAC based on the air toxics rules revisions in 2014 which resulted in a defined TAC list. The next highest baseline HP is 1. The proposed change would involve 4 VOCs, of which only 2 are on the TAC list in 2015. The highest HP for the 2 TACs in the proposal is 10.

Assessment: The baseline HP is the highest HP for the air toxics that were described and evaluated in the 2005 permit application, permit review, and permitting, regardless of whether or not the HP driver is a listed TAC at the future date of a proposed process change. Even if the highest HP is based on a chemical that is no longer a TAC, that HP is a valid metric of the relationship between the emission rate and an approvable impact. The proposed HP is the highest HP of the TACs that are listed at the time of the proposed change (2015), so that assessment would include only the 2 listed TACs among the 4 VOCs in the proposal. Therefore, the baseline HP is 10 and the proposed HP is 10. There is no increase in the HP, so the proposed change meets the exemption from permitting for air toxics.

This is proper because the 2005 permit application and review accounted for the TACs, emission rates and impacts, which set the baseline appropriately despite the fact that the HP driver is not a listed TAC in 2015. The 2015 proposal focuses on only the listed TACs. Compounds in the proposal that are not listed TACs do not enter into the HP assessment. The rationale for this is that, if the source does go through permitting in 2015, the non-TACs would not need to be evaluated by the permit applicant for the acceptability of impacts. The non-TACs would also not be *routinely* evaluated by the AQD (they would only be evaluated, under R 228 authority, if AQD staff had a particular concern for the substance and emission rate).

Chemical	**PTE (pph)**	**Modeled impact µg/m^3 (AT)**	**IRSL (µg/m^3)**	**ITSL (µg/m^3)**	**ITSL AT**	**ITSL AT conver-sion factor**	**Adjusted annual AT ITSL**	**HP (PTE÷ IRSL or annual ITSL)**
Baseline:								
A	1	0.1 (ann)		0.1(default)	Ann.	1	0.1	10
B	0.7	0.07(ann)		0.7	Ann.	1	0.7	1
C	0.4	0.04(ann)		100	Ann.	1	100	0.004
Proposed:								
D	1			0.1	Ann.	1	0.1	10
E	100			40	Ann.	1	40	2.5
F	100			Non-TAC				N/A
G	100			Non-TAC				N/A

Example 1-7: Multiple rounds of exemptions over time.
Baseline and Proposal: A coating operation was permitted in 2000 with a permit limit for total VOCs and a permit limit for one noncarcinogenic TAC. All of the VOCs were noncarcinogenic. The baseline HP is 10. In 2015, they propose a change in the coating, replacing these VOCs with several other noncarcinogenic VOCs, only 3 of which are listed TACs. They do not exceed their VOC limit. The highest HP for the 2015 proposal is 2 (based only on the listed TACs). They qualify for the exemption, and do not apply for a permit. In 2017, they propose to make another change in the coating, involving several noncarcinogenic VOCs; among the 2 that are listed TACs, the highest HP is 8. Again, the VOC permit limit would not be exceeded.

Assessment: In 2017, the baseline HP is still 10; it did not change to 2 with the coating change in 2015, because they did not undergo permit review (if they had applied for and obtained a permit in 2015 that would have re-set the baseline.) Therefore, the proposed coating change in 2017, with a HP of 8 (a reduction from a baseline HP of 10), meets the exemption from permitting for air toxics.

Chemical	**PTE (pph)**	**Modeled impact µg/m^3 (AT)**	**IRSL (µg/m^3)**	**ITSL (µg/m^3)**	**ITSL AT**	**ITSL AT conver-sion factor**	**Adjusted annual AT ITSL**	**HP (PTE÷ IRSL or annual ITSL)**
Baseline:								
A	220	150(8 hr)		200	8 hr	0.11	22	10
Change in 2015 (exempt from permitting):								
B	66			300	8 hr	0.11	33	2
C	20			20	annual	1	20	1
D	25			50	annual	1	50	0.5
Proposed in 2017:								
E	220			250	8 hr	0.11	27.5	8
F	200			40	annual	1	40	5

Example 1-8. Proposed addition of noncarcinogens with the same mode of action; potential concern for cumulative impacts.

Baseline and Proposal: A company was permitted in 2013 for a process involving sulfuric acid emissions. Sulfuric acid has two ITSLs; the highest HP of 10 is derived from the annual ITSL. In 2015 they propose a change in the formulation used in that process; the new formulation contains the same level of sulfuric acid (so the emissions of sulfuric acid would not change), but it also has hydrogen bromide and hydrogen chloride (a.k.a., hydrochloric acid). The critical toxic effect of all three acids is irritancy to the eyes, nose, throat, and respiratory tract. All three acids have ITSLs with 1 hr ATs. The sulfuric acid and the hydrogen chloride also have ITSLs with annual ATs.

Assessment: Since there is no increase in the HP posed by the proposal, it is regarded as not meaningful and it meets the exemption from permitting for air toxics.

The common mode of action (irritancy), and the co-emission and therefore common points of modeled maximum ambient air impact, may raise a concern for a potential cumulative effect of irritancy. The HP procedure does not account for potential cumulative impacts. In this particular example, the baseline modeling resulted in modeled maximum ambient air impacts that were only 50% of the ITSL (annual AT) and 42% of the ITSL (1 hr AT). Although in some cases, an approved emission has a modeled impact that approaches or matches the SL, it is much more typical that proposed emissions are modeled to be well below the SL, as in this example. Nevertheless, as in this example, the procedure can result in an exemption when additional chemical emissions could have an interactive effect.

However, proposed changes would not be exempted if they would pose an increase in HP of 10% or greater. This restriction seems to limit the potential concern for cumulative effects. And, if such process modifications appeared in a permit application, they would typically not be evaluated for cumulative impact potential, except in infrequent cases under Rule 228 authority. In those cases of Rule 228 review, all relevant case-specific information would be taken into account, including reasonably anticipated environmental impacts and exposures, rather than a focus on only the modeled maximum ambient air impacts. For example, in this hypothetical situation, the baseline HP is driven by the modeled maximum ambient air impact with an annual averaging time, and, we can presume from the baseline modeling findings that the impacts in the proposal would all meet their respective ITSLs. This information alone does not suggest that this situation would raise sufficient concern for cumulative impacts to warrant more stringent emission limits under Rule 228.

Chemical	PTE (pph)	Modeled impact µg/m^3 (AT)	IRSL (µg/m^3)	ITSL (µg/m^3)	ITSL AT	ITSL AT conver-sion factor	Adjusted annual AT ITSL	HP (PTE÷ IRSL or annual ITSL)
Baseline:								
Sulfuric acid	10	0.5(ann.)		1	annual	1	1	10
Sulfuric acid	10	50 (1 hr)		120	1 hr	0.1	12	0.83
Proposed:								
Sulfuric acid	10			1	annual	1	1	10
Sulfuric acid	10			120	1 hr	0.1	12	0.83
Hydrogen bromide	10			70	1 hr	0.1	7	1.4
Hydrogen chloride	40			20	annual	1	20	2
Hydrogen chloride	40			2100	1 hr	0.1	210	0.19

Attachment 2. Examples of Draft Methodology for:
"Meaningful Increase in the Quantity of the Emission" of an Air Contaminant
August 22, 2013 Draft

Based on the methodology and definitions in the August 22, 2013 Updated Draft Discussion Paper on this issue, the following examples illustrate how the method would work. Even if not explicitly stated in these examples, the HP calculations are all appropriately based upon the potential to emit (PTE), and the noncarcinogenicity HPs are all based on adjusted annual averaging times (ATs). As described in the methodology and definitions, an HP is calculated for each chemical and SL in the baseline and future process scenarios. The HP is the PTE divided by the IRSL or ITSL (adjusted to annual AT). HPs for carcinogenic and noncarcinogenic effects are kept separate. Only the highest HP for each scenario (baseline and proposed) is then compared. If the change in HP is less than a 10% increase, then the change is not "meaningful" regarding the air toxics under Rule 285. The following examples focus on the HP calculation and whether or not the change in HP is meaningful or not; as discussed in the methodology and definitions, an exceedance of a permit limit can also trigger a meaningful change in TACs.

Example 2-1. Proposed increase in the quantity of the emission of a TAC.
Baseline and Proposal: A source was permitted in 1995 for an emission of chemical A. A permit limit was not included for chemical A in the permit. They would like to increase production by 10%, resulting in a 10% increase in the emission of chemical A. There has been no change in the SL for chemical A over time.

Assessment: The baseline is set by the emission rate as stated in the permit application, regardless of whether or not there is a permit limit. The modeling performed by the applicant and the agency in 1995 showed that the modeled maximum ambient air impact was only 50% of the ITSL. Nevertheless, the baseline HP of 10 would be increased by 10% in the proposal, therefore the proposal is regarded as a meaningful increase in emission and it is not exempt.

Chemical	**PTE (pph)**	**Modeled impact µg/m^3 (AT)**	**IRSL (µg/m^3)**	**ITSL (µg/m^3)**	**ITSL AT**	**ITSL AT conver-sion factor**	**Adjusted annual AT ITSL**	**HP (PTE÷ IRSL or annual ITSL)**
Baseline:								
A	10	0.5(ann.)		1	annual	1	1	10
Proposed:								
A	11			1	annual	1	1	11

Example 2-2. Proposed increase in the quantity of emission of a TAC; the IRSL has decreased over time.
Baseline and Proposal: A source was permitted in 2010 for a process with an emission of carcinogen A. They now propose a 5% increase in the process emission of this chemical. The IRSL was reduced in 2011 from 0.1 µg/m^3 to 0.01 µg/m^3.

Assessment: The baseline was approvable because the source complied with the SRSL; note that the modeled impact exceeded the IRSL, but only 5-fold, indicating that the SRSL was not exceeded. The baseline HP, which is based on the IRSL, is 100. An increase in emissions of only 5% would qualify for the exemption if there was no change in the IRSL. However, the IRSL has decreased, therefore the change in HP must be evaluated. Any decrease in the SL since the baseline was established must be accounted for in the "proposed" HP calculation for a proposal to increase the quantity of the emission of a TAC, just as it was in the **Attachment 1** examples of proposed changes in the quality and nature of TAC emissions. The proposal is associated with a 950% increase in the HP, utilizing the current IRSL for the "proposed" HP calculation; this is a meaningful increase and it is not exempt.

% Increase in HP = [(1050 - 100) ÷ (100)] X 100 = 950% increase

Chemical	PTE (pph)	Modeled impact µg/m^3 (AT)	IRSL (µg/m^3)	ITSL (µg/m^3)	ITSL AT	ITSL AT conver-sion factor	Adjusted annual AT ITSL	HP (PTE÷ IRSL or annual ITSL)
Baseline:								
A	10	0.5	0.1					100
Proposed:								
A	10.5		0.01					1050

Example 2-3. Proposed increase in the quantity of emission of xylene; the ITSL has had multiple changes over time.

Baseline and Proposal: A source was permitted in November, 1992 for a process with xylene emissions. The baseline HP was 10. In 2015, they propose to increase the xylene emissions 5%, from 510 pph to 535.5 pph.

Assessment: The proposed increase in the PTE is less than 10%, therefore it would meet the exemption if there was no change in the baseline SL. Since there has been a change in the baseline SL, the change in HP must be evaluated to see if there is a meaningful increase in the HP.

At the time of permitting in November, 1992, the ITSL for xylenes (mixed) was 300 µg/m^3 (24 hr AT). In 1993, the AQD's Scientific Advisory Panel recommended that the ITSL should be changed to 4400 µg/m^3 (1 hr AT), and AQD made that change. In 2003, the U.S. EPA finalized an RfC for xylenes in the IRIS database, and the AQD changed the ITSL to 100 µg/m^3 to be consistent with the RfC. At that time, the default AT assigned to RfC-based ITSLs was 24 hours, so the ITSL was set at 100 µg/m^3 with a 24 hr AT. In 2014, AQD promulgated rule changes which included a change in the default AT from 24 hours to annual for all ITSLs derived via the RfC or RfD methodologies, based on recommendations from their Air Toxics Workgroup in 2014. Therefore, in 2014 the ITSL changed to 100 µg/m^3 (annual AT).
% change in HP = [(5.35 - 10) ÷ 10] X 100 = 46% <u>decrease</u>

The baseline HP establishes a finding of acceptability for the SL value and the emission rate, accounting for the modeling of ambient air impacts. That baseline finding remains valid even if the SL changes over time. The 2015 proposal to increase the xylene emission rate must be evaluated with a "proposed" HP using the ITSL that is current at that time. Based on that HP comparison, the proposed change represents a decrease in the HP, which is regarded as not meaningful and meets the exemption for air toxics. For demonstration purposes, the interim changes in the ITSL are shown in the table below, although they do not pertain to the 2015 HP comparison. Note that, if the change was proposed when the ITSL was 100 µg/m^3 (24 hr AT), the HP increase (from 10 to 31.5) would have been 215%, and would not have been exempt.

Chemical	PTE (pph)	Modeled impact µg/m^3 (AT)	IRSL (µg/m^3)	ITSL (µg/m^3)	ITSL AT	ITSL AT conver-sion factor	Adjusted annual AT ITSL	HP (PTE÷ IRSL or annual ITSL)
Baseline in 1992:								
xylene	510	200		300	24 hr	0.17	51	10
(interim changes in ITSL, shown here only for demonstration purposes):								
xylene	(535.5)			4400	1 hr	0.1	440	(1.2)
xylene	(535.5)			100	24 hr	0.17	17	(31.5)
Proposed in 2015:								
xylene	535.5			100	annual	1	100	5.35

APPENDIX E:

CLEAN FUELS DISCUSSION PAPER

Air Toxics Workgroup (ATW)
Discussion Paper: Clean Fuels Exemption
June 11, 2013

ORR (2011) Report Recommendation A-1(4):
R 336.1225 (R 225) should be amended and specifically include the following: Exempt clean fuels such as natural gas, low sulfur #2 fuel oil, and non-chemically treated biofuels.

Summary

The ATW discussed how this exemption would help streamline the permitting process and provide an incentive for companies to use relatively cleaner-burning fuels. However, there were questions about how broad the exemption should be, and there was a need to characterize the ambient air impacts and the level of public health protection if sources were exempted from R 225 review. Therefore, toxic air contaminant (TAC) emission factors were compiled and the modeled ambient air impacts were compared to health-based screening levels. TAC emission estimates and modeled impacts are presented for engines, turbines, boilers, and process heaters that burn natural gas, low sulfur diesel, biodiesel, and wood. The ambient air concentrations of TACs for each fuel, process type and size which resulted in impacts above their respective screening levels (ITSLs and IRSLs) are provided, and for those TACs the critical toxic effects and basis for the screening levels are briefly discussed. Besides the modeling exercise for small, medium and large hypothetical facilities, TAC emissions and modeled impacts for several actual sources ("case studies") are also presented. As a result of these exercises, the ATW and AQD are much better able to make informed proposals about exempting such sources from R 225 review in permitting. Specific AQD proposals for ATW discussion are presented.

AQD Proposal for ATW Discussion

It is proposed that engines, turbines, boilers and process heaters burning solely natural gas, diesel fuel (#2 fuel oil), or biodiesel, of up to 100 MMBTU/hr, may be exempted from R 225, provided that the stack height is at least 1.5 times the building height.

These exemptions are proposed because they will provide significant streamlining of the permitting process for qualifying facilities and provide an incentive for relatively cleaner fuels to be utilized, while not significantly endangering the public health. These exemptions would be significantly broader than the current AQD permitting exemptions and variance (listed below in the "Background" section). Sources that do not qualify for the proposed exemption (i.e., sources larger than 100 MMBTU/hr burning these three fuels, plus wood-burning sources of all sizes) have relatively greater modeled levels of TAC emissions and impacts exceeding screening levels, as well as relatively greater levels of anticipated community concerns, therefore it is proposed that they not be exempted from R 225.

Key Terms

MMBTU/hour = million British Thermal Units per hour. Emission factors are commonly presented in, or can be converted to, units of pounds of a particular TAC emitted per MMBTU (lbs/MMBTU).

Biodiesel is defined as a vegetable oil- or animal fat-based diesel fuel consisting of long-chain alkyl (methyl, propyl or ethyl) esters. (The definition would be added to the Part 2 Rules.)

Background

Relevant current AQD permitting exemptions and requirements:

a. Rule 285(g) exempts from the requirement to obtain a Permit to Install, engines that have <10 MMBTU/hour maximum heat input.

b. Rule 282(b) exempts from the requirement to obtain a Permit to Install, several types of fuel and fuel-burning equipment, including natural gas combustion with a rated heat input capacity of not more than 50 MMBTU/hour.

c. Emission units that do not meet any of the exemptions from the requirement to obtain a Permit to Install must currently undergo R 225 review, with one notable exception. In 2006, the AQD suspended enforcement of R 225 for certain natural gas combustion units. This one-year variance has been renewed annually since then. This variance applies to emission units that combust natural gas as fuel and that meet either of the following criteria:

1. Fuel-burning equipment or natural gas fired equipment, with a maximum natural gas usage rate of 50,000 cubic feet per hour or less, where the emissions from the natural gas combustion are discharged unobstructed vertically upwards from an emissions discharge point at least 1.5 times the height of the building most influential in determining the predicted ambient impacts of the emissions.
2. Air pollution control equipment, as defined by Act 451, not limited in the natural gas usage rate.

The justification for the variance for natural gas combustion engines (refer to c. above) is that some of these processes would not meet the requirements of R 225 for one or more TACs (acrolein being one), and, requiring compliance with R 225 would create an undue hardship and would be out of proportion to the benefits to be obtained by compliance. Natural gas is recognized as an environmentally beneficial, clean burning fuel; there is no better readily available alternative fuel for some sources at this time. Good engineering practice will be applied to sources that qualify for the variance to assure a continuing level of public health protection. It may be noted that the conversion factor between cubic feet of natural gas and MMBTU is: 1000 cf = 1.02 MMBTU. Therefore, the above criterion in "c.1" of 50,000 cubic feet per hour is approximately equivalent to 51 MMBTU/hr.

General Approach

A wide range of air toxics are emitted by combustion of these fuels, including VOCs, acid gases, PAHs, and aldehydes. These air toxics pose hazards including carcinogenicity and irritancy. If it can be adequately demonstrated that the ambient air impacts of air toxics from these sources are sufficiently low and that the public health will be protected, then an exemption from R 225 may be appropriate. This report summarizes the TAC emissions

and modeled ambient air impacts for model facilities and the included fuels. This report also summarizes some case studies of actual permitted facilities of various sizes that utilize the evaluated fuel types, including the modeled TAC ambient air impacts and comparison of those impacts to screening levels. Additional details of both the modeling exercise and the case studies are available in a **Technical Support Document (TSD)**.

AQD staff performed modeling exercises to characterize the potential TAC impacts and public health concerns for reasonably anticipated sources and scenarios. TAC emission factors were obtained from the EPA's WebFIRE database (EPA, 2013), and air dispersion modeling was performed using EPA's AERSCREEN model. The available TAC screening levels (ITSLs and IRSLs) were used to "screen" the modeled impacts. The TACs, fuels, source types and sizes that did not pass this screen were noted, as well as the magnitude of exceedance of the screening levels (i.e., how much greater the modeled impact was, compared to the IRSL or ITSL).

One of the key concepts used to determine emissions for combustion processes is the amount of fuel burned per hour. Emission factors are commonly presented in, or can be converted to, units of pounds of a particular TAC emitted per million British Thermal Units (MMBTU), or lbs/MMBTU. In order to facilitate comparison between the processes, all emission rates were converted to lbs/MMBTU. The size of a particular fuel burning process is generally characterized in terms of heat output per hour, or MMBTU/hour.

Methodology

The modeling approach is outlined as follows:

1. Appropriate air toxics emission factors were selected, for boilers, turbines, engines, and process heaters. For a particular TAC and fuel type, the highest emission factor for any of these four source types was selected for the subsequent modeling and evaluation.
2. Only indirect combustion sources (processes where the products of combustion do not come in direct contact with a raw material being processed) were included.
3. The fuel types evaluated included natural gas, diesel fuel (a.k.a., No. 2 fuel oil[1]), wood/bark, and biodiesel. EPA does not have emission factors (EFs) for biodiesel in WebFIRE, therefore a literature search was performed.
4. For the purposes of this exercise, modeling was performed for relatively small, medium, and large source sizes (with representative values of 50 MMBTU/hour, 100 MMBTU/hour, and 500 MMBTU/hour, respectively).
5. The stack heights for the modeled small, medium, and large sources were 40', 60', and 80', respectively. These are believed to be fairly representative, for the purposes of this exercise. Other facility parameters (e.g., exit velocity (10 m/s); temperature (250F)) are believed to be reasonable values.
6. The assumed ratio of the stack height and building height (Hs/Hb) was 1.5.

[1] The predominant form of No. 2 fuel oil in use by Michigan facilities today is ultra-low sulfur diesel fuel. However, this is not an important distinction because the available air toxics emission factors do not differentiate based on the sulfur grade of the fuel.

7. The modeling grid used 25 m spacing, with 50 m from the stack to the nearest receptor.
8. The building dimensions were 100' X 100', and the stack was placed at the center of the building. Therefore, the nearest modeling receptor was approximately 150' from the stack and 100' from the edge of the building.

It should be noted that this methodology utilized some conservative elements and assumptions, including:

1. The highest available and appropriate emission factor was selected for each TAC, across the four source types, for each fuel type evaluated. In some cases, the highest EF had a quality rating that was lower than other EFs, e.g.: diesel, benzene ("E" highest EF was 17X higher than the "C" lowest EF; diesel, beryllium ("E" highest EF was 10X higher than the "D" lowest EF. In two cases, the highest EF utilized was actually reported as a "<" value: diesel, acrolein; and, diesel, arsenic. Details are provided in the TSD.
2. The emission factors utilized were for uncontrolled emission sources. Although some actual sources may have emission limits or controls, not all will, and the proposed exemption does not require emission control equipment. It may be noted, for example, that natural gas boilers may be subject to several regulations, including the following:
    - R 301 & 331 – Opacity and particulate matter emissions.
    - Part 4 – Sulfur Compounds.
    - R 702 – BACT for VOCs
    - Part 9 – Preventative maintenance and SU/SD emissions
    - NAAQS and PSD Increment compliance
    - Demonstration of compliance with applicable federal new source performance standards (NSPS), including subparts da, db, and/or dc.
    - Demonstration of compliance with applicable federal national emissions standards for hazardous air pollutants (NESHAPS), including subparts ddddd or jjjjjj.
    - PSD top-down BACT for all affected pollutants.
3. The nearest receptor point was fairly close to the building (100 ft), and the receptor point with the maximum modeled impact was selected for comparison to screening levels.
4. The model used to estimate ambient air impacts was AERSCREEN. This is a screening model, designed to give conservative results that would be equal to or greater than the results that would be expected from a refined model (Haywood, personal communication).
5. The public exposure potential was assumed to be continuous, at the point of maximum modeled impact. This may be fairly realistic for screening levels with short averaging times (e.g., 1-24 hr), but this is generally conservative for annual averaging times. For cancer risk assessment and other critical effects associated with chronic exposure, assumed continuous lifetime exposure at the point of maximum modeled impact is conservative.
6. Air toxics screening levels generally have uncertainty, and are designed to be protective of the public including sensitive subgroups. Therefore, a modeled ITSL

exceedance that is small in magnitude would not necessarily be expected to result in adverse health effects in a community. Cancer risk estimates are based on generally conservative extrapolation to low-risk estimates, using "plausible upper-bound" modeling, and, IRSLs are associated with a plausible upper bound lifetime incremental risk (1 in one million) that is considered acceptably low in the AQD's Permit to Install regulatory program.

It should also be noted that this methodology utilized some nonconservative elements and assumptions, including:

1. Background (aggregate) exposures to the same TACs are not accounted for. (Typical R 225 review would also not account for this; R 228 and R 226(d) reviews may account for it.)
2. Cumulative interactive exposures (multiple TACs) from co-emitted TACs and background exposures are not accounted for. (Typical R 225 review would also not account for this; R 228 and R 226(d) reviews may account for it.)
3. Potentially higher intermittent emissions during start-up, shutdown and malfunction episodes are not accounted for.
4. A single source scenario is evaluated in the methodology, however, a facility could potentially have multiple such engines, turbines, boilers and process heaters. (Typical R 225 review would also not account for this, unless the multiple units are part of the same project in the PTI application, or, if compliance with a SRSL is being demonstrated. R 228 and R 226(d) reviews may account for it.)

Results

The modeling exercise was a screening approach that was intended to identify fuel types and source sizes that may *potentially* result in modeled ambient air impacts that exceed ITSLs or IRSLs, based on the screening methodology. The screening exercise provides estimated SL exceedances that *could* occur, not exceedances that would be *expected* to occur. In those cases where a SL is exceeded, the following Tables also present the magnitude by which the modeled impact exceeds the ITSL or IRSL ("magnitude of SL exceedance"). Modeled ambient air impacts that exceed their screening levels should not necessarily be interpreted to mean that unacceptable public health risks exist and that an exemption is inappropriate. It does indicate the sources, fuels and TACs that warrant more focused consideration.

A. Natural gas

A total of 76 TACs had available appropriate emission factors for natural gas, for at least one of the four source types. Most EFs were for engines or boilers; process heaters had EFs only for formaldehyde. Cumulative (additive) cancer risks for small, medium and large sources were 9, 12, and 43 in one million, respectively. The TACs that had maximum modeled impacts exceeding an ITSL or IRSL were as follows:

Source Size (MMBTU/hr)	Chemical Name	SL* Type	SL ($\mu g/m^3$)	AT**	Magnitude of SL exceedance***	Process Type
50	1,3-Butadiene	IRSL	0.03	annual	3.0	Recip engine
50	Acetaldehyde	IRSL	0.5	annual	1.8	Recip engine
50	Acrolein	ITSL	5	1 hr	1.7	Recip engine
50	Acrolein	ITSL	0.02	annual	42.2	Recip engine
50	Ethylene dibromide	IRSL	0.002	annual	4.0	Recip engine
100	1,3-butadiene	IRSL	0.03	Annual	3.9	Recip engine
100	Acetaldehyde	IRSL	0.5	Annual	2.4	Recip engine
100	Acrolein	ITSL	5	1 hr	2.2	Recip engine
100	Acrolein	ITSL	0.02	Annual	56	Recip engine
100	Ethylene dibromide	IRSL	0.002	Annual	5.3	Recip engine
500	1,1,2,2-Tetrachloroethane	IRSL	0.02	annual	1.7	Recip engine
500	1,3-Butadiene	IRSL	0.03	annual	13.9	Recip engine
500	1,3-Butadiene	ITSL	2	24 hr	1.25	Recip engine
500	Acetaldehyde	ITSL	9	24 hr	2.8	Recip engine
500	Acetaldehyde	IRSL	0.5	annual	8.5	Recip engine
500	Acrolein	ITSL	5	1 hr	7.9	Recip engine
500	Acrolein	ITSL	0.02	annual	198.0	Recip engine
500	Ethylene dibromide	IRSL	0.002	annual	18.6	Recip engine

*Screening Level: Initial Threshold Screening Level (ITSL); Initial Risk Screening Level (IRSL)
** AT = Averaging Time associated with the Screening Level
***The magnitude of the IRSL exceedance can also be characterized as the incremental lifetime cancer risk in 1 million, and the magnitude of the ITSL exceedance can also be called the noncancer Hazard Quotient (HQ).

B. Diesel fuel (#2 fuel oil)

A total of 36 TACs had available appropriate emission factors for diesel fuel, for at least one of the four source types. Cumulative (additive) cancer risks for small, medium and large sources were 8, 13, and 56 in one million, respectively. The TACs that had maximum modeled impacts exceeding an ITSL or IRSL were as follows:

Source Size (MMBTU/hr)	Chemical Name	SL* Type	SL ($\mu g/m^3$)	AT**	Magnitude of SL exceedance***	Process Type
50	Arsenic	IRSL	0.0002	Annual	6.0	Engine turbine
50	Benzene	IRSL	0.1	Annual	1.01	Engine recip.
50	Chromium VI	IRSL	8.3E-5	Annual	1.44	Engine turbine
50	Manganese	ITSL	0.05	Annual	1.71	Engine turbine
100	Arsenic	IRSL	0.0002	Annual	7.9	Engine turbine
100	Benzene	IRSL	0.1	Annual	1.3	Engine recip.
100	Beryllium	IRSL	0.0004	Annual	1.1	Boiler
100	Cadmium	IRSL	0.0006	Annual	1.2	Engine turbine
100	Chromium VI	IRSL	8.3E-4	Annual	1.9	Engine turbine
100	Manganese	ITSL	0.05	Annual	2.3	Engine turbine
500	Acetaldehyde	IRSL	0.5	Annual	1.1	Engine Recip
500	Acrolein	ITSL	0.02	Annual	2.4	Engine Recip
500	Arsenic	IRSL	0.0002	Annual	28.0	Engine turbine
500	Benzene	IRSL	0.1	Annual	4.7	Engine Recip
500	Beryllium	IRSL	0.0004	Annual	3.8	Boiler
500	Cadmium	IRSL	0.0006	Annual	4.1	Engine turbine
500	Chromium VI	IRSL	8.3E-5	Annual	6.7	Engine turbine
500	Formaldehyde	IRSL	0.08	Annual	7.5	Engine Recip
500	Manganese	ITSL	0.05	Annual	8.0	Engine turbine

*Screening Level: Initial Threshold Screening Level (ITSL); Initial Risk Screening Level (IRSL)

** AT = Averaging Time associated with Screening Level

*** The magnitude of the IRSL exceedance can also be characterized as the incremental lifetime cancer risk in 1 million, and the magnitude of the ITSL exceedance can also be called the noncancer Hazard Quotient (HQ).

C. Wood

A total of 129 TAC Emission Factors were available for wood fired boilers. Cumulative (additive) cancer risks for small, medium and large sources were 27, 37, and 141 in one million, respectively. The TACs that had maximum modeled impacts exceeding an ITSL or IRSL were as follows:

Source Size (MMBTU/hr)	Chemical Name	SL* Type	SL ($\mu g/m^3$)	AT**	Magnitude of SL exceedance***	Process Type
50	Acrolein	ITSL	0.02	annual	21.72	Wood boiler
50	Arsenic	IRSL	0.0002	Annual	11.95	Wood boiler
50	Benzene	IRSL	0.1	Annual	4.56	Wood boiler
50	Chromium VI	IRSL	8.5E-5	Annual	4.58	Wood boiler
50	Formaldehyde	IRSL	0.08	Annual	5.97	Wood boiler
50	Manganese	ITSL	0.05	annual	3.48	Wood boiler
50	Silver	ITSL	0.1	8 hr	16.62	Wood boiler
100	Acrolein	ITSL	0.02	annual	28.78	Wood boiler
100	Acrolein	ITSL	5	1 hr	1.15	Wood boiler
100	Arsenic	IRSL	0.0002	Annual	15.83	Wood boiler
100	Benzene	IRSL	0.1	Annual	6.04	Wood boiler
100	Chromium VI	IRSL	8.5E-5	Annual	6.07	Wood boiler
100	Formaldehyde	IRSL	0.08	Annual	7.91	Wood boiler
100	Manganese	ITSL	0.05	annual	4.60	Wood boiler
100	Nickel	IRSL	0.0042	Annual	1.13	Wood boiler
100	Silver	ITSL	0.1	8 hr	22.02	Wood boiler
500	Acrolein	ITSL	0.02	annual	101.80	Wood boiler
500	Acrolein	ITSL	5	1 hr	4.07	Wood boiler
500	Arsenic	IRSL	0.0002	Annual	55.99	Wood boiler
500	Benzene	IRSL	0.1	Annual	21.38	Wood boiler
500	Benzo (a) pyrene	IRSL	0.0005	Annual	2.65	Wood boiler
500	Beryllium	IRSL	0.0004	Annual	1.40	Wood boiler
500	Cadmium	IRSL	0.0006	Annual	3.48	Wood boiler
500	Chlorine	ITSL	0.3	annual	1.34	Wood boiler
500	Chromium VI	IRSL	8.3E-5	Annual	21.46	Wood boiler
500	Chromium VI	ITSL	0.008	24 hr	1.34	Wood boiler
500	Formaldehyde	IRSL	0.08	Annual	28.00	Wood boiler
500	Formaldehyde	ITSL	9	8 hr	2.24	Wood boiler
500	Manganese	ITSL	0.05	annual	16.29	Wood boiler
500	Nickel	IRSL	0.0042	Annual	4.00	Wood boiler
500	Silver	ITSL	0.1	8 hr	77.86	Wood boiler
500	Total Dioxin TEQ****	IRSL	2.3E-08	Annual	2.66	Wood boiler

*Screening Level: Initial Threshold Screening Level (ITSL); Initial Risk Screening Level (IRSL)

** AT = Averaging Time associated with Screening Level

*** The magnitude of the IRSL exceedance can also be characterized as the incremental lifetime cancer risk in 1 million, and the magnitude of the ITSL exceedance can also be called the noncancer Hazard Quotient (HQ).
**** The EF for total dioxin TEQ is based on a boiler with a multicyclone air pollution control device. It was assumed that very little dioxin-like compounds would be captured using this device, therefore, it was deemed appropriate to use this EF as an "uncontrolled" process for the purposes of this assessment. EPA (WebFire) has EF for uncontrolled wood boilers for dioxins congeners which group dioxins by chlorine number. AQD was unable to allocate carcinogenic potency of these groupings because not all the individual congeners within a group are carcinogenic and/or do not have toxic equivalency factors.

D. Biodiesel

EPA does not have EFs for biodiesel in WebFIRE. A study by EPA (2008) was performed and the resulting EFs were used for this exercise. A total of 157 TAC Emission Factors were available for biodiesel fired boilers burning either soy or animal biodiesel. EFs for metals and acrolein were not available for biodiesel boilers. Another study (Cosseron et al., 2011) suggests that carbonyl compounds may be emitted at a higher rate than for petroleum diesel. Cumulative (additive) cancer risks for small, medium and large sources were 4, 6, and 23 in one million, respectively. The TACs that had maximum modeled impacts exceeding an ITSL or IRSL were as follows:

Source Size (MMBTU/hr)	Chemical Name	SL* Type	SL ($\mu g/m^3$)	AT**	Magnitude of SL exceedance***	Biodiesel Boiler Fuel Type
50	Formaldehyde	IRSL	0.08	Annual	4.19	SOY
100	Formaldehyde	IRSL	0.08	Annual	5.55	SOY
500	Formaldehyde	ITSL	9	8 hr	1.57	SOY
500	Formaldehyde	IRSL	0.08	Annual	19.62	SOY
500	Acetaldehyde	ITSL	9	24 hr	1.15	SOY
500	Acetaldehyde	IRSL	0.5	Annual	3.45	SOY
500	Formaldehyde	IRSL	0.08	Annual	1.88	Animal

*Screening Level: Initial Threshold Screening Level (ITSL); Initial Risk Screening Level (IRSL)
** AT = Averaging Time associated with Screening Level
*** The magnitude of the IRSL exceedance can also be characterized as the incremental lifetime cancer risk in 1 million, and the magnitude of the ITSL exceedance can also be called the noncancer Hazard Quotient (HQ).

Further details of the screening levels that were exceeded by the maximum modeled impacts for any of the fuel types are provided in **Appendix 1**.

The case studies of actual permitted sources are described in the **Technical Support Document**. In all cases, the modeled impacts met the SLs, but it is interesting to note the TACs that had ambient air impacts with the highest percentages of the SLs. Five sources burning natural gas were reviewed and summarized: one large source had relatively higher impacts (as % of SLs) for formaldehyde (72%), PAHs (36%), cadmium (15%), hexavalent chrome (12%), arsenic (8%), nickel (4%) and acrolein (2.6%), etc. Four diesel sources were summarized: the relatively higher impacts (as % of SLs) were for benzene (up to 37%), formaldehyde (up to 6.9%), benzo(a)pyrene equivalents (26%), naphthalene (up to 23%), and acrolein (up to 18%), etc. Four wood-burning sources were summarized: the

relatively higher impacts (as % of SLs) were for silver (97.7%), chrysene (75%), acrolein (56%), formaldehyde (47%), hexavalent chrome (41%), manganese (27%), chlorine (27%), naphthalene (18%), 1,3-butadiene (17%), arsenic(28%), ethylene dibromide (10%), and acetaldehyde (10%), etc.

Discussion

The rationale for potentially exempting from R 225 certain sources that burn certain fuels was evaluated by modeling hypothetical facilities, and by reviewing some actual case study facilities. Although there are uncertainties in the health-based screening levels and in the methodology utilized in the modeling exercise, the results may support reasonable risk management decisions for exempting certain sources from future R 225 reviews in Permit to Install applications. Significant streamlining of permit applications and permit reviews, and an incentive for sources to utilize relatively cleaner fuels, would be the benefit of a R 225 exemption. Based on the findings, it appears reasonable to propose R 225 exemptions for natural gas, diesel fuel (#2 fuel oil) and biodiesel combustion sources of up to 100 MMBTU/hr that have a stack height-to-building height ratio of at least 1.5. These exemptions are proposed to apply to single-fuel or multi-fuel units burning only these fuels. And, diesel fuel is intended to mean only non-recycled diesel fuel (not recycled used oil).

These proposed exemptions would be significantly broader than the current AQD permitting exemptions and variance (listed in the "Background" section). Sources that do not qualify for the proposed exemptions (i.e., sources larger than 100 MMBTU burning these three fuels, plus wood-burning sources of all sizes) have relatively greater modeled levels of TAC emissions and impacts exceeding screening levels as well as relatively greater levels of anticipated community concerns, therefore it is proposed that they not be exempted from R 225.

It may also be noted that if an applicant is applying for a PTI for a unit that is not exempt from R 225, and is attempting to demonstrate compliance with a SRSL for a TAC, then they must account for facilitywide emissions of that TAC, including emissions from units that are exempt from R 225 or exempt from requiring a PTI. That approach is consistent with AQD's past policy.

Appendix 1. Summary of the Screening Levels That Were Exceeded By Modeled Impacts

Noncarcinogenic Effects

Eight TACs had ITSLs that were exceeded when impacts were modeled, for certain size, fuel and process types. Modeled impacts are listed below as Predicted Ambient Impacts (PAIs).

1) Acrolein
    a. Acrolein Acute SL: 5 µg/m³ with a 1-hr averaging time
        i. The Acute SL for acrolein was exceeded for these fuels and size processes:

Fuel	Size	PAI* (µg/m³)	Ratio of PAI/ITSL	Ratio of PAI/14 µg/m³
Wood	Medium	5.76	1.2	0.41
Wood	Large	20.36	4.1	0.60
Nat Gas	Small	8.45	1.7	0.80
Nat Gas	Medium	11.20	2.2	1.45
Nat Gas	Large	39.60	7.9	2.83

        ii. The basis of the acute acrolein ITSL is a study (Darley et al., 1960) where 36 healthy human (student) volunteers were exposed (eyes only) to 140 µg/m³ for 5 minutes. Severity of eye irritation was measured subjectively in test subjects and controls as 0=no irritation, 1=mild and 2=severe. The low dose of 140 µg/m^3 had an average irritation score of 0.47 compared to control subjects of 0.36. More significant irritancy at the higher dose of 3380 µg/m³ had an average eye irritation score of 1.2, which is slightly higher than mild irritation. The ITSL derivation utilized a total uncertainty factor of 30, including 10 for human variability and 3 to account for mild irritation effects at the low dose. Another benchmark could be calculated as 14 µg/m³ (using a total uncertainty factor of 10 for protection of sensitive individuals and duration uncertainty). In another key study (Weber-Tschopp et al., 1977), eye irritation occurred in people exposed to 210 µg/m^3 and irritation of the nose and throat occurred at 690 µg/m^3, within a short time (5 minutes up to 1 hour). Applying an uncertainty factor of 30 (10 for human variability and 3 for irritant effects) to these effect levels would result in additional benchmarks of 7 and 23 µg/m^3. There is also a concern that sensitive subgroups, such as asthmatics, may be affected by irritants such as acrolein, as well as the additive effects from other TACs that may be co-emitted. The modeled acrolein impacts of the large natural gas source (39.6 µg/m^3, 1 hr AT) pose a relatively greater level of concern. Peak impacts for even shorter time periods (e.g., 5 minutes) would be expected to be even higher, and as shown in the key studies, could elicit effects over such short periods.

b. Acrolein Chronic SL: 0.02 µg/m³ with an annual averaging time.
   i. Fuel, Size and Process Scenarios

Fuel	Size	Worst Process	PAI (µg/m^3)	Ratio PAI to ITSL
Diesel	Large	Reciprocating Engine	0.05	2.4
Wood	Small	Boiler	0.43	21.7
Wood	Medium	Boiler	0.58	28.8
Nat Gas	Small	Reciprocating Engine	0.84	42.2
Nat Gas	Medium	Reciprocating Engine	1.12	56.0
Wood	Large	Boiler	2.04	101.8
Nat Gas	Large	Reciprocating Engine	3.96	198.0

   ii. The chronic ITSL for acrolein is based on an EPA RfC, which is based on a subchronic (3 month) rat inhalation study. Histopathologic changes described as "slightly affected" were found in the nasal cavity of 1 of 12 rats exposed to the lowest dose of 0.4 ppm (900 µg/m^3). The duration adjusted LOAEL (6 hours per day; 5 days per week; 6/24x5/7) = 160 µg/m^3. A total uncertainty factor of 1000 was applied. The animal dose was also adjusted to a human equivalent concentration using a regional gas dose ratio (RGDR) of 0.14. However, recent EPA guidance states that acrolein is among one of a number of compounds that act on the nasal passages via a mechanism in which the RGDR should be equal to 1 (i.e., the dose in rats equals the dose in humans). An alternative ITSL calculation reflecting this change in the EPA recommended approach would therefore be 0.16 µg/m³ with an annual averaging time. **The AQD will proceed to make that change to the ITSL.** It is also noted that California and Texas have chronic benchmarks, based on a more recent (2008) study, at 0.35 and 0.5 µg/m^3, respectively, based on a rat no-effect-level of 458 µg/m^3. The highest impact scenario comes from the large natural gas reciprocating engine scenario, with a fenceline ambient air concentration of ~4 µg/m³ (annual averaging time). This summary of the underlying key study and the application of uncertainty factors suggests that the maximum modeled impacts exceed the health protective benchmarks by a large margin, however there is a large uncertainty factor utilized in deriving the benchmark. The results indicate some concern for chronic nasal irritant effects, particularly for larger wood and natural gas sources.

2) Butadiene: Chronic ITSL = 2 µg/m³ with 24-hr averaging time.
   a. The ITSL was modestly exceeded for one scenario: Large Natural Gas Reciprocating engine at 2.5 µg/m³.
   b. According to Rule 232(21)(a), the 24-hr averaging time is applied to the EPA RfC of 2 µg/m³ which is the basis of the ITSL. Because EPA used a long-term study as the basis of the RfC and applied methodology consistent with calculating a long-term health benchmark (i.e., chronic) it may be more appropriate to use an annual averaging time with the ITSL. If impacts are

compared to 2 µg/m³ with an annual averaging time, then the annual impacts for Butadiene are 0.4 µg/m³ and are below the benchmark.

3) Acetaldehyde: Chronic ITSL = 9 µg/m³ with 24 hour averaging time.
    a. The ITSL was exceeded for one scenario: Large Natural Gas Reciprocating engine at 25.5 µg/m³. (2.83x above the ITSL)
    b. According to Rule 232(21)(a), the 24-hr averaging time is applied to the EPA RfC of 9 µg/m³ which is the basis of the ITSL. Because EPA used a long-term study as the basis of the RfC and applied methodology consistent with calculating a long-term health benchmark (i.e., chronic) it may be more appropriate to use an annual averaging time with the ITSL. If impacts are compared to 9 µg/m³ with an annual averaging time, the annual impacts for acetaldehyde are 4.3 µg/m³ and are below the benchmark.
4) Chlorine: Chronic ITSL = 0.3 µg/m³ with annual averaging time
    a. The impact of 0.4 µg/m³ modestly exceeded the ITSL for one scenario: Large wood fired boiler. This is 1.3x ITSL.
    b. The study used to derive the ITSL exposed rats to various concentrations of chlorine; the lowest dose of 0.4 ppm (1.1 mg/m³) produced significant nasal lesions. The benchmark dose methodology was used to extrapolate to a NOAEL of 0.2 mg/m³ (200 µg/m³), then duration adjusted (6/24x 5/7) to get 0.042 mg/m^3 (42 µg/m³). A further adjustment was made to account for the differences between rat and human nasal dosimetry, with a factor of 0.2 for the regional gas dose ratio (RGDR) to obtain a point of departure of 8.4 µg/m³. A total UF of 30 was used: 3 for animal to human and 10 for sensitive individuals to get ITSL of 0.3 (rounded from 0.28 µg/m³). Recent analysis comparing the nasal region of rat to humans indicates, “a larger portion of inspired air passed through olfactory-lined regions in the rat than in the monkey or human.” (Kimbell, 2006). Given that the rat nasal region gets a higher dose than humans then the RGDR could default to 1. If the RGDR of 1 is used, the RfC and ITSL would 1.4 µg/m³. The chlorine impact from large wood fired boilers is 0.4 µg/m³ and is less than the adjusted chlorine benchmark of 1.4 µg/m³
5) Chromium IV (hexavalent chromium): Chronic ITSL = 0.01 µg/m^3 with a 24-hr averaging time.
    a. Large wood fired boiler produced an impact of 0.0107 µg/m³ with a 24-hr average; this is slightly above the ITSL.
    b. As mentioned before, the averaging time for chronic benchmarks may be more appropriately set at annual averaging. The annual impact of Chromium IV is 0.00178 µg/m³, which is less than the adjusted benchmark of 0.01 µg/m^3 with annual averaging.
6) Formaldehyde: Acute ITSL = 9 µg/m³ with 8-hr averaging time
    a. Large wood fired boiler produced an impact of 20 µg/m³ with an 8-hr average, which is 2.3x higher than the ITSL.
    b. The ITSL was derived from a human occupational study where workers were exposed for 8 hrs/day for an average of 10 years. The observed effects were: Nasal obstruction and discomfort, lower airway discomfort, and eye

irritation at the LOAEL of 0.26 mg/m³. A NOAEL of 0.09 mg/m^3 was also identified. The formaldehyde impact is roughly 3x lower than the NOAEL and 13x lower than the LOAEL.

7) Manganese: Chronic ITSL = 0.05 µg/m³ annual averaging time (based on the EPA RfC).
   a. Fuel, process and size scenarios where impacts exceeded ITSL:

Fuel	**Size**	**Worst Process**	**PAI Impacts (µg/m^3)**	**Ratio** to SL
diesel	Small	Engine Turbine	0.09	1.72
diesel	Medium	Engine Turbine	0.11	2.27
diesel	Large	Engine Turbine	0.40	8.04
wood	Small	Boiler	0.17	3.48
wood	Medium	Boiler	0.23	4.60
wood	Large	Boiler	0.81	16.29

   b. The ITSL is based on an occupational study where neurological effects were observed at an effect level of 150 µg/m³, which was duration adjusted to 50 µg/m³, and an uncertainty factor of 1000 was applied. It may be noted that EPA's RfC is under reevaluation by EPA, and, the ATSDR recently increased their chronic inhalation Minimal Risk Level (MRL) to 0.3 µg/m^3. The ITSL exceedances raise some concern, particularly for large diesel and all sizes of wood-fired sources.
8) Silver: Acute ITSL = 0.1 µg/m³ 8 hr
   a. Wood boilers of all sizes (small, medium and large) had impacts of 1.7, 2.2 and 7.8 µg/m³, respectively (magnitude of ITSL exceedance = 17, 22 and 78, respectively).
   b. The ITSL is based on an occupational exposure limit (OEL) of 10 µg/m³ for *soluble* silver compounds, in order to prevent argyria. Silver *dust* has an OEL of 100 µg/m³. The ITSL is derived by dividing the soluble silver OEL by 100. Argyria is caused by chronic intake of silver, resulting in an accumulation of silver or silver sulfide particles in the skin and eyes. Argyria is generally believed to be irreversible. The effect is objectionable, but generally not regarded as physically harmful. The American Conference of Governmental and Industrial Hygienists (ACGIH) stated that the photographic industry's use of silver nitrate indicated that no cases of argyria or other adverse effects have appeared where average exposures were about 40 to 60 µg/m³ with values as high as about 150 µg/m³. The highest impact of 7.8 µg/m³ is below the OEL of 10 µg/m³ and is below a reported no effect level of approximately 40 µg/m³.

Carcinogenic Effects: Twelve TACs were modeled to have impacts associated with incremental lifetime cancer risk estimates of at least 1 in one million, for a specific fuel, process type and size:

Fuel	Size	Chemical	IRSL (µg/m³)	Worst Process	PAI* (µg/m^3)	Risk per Million	Comparison to SRSL
Nat Gas	Large	1,1,2,2-Tetrachloroethane	0.02	Reciprocating Engine	0.034	2	<SRSL
Nat Gas	Small	1,3-Butadiene	0.03	Reciprocating Engine	0.089	3	<SRSL
Nat Gas	Medium	1,3-Butadiene	0.03	Reciprocating Engine	0.12	4	<SRSL
Nat Gas	Large	1,3-Butadiene	0.03	Reciprocating Engine	0.42	14	> SRSL
Diesel	Large	Acetaldehyde	0.5	Reciprocating Engine	0.54	1.1	<SRSL
Nat Gas	Small	Acetaldehyde	0.5	Reciprocating Engine	0.91	2	<SRSL
Nat Gas	Medium	Acetaldehyde	0.5	Reciprocating Engine	1.2	2	<SRSL
Soy BD	Large	Acetaldehyde	0.5	Boiler	1.7	3	<SRSL
Nat Gas	Large	Acetaldehyde	0.5	Reciprocating Engine	4.3	9	<SRSL
Diesel	Small	Arsenic	2E-4	Engine Turbine	0.0012	6	<SRSL
Diesel	Medium	Arsenic	2E-4	Engine Turbine	0.0016	8	<SRSL
Wood	Small	Arsenic	2E-4	Boiler	0.0024	12	> SRSL
Wood	Medium	Arsenic	2E-4	Boiler	0.0032	16	> SRSL
Diesel	Large	Arsenic	2E-4	Engine Turbine	0.0056	28	> SRSL
Wood	Large	Arsenic	2E-4	Boiler	0.011	56	> SRSL
Diesel	Small	Benzene	0.1	Reciprocating Engine	0.10	1.01	<SRSL
Diesel	Medium	Benzene	0.1	Reciprocating Engine	0.13	1.3	<SRSL
Wood	Small	Benzene	0.1	Boiler	0.46	5	<SRSL
Diesel	Large	Benzene	0.1	Reciprocating Engine	0.47	5	<SRSL
Wood	Medium	Benzene	0.1	Boiler	0.60	6	<SRSL
Wood	Large	Benzene	0.1	Boiler	2.1	21	> SRSL
Wood	Large	Benzo (a) pyrene	5E-4	Boiler	0.0013	3	<SRSL
Diesel	Medium	Beryllium	4E-4	Boiler	0.00043	1.1	<SRSL
Wood	Large	Beryllium	4E-4	Boiler	0.00056	1.4	<SRSL
Diesel	Large	Beryllium	4E-4	Boiler	0.0015	4	<SRSL
Diesel	Medium	Cadmium	6E-4	Engine Turbine	0.00069	1.2	<SRSL
Wood	Large	Cadmium	6E-4	Boiler	0.0021	3	<SRSL
Diesel	Large	Cadmium	6E-4	Engine Turbine	0.0024	4	<SRSL
Diesel	Small	Chromium (VI)	8.3E-5	Engine Turbine	0.00012	1.4	<SRSL
Diesel	Medium	Chromium (VI)	8.3E-5	Engine Turbine	0.00016	2	<SRSL
Wood	Small	Chromium (VI)	8.3E-5	Boiler	0.00038	5	<SRSL
Wood	Medium	Chromium (VI)	8.3E-5	Boiler	0.00050	6	<SRSL
Diesel	Large	Chromium (VI)	8.3E-5	Engine Turbine	0.00056	7	<SRSL
Wood	Large	Chromium (VI)	8.3E-5	Boiler	0.0018	21	> SRSL
Nat Gas	Small	Ethylene Dibromide	0.002	Reciprocating Engine	0.0080	4	<SRSL
Nat Gas	Medium	Ethylene Dibromide	0.002	Reciprocating Engine	0.011	5	<SRSL
Nat Gas	Large	Ethylene Dibromide	0.002	Reciprocating Engine	0.037	19	> SRSL
Animal BD	Large	Formaldehyde	0.08	Boiler	0.15	2	<SRSL
Diesel	Large	Formaldehyde	0.08	Reciprocating Engine	0.6	7.5	<SRSL
Soy BD	Small	Formaldehyde	0.08	Boiler	0.33	4	<SRSL
Soy BD	Medium	Formaldehyde	0.08	Boiler	0.44	6	<SRSL
Wood	Small	Formaldehyde	0.08	Boiler	0.48	6	<SRSL
Wood	Medium	Formaldehyde	0.08	Boiler	0.63	8	<SRSL
Soy BD	Large	Formaldehyde	0.08	Boiler	1.6	20	> SRSL
Wood	Large	Formaldehyde	0.08	Boiler	2.2	28	> SRSL
Wood	Medium	Nickel	0.0042	Boiler	0.0047	1.1	<SRSL
Wood	Large	Nickel	0.0042	Boiler	0.017	4	<SRSL

* PAI = predicted ambient impact. This is the maximum modeled ambient air concentration

It may be noted that several of the TAC modeled impacts also exceeded the SRSL. None exceeded a 1 in 10,000 risk level. Cumulative (additive) cancer risk is noted previously, in the Results section for each fuel type.

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APPENDIX F:

CLEAN FUELS TECHNICAL SUPPORT DOCUMENT

Clean Fuels Exemptions from the Air Toxics Rules

Technical Support Document
for the
Air Toxics Workgroup

June 11, 2013

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Procedure for Obtaining Emission Factors

Two Processes were used to obtain EFs.

1) For Natural Gas, Diesel, and Wood/Bark, EFs were obtained from EPA's WebFIRE (Factor Information Retrieval System) http://www.epa.gov/ttn/chief/webfire/index.html

2) For Biodiesel, data in MS-Excel spreadsheet format were e-mailed (3/28/2013 2:34 PM) to MDEQ-AQD (Depa, Michael) as attachments from C.A. (Andy) Miller Miller.Andy@epa.gov. Associate Director for Climate, Air, Climate, and Energy Research Program, US EPA Office of Research and Development, Los Angeles, CA, 213-244-1809.

Detailed Procedure for Obtaining EF from WebFIRE for Each Fuel Type

(1) NATURAL GAS:

a. Go to "Detailed Search" select "External Combustion Boilers," "Uncontrolled", and "1.4 Natural Gas Combustion"
b. Go to "Detailed Search" select "Internal Combustion Engines," "Uncontrolled", and "3.1 Stationary Gas Turbines"
c. Go to "Detailed Search" select "Internal Combustion Engines," "Uncontrolled", and "3.2 Natural Gas-fired Reciprocating Engines"
d. Combine tables a., b. and c.
e. Delete EF records for coal, waste oil, diesel, residential furnaces, digester gas, landfill gas, distillate oil, etc., and EF records for criteria pollutants and non-TACs (e.g., methane, ethane, propane, zinc, total organics and VOC, etc.)

(2) DIESEL (including "dual-fuel engines"):

a. Go to "Detailed Search", select "External Combustion Boilers," "Uncontrolled", and "1.3 Fuel Oil Combustion"
b. Start another Detailed Search and select "Internal Combustion Engines", "Uncontrolled", and "3.3 Gasoline and Industrial Engines"
c. Start another Detailed Search and select "Internal Combustion Engines", "Uncontrolled", and "3.4 Large Stationary Diesel and All Stationary Dual-fuel Engines"
d. Combine tables a., b. and c.
e. Delete EF records that have criteria pollutants and notes with "Lack of supporting documentation." Delete records for wood, kerosene, naphtha, landfill gas, natural gas, residual oil. Delete records based on Level 3 entries that equal: digester gas, kerosene, naphtha, landfill gas, natural gas, residual and crude oil, etc.

(3) WOOD, BARK, WOOD-BARK

a. Go to "Detailed Search", select "External Combustion Boilers," "Uncontrolled" and "1.6 Wood Residue Combustion in Boilers."
b. Delete EF records for open burning, residential, criteria pollutants and non-TACs

(4) BIODIESEL

a. Obtained 4 spreadsheets via email from US EPA author C. Andrew Miller. EFs originally published in EPA 2008 report *Characterizing Emissions from the Combustion of Biofuels* (EPA/600/R-08/069).
b. The 4 spreadsheets contained data for PAHs, PCBs, VOCs and Carbonyls-Aldehydes.

Ambient Air Impact Calculations Using Emission Factors

All emission factors (EFs) were obtained from US EPA.

Typical calculation for ambient impact.

	Impact($\mu g/m^3$) with **Avg. Time**	=	**EF** (lbs/mmbtu)	x	**Burn Rate** (mmbtu/hr)	x	**DF** ($\mu g/m^3$ per mmbtu/hr)
Notes:	(1)		(2)		(3)		(4)

Notes:

(1) Ambient air concentration at 150 feet from stack. Avg. Time = Averaging time; specific for each screening level
(2) Emission Factor (EF) for specific toxic air contaminant
(3) Burn Rate for fuel, i.e., heat generated per hour. Assumes that higher burn rates are associated with larger industrial processes.
(4) DF=Dispersion Factor at an averaging time. Each toxic air contaminant has a screening level with an averaging time associated with it. Based on EPA's AERSCREEN[2].

Calculation of "PASS/FAIL"
If ambient impact is below the screening level then PASS
If ambient impact is above the screening level then FAIL

The magnitude of ambient air impact above or below screening level was calculated as follows:

$$\text{Ratio} = \frac{\text{Ambient Impact } (\mu g/m^3) \text{ at Avg. Time}}{\text{Screening Level } (\mu g/m^3) \text{ at Avg. Time}}$$

Screening Levels: The health based screening level for noncarcinogenic effects of a toxic air contaminant is called the Initial Threshold Screening Level (ITSL). It is determined by a number of different methods, depending upon the available toxicological data. The rules specify a hierarchy of methods for determining the ITSL. There are two health based screening levels for carcinogenic effects. These include the Initial Risk Screening Level (IRSL), which is defined as an increased cancer risk of one in one million (10^{-6}), and the Secondary Risk Screening Level (SRSL), which is defined as an increased cancer risk of one in one hundred thousand (10^{-5}). The IRSL applies only to the new or modified source subject to the permit application. If an air permit applicant cannot demonstrate that the emissions of the toxic air contaminant (TAC) meet the IRSL, they may choose to demonstrate compliance with the SRSL, however in this case they must include all sources of that TAC emitted from the plant, not just the emission unit being permitted.

[2] AERSCREEN is the recommended screening model based on AERMOD. The model will produce estimates of "worst-case" 1-hour concentrations for a single source, without the need for hourly meteorological data, and also includes conversion factors to estimate "worst-case" 3-hour, 8-hour, 24-hour, and annual concentrations. http://www.epa.gov/scram001/dispersion_screening.htm

DIESEL EMISSION FACTOR RESULTS

AP42 Section 1.3, 3.2, 3.3 and 3.4 generated most of the EF records for TACs from burning diesel in engines or boilers. An additional 28 records were found in WebFIRE which did not reference an AP42 section number. These records were found doing a general search in WebFIRE for "Diesel", "Internal Combustion Engines" and "Uncontrolled". Eighteen of 28 of these records were for "reciprocating: cogeneration" (n=11) or "Dual Fuel (Oil/Gas)" (n=7). Of the 28 EFs from this data set, 22 had the highest EF for a particular TAC. Cogeneration and dual-fuel processes produced EFs for three TACs that resulted in impacts above screening levels: acetaldehyde, benzene and formaldehyde, with individual cancer risks of 1.1, 4.7 and 3.0 per million, respectively.

Table 1. Diesel EF Conversion Factors

Unit	Convert to MMBTUs
IF MMBTUs	-
IF Gallons	Multiply by 7.14
IF 1000 Gallons	Multiply by 0.00714
IF Kiloliters	Multiply by 0.06

=IF(L12="Million Btus",J12,IF(L12="Gallons",J12*7.14,IF(L12="1000 Gallons",J12*0.00714,IF(L12="Kiloliters",J12*0.06,"?"))))

1 L = 0.26417 Gallons
1000 L = 264.17 Gallons

EF for Diesel (e.g., contained "diesel", and fuel/distillate that was "No. 2", or "#2")
Deleted Factors that were…
Criteria pollutants: PM, Nitrogen Oxides (NOx), Sulfur Oxides (SOx), Lead, and Carbon Monoxide (CO)
Other Non-TAC pollutants: Carbon dioxide (CO_2), Volatile organic compounds (VOC), methane, zinc, Total Organic Carbon, PAH (unspeciated), POM (polycyclic organic matter), Total non-methane organic compounds (TNMOC).
Deleted Factors that contained…
"Lack of Supporting Documentation."
Pollution control measures (e.g., water sprays) or devices (e.g., fabric filters)

Subsequent to the creation of the report "Clean Fuels Discussion" Draft2 dated 4/10/2013, a higher EF was found in WebFIRE for formaldehyde. The worst case formaldehyde EF should be 1.18E-3, not 4.7E-4 lb/mmbtu. If the worst case EF of 1.18E-3 was used, the ambient air impact would be 0.6 µg/m³ (annual) and be 750% higher than IRSL of 0.08 µg/m³, although it is below the SRSL of 0.8 µg/m³. The higher EF of 1.18E-3 is from AP42 Section 3.3 with EF ID as 11601. This is for reciprocating internal combustion engines (RICE).

As to how a higher formaldehyde EF for diesel was missed in the initial WebFIRE query, it is not known for sure. However, the higher EF for formaldehyde is not in AP42 Sections 1.3, 3.1, 3.3 or 3.4 (Fuel Oil Combustion, Stationary Gas Turbines, Gasoline and Diesel

Industrial Engines, and Large Stationary Diesel and All Stationary Dual-fuel Engines, respectively) so it does not show up when querying these sections individually, which is probably how it was missed.

Multiple EFs were found for specific TACs for the same type of unit (engine or boiler) and fuel. Therefore, Table 2 has a column title "high and low" to help convey the ranges of EFs for each unit type and TAC.

Table 2. Range of Diesel EFs for TACs that had impacts Greater than SL (Highest was selected for Impact Analysis)

Pollutant	Level 1	Level 3 & 4	EF (lb/mmbtu)	Quality	High and Low	AP42	Factor ID
Acetaldehyde	Engine	Reciprocating	1.07E-3	E	highest	3.3	11582
Acetaldehyde	Engine	Large Bore Engine	2.5E-5	E	lowest (of 3)	3.4	12140
Acrolein	Engine	Reciprocating	9.3E-5*	E	highest	3.3	11583
Acrolein	Engine	Large Bore Engine	7.9E-6	E	lowest (of 3)	3.4	12141
Arsenic	Engine	Turbine	1.1E-5*	D	highest	3.1	11328
Arsenic	Boiler		4.E-6	E	lowest (of 7)	1.3	9709
Benzene	Engine	Reciprocating	9.3E-4	E	highest	3.3	11588
Benzene	Engine	Turbine	5.5E-5	C	lowest (of 7)	3.1	12304
Beryllium	Boiler		3.E-6	E	highest	1.3	2218
Beryllium	Engine	Turbine	3.1E-7*	D	lowest (of 7)	3.1	12305
Cadmium	Engine	Turbine	4.8E-6	D	highest	3.1	11339
Cadmium	Boiler		3.E-6	E	lowest (of 7)	1.3	7922
Chromium VI**	Engine	Turbine	1.1E-6	D	highest	3.1	11348
Chromium VI**	Boiler		3.E-7	E	lowest (of 7)	1.3	7926
Formaldehyde	Engine		1.2E-3***	E	highest	3.3	11601
Formaldehyde	Engine	Large Bore Engine	7.9E-5	E	lowest (of 10)	3.4	12158
Manganese	Engine	Turbine	7.9E-4	D	highest	3.1	11359
Manganese	Boiler		6.E-6	E	lowest (of 7)	1.3	9713

*** listed as "<" in the WebFIRE database**

**** Chromium VI was estimated as 10% of Chromium. WebFIRE listed the EF for Chromium, then: $EF_{CrVI} = EF_{Cr} * 0.1$**

*****A lower EF of 4.7E-4 lb/mmbtu was used previously in Clean Fuels Discussion, Draft2 (April 10, 2013) which was for Reciprocating ICE (actually converted from pounds formaldehyde per 1000 gallons with the emission factor of 0.00714 Million BTUs per 1000 gallons).**

WOOD BOILER EMISSION FACTOR RESULTS

There were 110 TACs that had EFs. There were eight EFs per chemical for a total of 880 EFs. WebFIRE listed eight EFs per TAC because each TAC had EFs for eight different types of wood, wood/bark and various moisture content. Each EF for each TAC was the same. The eight different types of wood are shown here:

	LEVEL4
1	Bark-fired Boiler
2	Wood/Bark Fired Boiler
3	Wood-fired Boiler - Wet Wood (>=20% moisture)
4	Wood-fired Boiler - Dry Wood (<20% moisture)
5	Bark-fired Boiler
6	Wood/Bark-fired Boiler
7	Wood-fired Boiler - Wet Wood (>=20% moisture)
8	Wood-fired Boiler - Dry Wood (<20% moisture)

BIODIESEL BOILER EMISSION FACTOR RESULTS

Recall that EFs for biodiesel were obtained via email from an EPA sponsored study by Andy Miller. The author presented data for all three individual trials as well as the average and standard deviation. The averages of 3 boiler trials were used for the EFs in order to calculate ambient air impacts. The average was chosen for assessing impacts of biodiesel instead of the highest EF because this dataset is from a single study and for a single process and the average is thought to better represent the emission rates for this size and type of boiler. Animal biodiesel EFs and soy biodiesel EFs were kept separate. PAH, Aldehyde, VOC and PCB EFs were available, however, PCB EF were not included in analysis of impacts. High field blank values during the PCB analysis and contamination from previous boiler usage were cited as factors. The author stated, “It is not believed that these values are representative of PCB emissions from No. 2 fuel oil or biofuels in general.” (EPA, 2008)

NATURAL GAS EMISSION FACTOR RESULTS:

The EF for benzo (g, h, i) pyrene for tangentially fired boilers (AP42 Section 1.4) for electrical generation was about a million times (1E6x) higher than other benzo (g,h,i) pyrene EFs for boilers of other types and all other PAHs for boilers, including tangentially fired boilers. Based on these observations it was concluded that this emission factor was erroneous and therefore not included in the impact analysis.

Unit conversion: One (1) standard cubic foot of natural gas yields approximately 1000 Btu.

The following table provides the natural gas emission factors for five TACs where the highest EF resulted in ambient air impacts above a screening level.

Natural Gas Emission Factors for Five TACs

Name	EF (lb/mmbtu)	Rank	LEVEL2	LEVEL4	QUAL	AP42 SECT	EF ID
1,1,2,2-TCEthane*	6.6E-5	1	Industr.	2-cycle Lean Burn	C	3.2	11978
1,1,2,2-TCEthane*	4.0E-5	2	Industr.	4-cycle Lean Burn	E	3.2	12116
1,1,2,2-TCEthane*	2.5E-5	3	Industr.	4-cycle Rich Burn	C	3.2	12039
1,3-butadiene	8.2E-4	1	Industrial	2-cycle Lean Burn	D	3.2	11908
1,3-butadiene	6.6E-4	2	Industr.	4-cycle Rich Burn	D	3.2	11996
1,3-butadiene	2.7E-4	3	Industr.	4-cycle Lean Burn	D	3.2	12061
1,3-butadiene	4.3E-7	4	Industr.	Turbine	D	3.1	11773
1,3-butadiene	4.3E-7	5	Electr. Gen.	Turbine	D	3.1	11426
1,3-butadiene	4.3E-7	6	Commerc./ Inst.	Turbine: Co-gen.	D	3.1	12413
1,3-butadiene	4.3E-7	7	Commerc./ Inst.	Turbine	D	3.1	12373
1,3-butadiene	4.3E-7	8	Industr.	Turbine: Co-gen.	D	3.1	11834
Acetaldehyde	8.4E-3	1	Industr.	4-cycle Lean Burn	A	3.2	12051
Acetaldehyde	7.8E-3	2	Industr.	2-cycle Lean Burn	A	3.2	11894
Acetaldehyde	2.8E-3	3	Industr.	4-cycle Rich Burn	C	3.2	8804
Acetaldehyde	4.0E-5	4	Commerc./ Inst.	Turbine	C	3.1	12367
Acetaldehyde	4.0E-5	5	Industr.	Turbine	C	3.1	11763
Acetaldehyde	4.0E-5	6	Industr.	Turbine: Co-gen.	C	3.1	11647
Acetaldehyde	4.0E-5	7	Electr. Gen.	Turbine	C	3.1	11419
Acetaldehyde	4.0E-5	8	Commerc./ Inst.	Turbine: Co-gen.	C	3.1	12407
Acrolein	7.8E-3	1	Industr.	2-cycle Lean Burn	A	3.2	11895
Acrolein	5.1E-3	2	Industr.	4-cycle Lean Burn	A	3.2	12052
Acrolein	2.6E-3	3	Industr.	4-cycle Rich Burn	C	3.2	8806
Acrolein	6.4E-6	4	Industr.	Turbine: Co-gen.	C	3.1	11648
Acrolein	6.4E-6	5	Commerc./ Inst.	Turbine: Co-gen.	C	3.1	12408
Acrolein	6.4E-6	6	Industr.	Turbine	C	3.1	11766
Acrolein	6.4E-6	7	Commerc./ Inst.	Turbine	C	3.1	12368
Acrolein	6.4E-6	8	Electr. Gen.	Turbine	C	3.1	11420
Ethylene dibromide	7.3E-5	1	Industr.	2-cycle Lean Burn	C	3.2	11930
Ethylene dibromide	4.4E-5	2	Industr.	4-cycle Lean Burn	E	3.2	12080
Ethylene dibromide	2.1E-5	3	Industr.	4-cycle Rich Burn	E	3.2	12011

* 1,1,2,2-Tetrachloroethane

Examples of Permits with Diesel, Wood and Natural Gas

Note: In several of the following tables the list of TACs was truncated to include only top 33 TAC SLs resulting in the highest "% of screening level", in order to fit to 1 page. In these cases, the total numbers of TACs with non-null EF is indicated in the lower left corner.

Natural Gas Example 1

Permit #:		**27-12 (Mead Johnson & Co, LLC)**
Summary:		Natural Gas fired boiler
Emission source:		BOILER
Fuel Type:		Natural Gas
Equipment Capacity (MMBtu/hr):		97 MEDIUM
Stack Height (feet):		42.2
Building Height (feet):		
Distance to closest boundary:		
Emission Factor Source:		AP-42
	Screening Levels (SLs)	

TAC	ITSL (µg/m³)	IRSL (µg/m³)	EF (lb/mmbtu)	Impacts (µg/m³)	% of SL	Rank
Benzene		0.1		9.30E-04	0.93000%	1
Benzo(a)pyrene (PAH)		0.0005	1.20E-06	5.30E-07	0.10600%	2
Benzene	30			1.00E-02	0.03333%	3
Acenaphthylene	35		1.80E-06	8.80E-06	0.00003%	4
Anthracene	1000		2.40E-06	1.20E-05	0.00000%	5

Natural Gas Example 2

Permit #:		**149-10 (Lansing Brd Water & Light)**
Summary:		Nat. Gas Auxiliary Boiler
Emission source:		BOILER
Fuel Type:		Natural Gas
Equipment Capacity (MMBtu/hr):		245 LARGE
Stack Height (feet):		120
Building Height (feet):		
Distance to closest boundary:		
Emission Factor Source:		AP-42 Sections 1.4 and 3.1 (worse-case).
	Screening Levels (SLs)	

TAC	ITSL (µg/m³)	IRSL (µg/m³)	EF (lb/mmbtu)	Impacts (µg/m³)	% of SL	Rank
Formaldehyde		0.08	0.00071	5.79E-02	72.40669%	1
PAHs		0.0005	0.0000022	0.0001795	35.89740%	2
Cadmium		0.0006	1.078E-06	8.80E-05	14.66397%	3
Chrom6 (assumes 1/11th Cr is IV)		0.000083	1.373E-06	1.02E-05	12.26500%	4
Arsenic		0.0002	1.961E-07	1.60E-05	7.99853%	5
Nickel		0.0042	2.059E-06	1.68E-04	3.99926%	6
Acrolein	0.02		0.0000064	5.22E-04	2.61072%	7
Propylene oxide		0.3	0.000058	4.73E-03	1.57731%	8
Chrom6 (assumes 1/11th Cr is IV)	0.008		1.373E-06	8.59E-05	1.07379%	9
Benzene		0.1	0.000012	9.79E-04	0.97902%	10
Vanadium	0.5		2.255E-06	2.86E-03	0.57123%	11
Acetaldehyde	9		0.00004	2.75E-02	0.30598%	12
7,12-dimethylbenz(a)anthracene		0.0005	1.569E-08	1.28E-06	0.25595%	13
Beryllium		0.0004	1.176E-08	9.60E-07	0.23996%	14
1,3-butadiene		0.03	8.6E-07	7.02E-05	0.23388%	15
Lead	0.15		4.9E-07	3.37E-04	0.22489%	16
Hexane	700		0.0017647	1.21E+00	0.17356%	17
Acrolein	5		0.0000064	8.11E-03	0.16213%	18
Propylene oxide	30		0.000058	3.99E-02	0.13310%	19
Naphthalene		0.08	0.0000013	1.06E-04	0.13258%	20
Ethylbenzene		3	0.000032	2.61E-03	0.08702%	21
Barium	5		4.314E-06	3.32E-03	0.06637%	22
Manganese	0.05		3.725E-07	3.04E-05	0.06079%	23
Mercury	0.3		2.549E-07	1.75E-04	0.05850%	24
Xylenes	100		0.000064	4.41E-02	0.04406%	25
Zinc (as zinc oxide)	50		2.843E-05	2.19E-02	0.04374%	26
Beryllium	0.02		1.176E-08	8.10E-06	0.04050%	27
Acetaldehyde	9		0.00004	3.26E-03	0.03626%	28
Copper	2		8.333E-07	6.41E-04	0.03205%	29
Cobalt	0.2		8.235E-08	6.34E-05	0.03168%	30
Naphthalene	3		0.0000013	8.95E-04	0.02983%	31
1,3-butadiene	2		8.6E-07	5.92E-04	0.02960%	32
3-Methylchloranthrene (PAH)	0.0005		1.765E-09	1.44E-07	0.02879%	33

Natural Gas Example 3

Permit #:		**81-11 (WOLVERINE POWER SUPPLY)**	
Summary:		Turbine No.4 (NG) Emissions (lb/hr) - MMBtu/hr	
Emission source:		TURBINE	
Fuel Type:		Natural Gas	
Equipment Capacity (MMBtu/hr):		1117	LARGE
Stack Height (feet):		140	(Bypass 111 ft)
Building Height (feet):			
Distance to closest boundary:			
Emission Factor Source:		AP-42 Sections 1.4 and 3.1 (worse-case). adjusted for 4000 hr/yr limit	

TAC	ITSL (µg/m³)	IRSL (µg/m³)	EF (lb/mmbtu)	Impacts (µg/m³)	% of SL	Rank
	Screening Levels (SLs)					
Formaldehyde		0.08	7.10E-04	7.60E-04	0.95060%	1
PAHs		0.0005	2.20E-06	2.36E-06	0.47128%	2
Cadmium		0.0006	1.08E-06	1.16E-06	0.19252%	3
Chrom6 (assumes 1/11th Cr is IV)		0.000083	1.37E-06	1.34E-07	0.16102%	4
Arsenic		0.0002	1.96E-07	2.10E-07	0.10501%	5
Vanadium	0.5		2.25E-06	4.81E-04	0.09622%	6
Acrolein	0.02		6.40E-06	1.50E-05	0.07506%	7
Chrom6 (assumes 1/11th Cr is IV)	0.008		1.37E-06	4.61E-06	0.05767%	8
Nickel		0.0042	2.06E-06	2.21E-06	0.05250%	9
Acrolein	5		6.40E-06	1.37E-03	0.02731%	10
Propylene oxide		0.3	5.80E-05	6.21E-05	0.02071%	11
Acetaldehyde	9		4.00E-05	1.48E-03	0.01643%	12
Benzene		0.1	1.20E-05	1.29E-05	0.01285%	13
Lead	0.15		4.90E-07	1.81E-05	0.01208%	14
Manganese	0.05		3.73E-07	5.04E-06	0.01007%	15
Naphthalene		0.08	1.30E-06	8.02E-06	0.01003%	16
Hexane	700		1.76E-03	6.52E-02	0.00932%	17
Propylene oxide	30		5.80E-05	2.14E-03	0.00715%	18
Barium	5		4.31E-06	3.08E-04	0.00617%	19
Zinc (as zinc oxide)	50		2.84E-05	2.03E-03	0.00407%	20
Beryllium		0.0004	1.18E-08	1.26E-08	0.00315%	21
Mercury	0.3		2.55E-07	9.42E-06	0.00314%	22
1,3-butadiene		0.03	8.60E-07	9.21E-07	0.00307%	23
Copper	2		8.33E-07	5.96E-05	0.00298%	24
Cobalt	0.2		8.24E-08	5.89E-06	0.00294%	25
Xylenes	100		6.40E-05	2.37E-03	0.00237%	26
Beryllium	0.02		1.18E-08	4.35E-07	0.00217%	27
Chromium, total	5		1.37E-06	9.81E-05	0.00196%	28
Naphthalene	3		1.30E-06	4.81E-05	0.00160%	29
1,3-butadiene	2		8.60E-07	3.18E-05	0.00159%	30
Benzene	30		1.20E-05	4.44E-04	0.00148%	31
Ethylbenzene		3	3.20E-05	3.43E-05	0.00114%	32
Pentane	17700		2.55E-03	1.82E-01	0.00103%	33

Note: Truncated to fit to 1 page. The number of TACs that had non-null EFs = 53. (see note on page 8)

Natural Gas Example 4

Permit #:		**149-10 (Lansing Brd Water & Light)**
Summary:		2 Turbines (NG) Emissions (lb/hr) - MMBtu/hr
Emission source:		TURBINE
Fuel Type:		Natural Gas
Equipment Capacity (MMBtu/hr):		903.4 LARGE
Stack Height (feet):		160
Building Height (feet):		
Distance to closest boundary:		
Emission Factor Source:		AP-42 Sections 1.4 and 3.1 (worse-case).

TAC	ITSL (µg/m³)	IRSL (µg/m³)	EF (lb/mmbtu)	Impacts (µg/m³)	% of SL	Rank
	Screening Levels (SLs)					
Formaldehyde		0.08	7.10E-04	7.76E-03	9.70139%	1
PAHs		0.0005	2.20E-06	2.40E-05	4.80970%	2
Cadmium		0.0006	1.08E-06	1.18E-05	1.96475%	3
Chrom6 (assumes 1/11th Cr is IV)		0.000083	1.37E-06	1.36E-06	1.64332%	4
Arsenic		0.0002	1.96E-07	2.14E-06	1.07168%	5
Nickel		0.0042	2.06E-06	2.25E-05	0.53584%	6
Chrom6 (assumes 1/11th Cr is IV)	0.008		1.37E-06	3.13E-05	0.39171%	7
Vanadium	0.5		2.25E-06	1.96E-03	0.39112%	8
Acrolein	0.02		6.40E-06	7.00E-05	0.34980%	9
Propylene oxide		0.3	5.80E-05	6.34E-04	0.21134%	10
Benzene		0.1	1.20E-05	1.31E-04	0.13117%	11
Acetaldehyde	9		4.00E-05	1.00E-02	0.11162%	12
Acrolein	5		6.40E-06	5.55E-03	0.11101%	13
Lead	0.15		4.90E-07	1.23E-04	0.08204%	14
Hexane	700		0.0017647	4.43E-01	0.06331%	15
Barium	5		4.31E-06	2.92E-03	0.05846%	16
Propylene oxide	30		5.80E-05	1.46E-02	0.04855%	17
Zinc (as zinc oxide)	50		2.84E-05	1.93E-02	0.03853%	18
7,12-dimethylbenz(a)anthracene		0.0005	1.57E-08	1.71E-07	0.03429%	19
Beryllium		0.0004	1.18E-08	1.29E-07	0.03215%	20
1,3-butadiene		0.03	8.60E-07	9.40E-06	0.03134%	21
Copper	2		8.33E-07	5.65E-04	0.02823%	22
Cobalt	0.2		8.24E-08	5.58E-05	0.02790%	23
Mercury	0.3		2.55E-07	6.40E-05	0.02134%	24
Chromium, total	5		1.37E-06	9.30E-04	0.01860%	25
Naphthalene		0.08	1.30E-06	1.42E-05	0.01776%	26
Xylenes	100		6.40E-05	1.61E-02	0.01607%	27
Beryllium	0.02		1.18E-08	2.95E-06	0.01477%	28
Ethylbenzene		3	3.20E-05	3.50E-04	0.01166%	29
Naphthalene	3		1.30E-06	3.26E-04	0.01088%	30
1,3-butadiene	2		8.60E-07	2.16E-04	0.01080%	31
Benzene	30		1.20E-05	3.01E-03	0.01005%	32
Pentane	17700		0.002549	1.73E+00	0.00976%	33

Note: Truncated to fit to 1 page. The number of TACs that had non-null EFs = 61. (see note on page 8)

Natural Gas Example 5

Permit #:		**149-10 (Lansing Brd Water & Light)**
Summary:		Nat. Gas Engine
Emission source:		ENGINE
Fuel Type:		Natural Gas
Equipment Capacity (MMBtu/hr):		11.3 SMALL
Stack Height (feet):		120
Building Height (feet):		
Distance to closest boundary:		
Emission Factor Source:		AP-42 3.2 (worse-case). adjusted for 500 hr/yr operation

TAC	Screening Levels (SLs) ITSL (µg/m³)	IRSL (µg/m³)	EF (lb/mmbtu)	Impacts (µg/m³)	% of SL	Rank
Acrolein	5		5.14E-03	6.51E-01	13.01037%	1
PAHs		0.0005	1.41E-04	5.76E-05	11.51323%	2
Acrolein	0.02		5.14E-03	2.10E-03	10.49255%	3
Formaldehyde		0.08	5.28E-02	4.31E-03	5.38917%	4
Acetaldehyde	9		8.36E-03	3.91E-01	4.34973%	5
1,3-butadiene	2		6.63E-04	3.10E-02	1.55232%	6
1,3-butadiene		0.03	6.63E-04	2.71E-04	0.90228%	7
Benzene		0.1	1.58E-03	6.45E-04	0.64507%	8
Benzene	30		1.58E-03	7.40E-02	0.24662%	9
Naphthalene	3		9.71E-05	4.55E-03	0.15156%	10
Biphenyl	15		2.12E-04	1.41E-02	0.09367%	11
1,1,2,2-Tetrachloroethane		0.02	4.00E-05	1.63E-05	0.08165%	12
Naphthalene		0.08	9.71E-05	3.96E-05	0.04955%	13
Acetaldehyde	9		8.36E-03	3.41E-03	0.03792%	14
1,2-Dichloropropane	4		2.69E-05	1.26E-03	0.03149%	15
1,2-Dichloroethane		0.04	2.36E-05	9.64E-06	0.02409%	16
Ethylene Dibromide	9		4.43E-05	2.07E-03	0.02305%	17
1,1,2-Trichloroethane		0.06	3.18E-05	1.30E-05	0.02164%	18
Methanol	3250		3.06E-03	3.87E-01	0.01192%	19
Xylenes	100		1.95E-04	9.13E-03	0.00913%	20
Hexane	700		0.00111	5.20E-02	0.00743%	21
1,3-Dichloropropene	20		2.64E-05	1.24E-03	0.00618%	22
Phenanthrene	0.1		1.04E-05	4.25E-06	0.00425%	23
Isobutyraldehyde	160		1.01E-04	4.73E-03	0.00296%	24
Chloroform	0	0.4	2.85E-05	1.16E-05	0.00291%	25
Chlorobenzene	70		3.04E-05	1.42E-03	0.00203%	26
Carbon tetrachloride	100		3.67E-05	1.72E-03	0.00172%	27
Pentane	17700		0.003	1.99E-01	0.00112%	28
Nonane	550		1.10E-04	5.15E-03	0.00094%	29
Methylene Chloride	0	2	4.12E-05	1.68E-05	0.00084%	30
Acenaphthylene	35		5.53E-06	2.59E-04	0.00074%	31
Chrysene		0.04	6.93E-07	2.83E-07	0.00071%	32
Vinyl Chloride	100		1.49E-05	6.98E-04	0.00070%	33

Note: Truncated to fit to 1 page. The number of TACs that had non-null EFs = 59. (see note on page 8)

Diesel Example 1

Permit #:		**41-11 (Health Alliance Plan)**
Summary:		RICE distillate oil fired emergency generator.
Emission source:		ENGINE
Fuel Type:		Diesel
Equipment Capacity (MMBtu/hr):		10.8 SMALL
Stack Height (feet):		16.5
Building Height (feet):		
Distance to closest boundary:		Only ~10 ft (from drawing)
Emission Factor Source:		AP-42
	Screening Levels (SLs)	

TAC	**ITSL (µg/m³)**	**IRSL (µg/m³)**	**EF (lb/MMBtu)**	**Impacts (µg/m³)**	**% of SL**	Rank
Benzene		0.1			25.34%	1
Formaldehyde		0.08	7.89E-05		3.22%	2
Phenanthrene	0.1		4.08E-05		1.33%	3
Acrolein	0.02		7.89E-06		1.29%	4
Napthalene		0.08	1.30E-04		0.68%	5
Benzene	30		7.76E-04		0.40%	6
Acrolein	0.5		7.89E-06		0.37%	7
Acetaldehyde		0.5			0.16%	8
Acetaldehyde	9		2.52E-05		0.04%	9
Xylenes	100		1.93E-04		0.03%	10
Acenaphthylene	35		9.23E-06		0%	11
Anthracene	1000		1.23E-06		0%	11
Benzo(g,h,l)perylene	12		5.56E-07		0%	11
Fluoranthene	140		4.03E-06		0%	11
Fluorene	140		1.28E-05		0%	11
Pyrene	100		3.71E-06		0%	11
Toluene	5000		2.81E-04		0%	11

Diesel Example 2

Permit #:		**81-11 (WOLVERINE POWER SUPPLY)**
Summary:		No.2 Fuel Oil engine
Emission source:		ENGINE
Fuel Type:		Diesel
Equipment Capacity (MMBtu/hr):		4.38 SMALL
Stack Height (feet):		20
Building Height (feet):		
Distance to closest boundary:		
Emission Factor Source:		AP-42 Emission Factors from Section 3.4 (Tables 3.4-3 & 3.4-4, worse-case) Annual emission impacts adjusted for 100 hr/yr operation

	Screening Levels (SLs)					
TAC	**ITSL (µg/m³)**	**IRSL (µg/m³)**	**EF (lb/MMBtu)**	**Impacts (µg/m³)**	**% of SL**	Rank
Napthalene		0.08	1.30E-04	2.01E-02	25.18172%	1
PAHs (weighted as BaP)		0.0005	2.12E-04	5.97E-05	11.93560%	2
Acrolein	0.5		7.88E-06	2.62E-03	0.52365%	3
Benzene	30		7.76E-04	1.20E-01	0.40084%	4
Benzene		0.1	7.76E-04	2.18E-04	0.21844%	5
Chrysene		0.0005	1.53E-06	4.31E-07	0.08614%	6
Acetaldehyde	9		2.52E-05	3.91E-03	0.04339%	7
Xylenes	100		1.93E-04	2.99E-02	0.02991%	8
Propylene	1500		2.79E-03	4.32E-01	0.02882%	9
Formaldehyde		0.08	7.89E-05	2.22E-05	0.02776%	10
Phenanthrene	0.1		4.08E-05	1.15E-05	0.01149%	11
Acrolein	0.02		7.88E-06	2.22E-06	0.01109%	12
Acenaphthylene	35		9.23E-06	1.43E-03	0.00409%	13
Acetaldehyde		0.5	2.52E-05	7.09E-06	0.00142%	14
Naphthalene	3		1.30E-04	3.66E-05	0.00122%	15
Toluene	5000		2.81E-04	4.35E-02	0.00087%	16
Pyrene	100		3.71E-06	5.75E-04	0.00057%	17
Acenaphthene	210		4.68E-06	7.25E-04	0.00035%	18
Anthracene	1000		1.23E-06	1.91E-04	0.00002%	19

Diesel Example 3

Permit #:			**50-12 COMFORT RESEARCH**			
Summary:			Diesel Engine			
Emission source:			ENGINE			
Fuel Type:			Diesel Engine			
Equipment Capacity (MMBtu/hr):			9.85	SMALL		
Stack Height (feet):			19.5			
Building Height (feet):			13			
Distance to closest boundary:			~125			
Emission Factor Source:			AP-42 3.3, 3.4			
	Screening Levels (SLs)					
TAC	**ITSL (µg/m³)**	**IRSL (µg/m³)**	**EF (lb/MMBtu)**	**Impacts (µg/m³)**	**% of SL**	Rank
Benzene		0.1	9.42E-04	3.76E-02	37.56416%	1
PAHs (weighted as BaP)		0.0005	0.00E+00	1.32E-04	26.49816%	2
Formaldehyde		0.08	4.84E-04	1.93E-02	24.13279%	3
Napthalene		0.083	9.42E-05	1.88E-02	23.50078%	4
Acrolein	0.02		9.25E-05	3.69E-03	18.45084%	5
Acrolein	0.5		9.25E-05	4.62E-02	9.23362%	6
Acetaldehyde		0.5	7.67E-04	3.06E-02	6.11970%	7
1,3 Butadiene		0.03	3.91E-05	1.56E-03	5.19948%	8
Formaldehyde	9		4.84E-04	1.69E-01	1.87872%	9
Acetaldehyde	9		7.67E-04	1.53E-01	1.70159%	10
Phenanthrene	0.1		4.08E-05	1.63E-03	1.62766%	11
Chrysene		0.0005	8.76E-08	3.49E-06	0.69887%	12
Benzene	30		9.42E-04	1.88E-01	0.62669%	13
1,3 Butadiene	2		3.91E-05	7.81E-03	0.39035%	14
Naphthalene	3		9.42E-05	3.76E-03	0.12521%	15
Benzene	30		9.42E-04	3.76E-02	0.12521%	16
Propylene	1500		2.79E-03	5.57E-01	0.03714%	17
Xylenes	100		4.99E-05	9.97E-03	0.00997%	18
Acenaphthylene	35		9.23E-06	1.84E-03	0.00527%	19
Fluorene	140		0.0000292	5.83E-03	0.00416%	20
Toluene	5000		2.82E-04	5.63E-02	0.00113%	21
Pyrene	100		4.78E-06	9.54E-04	0.00095%	22
Ethylbenzene	1000		2.24E-05	4.47E-03	0.00045%	23
Acenaphthene	210		4.68E-06	9.34E-04	0.00044%	24
Fluoranthene	140		9.56E-07	1.91E-04	0.00014%	25
Anthracene	1000		1.87E-06	3.73E-04	0.00004%	26
Benz(a)anthracene			1.11E-08	-------		
Benzo(a)pyrene			4.29E-07	-------		
Benzo(b)fluoranthene			1.11E-06	-------		
Benzo(k)fluoranthene			2.18E-07	-------		
Dibenzo(a,h)anthracene			5.83E-07	-------		
Indeno(1,2,c,d)pyrene			4.14E-07	-------		

Diesel Example 4

Permit #:		**38-09 ST MARYS CEMENT, INC**
Summary:		Four diesel-fired emergency generators
Emission source:		ENGINE
Fuel Type:		Diesel Engine
Equipment Capacity (MMBtu/hr):		76 MEDIUM (total for 4 engines)
Stack Height (feet):		164
Building Height (feet):		~180
Distance to closest boundary:		
Emission Factor Source:		

TAC	ITSL (µg/m³)	IRSL (µg/m³)	EF (lb/MMBtu)	Impacts (µg/m³)	% of SL	Rank
	Screening Levels (SLs)					
Formaldehyde		0.08	1.18E-03	5.52E-03	6.90058%	1
Benzene		0.1		3.45E-03	3.45124%	2
Acetaldehyde		0.5		2.33E-03	0.46648%	3
Acrolein	0.02		9.25E-05	3.39E-05	0.16962%	4
Acetaldehyde	9		7.67E-04	8.14E-03	0.09042%	5
Acrolein	0.5			2.80E-04	0.05598%	6
Benzene	30		9.33E-04	1.20E-02	0.04014%	7
Napthalene		0.08	8.48E-05	2.85E-05	0.03564%	8
1,3 Butadiene		0.03		6.06E-06	0.02020%	9
Propylene	1500		2.58E-03	9.21E-02	0.00614%	10
Phenanthrene	0.1		2.94E-05	3.43E-06	0.00343%	11
Naphthalene	3			9.95E-05	0.00332%	12
Xylenes	100		2.85E-04	1.12E-03	0.00112%	13
1,3 Butadiene	2		3.91E-05	2.11E-05	0.00106%	14
PAHs (weighted as BaP)		0.0005		3.8726E-09	0.00077%	15
Toluene	5000		4.09E-04	2.31E-03	0.00005%	16
Fluorene	140		0.0000292	1.18E-05	0.00001%	17
Acenaphthylene	35		5.06E-06	3.54E-07	0.00000%	18
Fluoranthene	140		7.61E-06	8.01E-07	0.00000%	19
Pyrene	100		4.78E-06	3.16E-07	0.00000%	20
Benzo(g,h,l)perylene	12		4.89E-07	3.31E-09	0.00000%	21
Acenaphthene	210		1.42E-06	2.79E-08	0.00000%	22
Anthracene	1000		1.87E-06	4.84E-08	5E-11	23

Wood Example 1

Permit #:		**354-06 Michigan Wood Pellet Fuel, LLC**
Summary:		Wood Burner
Emission source:		Burner (BOILER???)
Fuel Type:		Wood
Equipment Capacity (MMBtu/hr):		25 SMALL
Stack Height (feet):		36
Building Height (feet):		
Distance to closest boundary:		
Emission Factor Source:		From Wood Residue Combustion in Boilers (SCC 1-02-009-08) Industrial Dry Wood-Fired Boiler

	Screening Levels (SLs)								
Chemical	**ITSL**	**AvgT**	**IRSL**	**Source**	**Emission Factor**	**Emission (lb/hr)**	**PAI**	**%SL**	**% SL Rank**
Silver	0.1	8-hr		Burner	1.7E-03	3E-02	1E-01	97.7%	1
Acrolein - ITSL	0.02	annual		Dryer	4.5E-03	2E-02	1E-02	56.2%	2
Formaldehyde			0.08	Dryer	1.8E-01	7E-01	4E-01	46.6%	3
Chromium (hexavalent) - IRSL			8.3E-05	Burner	3.5E-06	7E-05	3E-05	41.3%	4
Manganese	0.05	annual		Burner	1.6E-03	3E-02	2E-02	31.3%	5
chlorine	0.3	24-hr		Burner	7.9E-04	2E-02	8E-02	27.3%	6
Arsenic			0.0002	Burner	2.2E-05	4E-04	2E-04	10.8%	7
Acetaldehyde - IRSL			0.5	Dryer	1.3E-02	5E-02	5E-02	9.9%	8
Nickel			0.0042	Burner	3.3E-05	7E-04	3E-04	7.7%	9
Alpha-pinene	1120	8-hr		Dryer	2.8E+00	1E+01	9E+01	7.7%	10
Cadmium			0.0006	Burner	4.1E-06	8E-05	4E-05	6.7%	11
Acrolein - ITSL	5	1-hr		Dryer	4.5E-03	2E-02	3E-01	5.7%	12
Acetaldehyde - ITSL	9	24-hr		Dryer	1.3E-02	5E-02	5E-01	5.6%	13
benzo(a)pyrene			0.0005	Burner	2.6E-06	5E-05	3E-05	5.1%	14
Beryllium - IRSL			0.0004	Burner	1.1E-06	2E-05	1E-05	2.7%	15
Benzaldehyde			0.4	Dryer	2.6E-03	1E-02	8E-03	2.0%	16
Benzene - IRSL			0.1	Dryer	9.9E-04	4E-03	2E-03	1.9%	17
Hexaldehyde	2	annual		Dryer	1.6E-02	6E-02	4E-02	1.9%	18
Beta-pinene	1120	8-hr		Dryer	6.9E-01	3E+00	2E+01	1.8%	19
Buthlaldehyde	7	24-hr		Dryer	3.1E-03	1E-02	1E-01	1.5%	20
naphthalene - IRSL			0.08	Burner	9.7E-05	2E-03	9E-04	1.2%	21
Hydrogen Chloride - ITSL	20	annual		Burner	1.9E-02	4E-01	2E-01	0.9%	22
Propionaldehyde	8	24-hr		Dryer	3.2E-03	1E-02	7E-02	0.8%	23
Beryllium - ITSL	0.02	24-hr		Burner	1.1E-06	2E-05	1E-04	0.6%	24
Crotonaldehyde	9	1-hr		Burner	9.9E-06	2E-04	5E-02	0.5%	25
Barium	5	8-hr		Burner	1.7E-04	3E-03	2E-02	0.5%	26
Cobalt	0.2	8-hr		Burner	6.5E-06	1E-04	9E-04	0.5%	27
Methanol	3250	1-hr		Dryer	4.0E-02	2E-01	1E+01	0.4%	28
Antimony	0.2	24-hr		Burner	7.9E-06	2E-04	8E-04	0.4%	29
Phosphorus	1	8-hr		Burner	2.7E-05	5E-04	4E-03	0.4%	30
Chromium (hexavalent) - ITSL	0.1	24-hr		Burner	3.5E-06	7E-05	4E-04	0.4%	31
Copper	2	8-hr		Burner	4.9E-05	1E-03	7E-03	0.4%	32
naphthalene - ITSL	3	24-hr		Burner	9.7E-05	2E-03	1E-02	0.3%	33

Note: Truncated to fit to 1 page. The number of TACs that had non-null EFs = 101. (see note on page 8)

Wood Example 2

Permit #:		**404-08 Mancelona Renewable Resources**
Summary:		Bubbling fluidized bed boiler, Wood Fired
Emission source:		BOILER
Fuel Type:		Wood
Equipment Capacity (MMBtu/hr):		565 LARGE
Stack Height (feet):		270
Building Height (feet):		120
Distance to closest boundary:		400 ft
Emission Factor Source:		Some from AP-42, others supplied by applicant from testing

	Screening Levels (SLs)					
TAC	**ITSL (µg/m³)**	**IRSL (µg/m³)**	**EF (lb/MMBtu)**	**Impacts (µg/m³)**	**% of SL**	Rank
chrysene		0.0005	6.37E-06	3.8E-04	75.34800%	1
1,2-dibromoethene (1,2-ethylene dibromide)		0.002	5.50E-05	2.0E-04	9.82760%	2
Arsenic		0.0002	3.29E-06	1.2E-05	5.87760%	3
Chromium (hexavalent)		0.000083	6.37E-07	2.3E-06	2.74120%	4
Formaldehyde		0.08	3.45E-04	1.2E-03	1.54050%	5
Acrolein	0.02		7.78E-05	2.8E-04	1.39040%	6
Benzene		0.1	3.54E-04	1.3E-03	1.26400%	7
Cadmium		0.0006	1.06E-06	3.8E-06	0.63200%	8
Nickel		0.0042	5.84E-06	2.1E-05	0.49657%	9
Styrene		1.7	1.89E-03	6.8E-03	0.39779%	10
Manganese	0.05		4.60E-05	1.6E-04	0.32864%	11
Zinc (SL for ZnO)	50		2.21E-03	1.3E-01	0.26163%	12
Antimony	0.2		1.27E-05	3.9E-04	0.19595%	13
Ammonia (slip from SNCR)	100		10 ppmdv	1.9E-01	0.19432%	14
Acrolein	5		7.78E-05	8.4E-03	0.16745%	15
Phosphorus	1		2.71E-05	1.6E-03	0.16011%	16
Chlorine	15		3.95E-04	2.3E-02	0.15558%	17
1,2-Dichloroethane		0.04	1.45E-05	5.2E-05	0.12956%	18
Acetaldehyde		0.5	1.77E-04	6.3E-04	0.12640%	19
Carbon tetrachloride		0.07	2.25E-05	8.0E-05	0.11466%	20
Naphthalene		0.08	2.44E-05	8.7E-05	0.10902%	21
Silver	0.1		1.25E-06	7.4E-05	0.07409%	22
Acetaldehyde	9		1.77E-04	5.4E-03	0.06048%	23
Beryllium		0.0004	6.14E-08	2.2E-07	0.05483%	24
Benzene	30		3.54E-04	1.1E-02	0.03629%	25
Strontium	0.1		1.00E-05	3.6E-05	0.03571%	26
carbazol		0.02	1.80E-06	6.4E-06	0.03223%	27
Copper	2		1.04E-05	6.2E-04	0.03087%	28
Vinyl chloride		0.11	9.02E-06	3.2E-05	0.02930%	29
dichloromethane		2	1.45E-04	5.2E-04	0.02591%	30
o-tolualdehyde	0.1		7.20E-06	2.6E-05	0.02572%	31
Naphthalene	3		2.44E-05	7.5E-04	0.02504%	32
Propanal/propionaldehyde	8		6.10E-05	1.9E-03	0.02347%	33

Note: Truncated to fit to 1 page. The number of TACs that had non-null EFs = 88. (see note on page 8)

Wood Example 3

Permit #:			**166-09A (FRONTIER KINROSS, LLC)**		
Summary:			Bubbling fluidized bed biomass boiler		
Emission source:			BOILER		
Fuel Type:			Wood		
Equipment Capacity (MMBtu/hr):			535	LARGE	
Stack Height (feet):			175		
Building Height (feet):					
Distance to closest boundary:					
Emission Factor Source:					
	Screening Levels (SLs)				
TAC	**ITSL (µg/m³)**	**IRSL (µg/m³)**	**EF (lb/MMBtu)**	**Impacts (µg/m³)**	**% of SL**
Naphthalene		0.08		1.5E-02	18.39175%
1,3-butadiene		0.03		5.2E-03	17.45576%
1,3-butadiene	2			2.6E-01	13.09182%
carbon tetrachloride		0.17		7.3E-03	4.29006%
Vinyl chloride		0.11		3.0E-03	2.69447%
Naphthalene	3			7.4E-02	2.47366%
hexachlorobenzene		0.002		3.9E-06	0.19647%
ethylene dichloride		0.04		6.1E-05	0.15154%
cumene	0.1			7.0E-05	0.06967%
2,4-dinitrotoluene		0.009		3.6E-06	0.03994%
Vinyl chloride	100			1.5E-02	0.01505%

Wood Example 4

Permit #:		**268-09 Sawyer Electric Company, LLC,**
Summary:		Gwinn, Michigan
Emission source:		
Fuel Type:		Wood
Equipment Capacity (MMBtu/hr):		560 LARGE
Stack Height (feet):		150
Building Height (feet):		75
Distance to closest boundary:		~250
Emission Factor Source:		Using representative emission factors
	Screening Levels (SLs)	

TAC	ITSL (µg/m³)	IRSL (µg/m³)	EF (lb/MMBtu)	Impacts (µg/m³)	% of screening	Rank
Arsenic		0.0002		5.6E-05	28.08960%	1
Chromium (hexavalent)		0.000083		6.0E-06	7.16964%	2
Ammonia (slip from SNCR)	100			2.6E+00	2.55039%	3
Naphthalene		0.08		1.3E-03	1.56408%	4
Phosphorus	1			1.4E-02	1.38996%	5
Combined Carcinogenic PAHs		0.0005		6.7E-06	1.34559%	6
Ammonia	100			1.3E+00	1.25495%	7
Chromium (hexavalent)	0.008			9.4E-05	1.17923%	8
Formaldehyde		0.08		9.2E-04	1.15254%	9
Cadmium		0.0006		6.5E-06	1.07922%	10
Acrolein	0.02			2.1E-04	1.03968%	11
Benzene		0.1		9.4E-04	0.94483%	12
Silver	0.1			7.4E-04	0.73842%	13
Naphthalene	3			2.0E-02	0.66121%	14
Manganese	0.05			2.9E-04	0.58779%	15
Potassium	0.1			5.0E-04	0.49795%	16
Acetaldehyde		0.5		2.1E-03	0.42390%	17
Acetaldehyde	9			3.4E-02	0.37334%	18
o-tolualdehyde	0.1			3.3E-04	0.33197%	19
Styrene		1.7		5.1E-03	0.29764%	20
benzoic acid	0.1			2.8E-04	0.28090%	21
Antimony	0.2			5.4E-04	0.26988%	22
Acrolein	5			1.3E-02	0.26807%	23
Chlorine	15			3.6E-02	0.23921%	24
ethylene dichloride		0.04		7.4E-05	0.18514%	25
Carbon tetrachloride		0.07		1.1E-04	0.16416%	26
1,2-dibromoethene (1,2-ethylene dibromide)	0.1			1.5E-04	0.14707%	27
2,3,7,8-Tetrachlorodibenzo-p-dioxin		2.3E-08		2.2E-11	0.09548%	28
Benzaldehyde		0.4		2.8E-04	0.07022%	29
Beryllium		0.0004		2.8E-07	0.06938%	30
Nickel		0.0042		2.3E-06	0.05506%	31
Benzene	30			1.5E-02	0.04993%	32

Note: Truncated to fit to 1 page. The number of TACs that had non-null EFs = 118. (see note on page 8)

APPENDIX G:

CLEAN FUELS: BIODIESEL EMISSION FACTORS AND AMBIENT IMPACTS

Appendix G and H were originally provided to the ATW in spreadsheet format with underlying formulas and supporting information. The data tables provided here were referenced in ATW discussions, whereas the supplementary data, also in the spreadsheet, was provided for workgroup members who wanted to see the raw data and format. Only the pertinent data from the spreadsheets are provided here. The original spreadsheets with all data and formulas are available upon request.

Table 1. Soy BioDiesel Process: 50mmbtu, 40 foot stack

Chemical	CAS	50mmbtu Soy BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Formaldehyde	50000	3.08E-03	9	8 hr		Aldehyde	1.54E-01	19.55	3.013637	PASS	33.5%
Formaldehyde	50000	3.08E-03			0.08	Aldehyde	1.54E-01	2.172	0.334814	FAIL	418.5%
Benzo(a)pyrene	50328	1.08E-09			0.0005	PAH	5.40E-08	2.172	0.0000001	PASS	0.0%
Dibenzo(a,h)anthracene	53703	1.09E-09			0.0005	PAH	5.47E-08	2.172	0.0000001	PASS	0.0%
Benzo(a)anthracene	56553	3.38E-09			0.005	PAH	1.69E-07	2.172	0.0000004	PASS	0.0%
Ethanol	64175	9.91E-05	19000	8 hr		VOC	4.95E-03	19.55	0.096836	PASS	0.0%
Hexanal	66251		2	annual		Aldehyde		2.172		PASS	0.0%
Isopropyl alcohol	67630	3.29E-06	220	24 hr		VOC	1.64E-04	13.03	0.002143	PASS	0.0%
Acetone	67641	7.54E-04	5900	8 hr		VOC	3.77E-02	19.55	0.736745	PASS	0.0%
Chloroform	67663	3.61E-06			0.4	VOC	1.81E-04	2.172	0.000393	PASS	0.1%
Benzene	71432	7.22E-06	30	annual		VOC	3.61E-04	2.172	0.000784	PASS	0.0%
Benzene	71432	7.22E-06	30	24 hr		VOC	3.61E-04	13.03	0.004702	PASS	0.0%
Benzene	71432	7.22E-06			0.1	VOC	3.61E-04	2.172	0.000784	PASS	0.8%
Bromomethane	74839		5	24 hr		VOC		13.03		PASS	0.0%
Chloromethane	74873		90	24 hr		VOC		13.03		PASS	0.0%
Chloromethane	74873				1.6	VOC		2.172		PASS	0.0%
Chloroethane	75003	1.94E-06	10000	24 hr		VOC	9.71E-05	13.03	0.001265	PASS	0.0%
Acetaldehyde	75070	3.38E-03	9	24 hr		Aldehyde	1.69E-01	13.03	2.204636	PASS	24.5%
Acetaldehyde	75070	3.38E-03			0.5	Aldehyde	1.69E-01	2.172	0.367496	PASS	73.5%
Carbon disulfide	75150	1.59E-04	700	24 hr		VOC	7.97E-03	13.03	0.103795	PASS	0.0%
Tribromomethane	75252	1.44E-05			0.9	VOC	7.22E-04	2.172	0.001568	PASS	0.2%
2-Butanone	78933	5.29E-06	5000	24 hr		VOC	2.65E-04	13.03	0.003448	PASS	0.0%
Trichloroethylene	79016	6.25E-06	2	annual		VOC	3.13E-04	2.172	0.000679	PASS	0.0%
Trichloroethylene	79016	6.25E-06	10000	24 hr		VOC	3.13E-04	13.03	0.004075	PASS	0.0%
Trichloroethylene	79016	6.25E-06			0.2	VOC	3.13E-04	2.172	0.000679	PASS	0.3%
1,1,2,2-Tetrachloroethane	79345				0.02	VOC		2.172		PASS	0.0%
Acenaphthene	83329	6.06E-09	210	24 hr		PAH	3.03E-07	13.03	0.000004	PASS	0.0%

Table 1. Soy BioDiesel Process: 50mmbtu, 40 foot stack

Chemical	CAS	50mmbtu Soy BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Phenanthrene	85018	1.85E-06	0.1	annual		PAH	9.23E-05	2.172	0.000200	PASS	0.2%
Fluorene	86737	1.09E-09	140	24 hr		PAH	5.47E-08	13.03	0.000001	PASS	0.0%
Naphthalene	91203	2.12E-07	3	24 hr		PAH	1.06E-05	13.03	0.000138	PASS	0.0%
Naphthalene	91203	2.12E-07			0.08	PAH	1.06E-05	2.172	0.000023	PASS	0.0%
2-Methylnapthalene	91576	1.24E-07	10	annual		PAH	6.21E-06	2.172	0.000013	PASS	0.0%
o-Xylene	95476		100	24 hr		VOC		13.03		PASS	0.0%
1,2-Dichlorobenzene	95501	2.40E-03	300	24 hr		VOC	1.20E-01	13.03	1.564736	PASS	0.5%
1,2,4-Trimethylbenzene	95636	7.75E-07	50	annual		VOC	3.88E-05	2.172	0.000084	PASS	0.0%
1,2,4-Trimethylbenzene	95636	7.75E-07	1200	8 hr		VOC	3.88E-05	19.55	0.000758	PASS	0.0%
Ethylbenzene	100414	2.70E-06	1000	24 hr		VOC	1.35E-04	13.03	0.001762	PASS	0.0%
Ethylbenzene	100414	2.70E-06			3	VOC	1.35E-04	2.172	0.000294	PASS	0.0%
Styrene	100425	2.25E-06	1000	24 hr		VOC	1.13E-04	13.03	0.001466	PASS	0.0%
Styrene	100425	2.25E-06			1.7	VOC	1.13E-04	2.172	0.000244	PASS	0.0%
Benzaldehyde	100527				0.4	Aldehyde		2.172		PASS	0.0%
1,4-Dichlorobenezene	106467		800	24 hr		VOC		13.03		PASS	0.0%
1,4-Dichlorobenezene	106467				0.14	VOC		2.172		PASS	0.0%
Vinyl acetate	108054		200	24 hr		VOC		13.03		PASS	0.0%
4-Methyl-2-pentanone	108101	3.55E-05	3000	24 hr		VOC	1.78E-03	13.03	0.023130	PASS	0.0%
1,3,5-Trimethylbenzene	108678	5.87E-07	50	annual		VOC	2.94E-05	2.172	0.000064	PASS	0.0%
1,3,5-Trimethylbenzene	108678	5.87E-07	1200	8 hr		VOC	2.94E-05	19.55	0.000574	PASS	0.0%
Toluene	108883	8.10E-07	5000	24 hr		VOC	4.05E-05	13.03	0.000528	PASS	0.0%
Chlorobenzene	108907	1.86E-06	50	annual		VOC	9.32E-05	2.172	0.000202	PASS	0.0%
Chlorobenzene	108907	1.86E-06	4400	8 hr		VOC	9.32E-05	19.55	0.001822	PASS	0.0%
Tetrahydrofuran	109999	2.71E-06	8000	annual		VOC	1.36E-04	2.172	0.000295	PASS	0.0%
Veraldehyde	110623		1760	8 hr		Aldehyde		19.55		PASS	0.0%
Cyclohexane	110827	1.19E-05	6000	24 hr		VOC	5.95E-04	13.03	0.007747	PASS	0.0%
Anthracene	120127	1.66E-08	1000	24 hr		PAH	8.28E-07	13.03	0.000011	PASS	0.0%
Propionaldehyde	123386		8	24 hr		Aldehyde		13.03		PASS	0.0%

Table 1. Soy BioDiesel Process: 50mmbtu, 40 foot stack

Chemical	CAS	50mmbtu Soy BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Butylaldehyde	123728		7	24 hr		Aldehyde		13.03		PASS	0.0%
1,4 Dioxane	123911		100	24 hr		VOC		13.03		PASS	0.0%
1,4 Dioxane	123911				0.04	VOC		2.172		PASS	0.0%
Pyrene	129000	1.21E-07	100	24 hr		PAH	6.05E-06	13.03	0.000079	PASS	0.0%
Ethyl acetate	141786	1.03E-05	3200	24 hr		VOC	5.16E-04	13.03	0.006722	PASS	0.0%
Benzo(ghi)perylene	191242	3.86E-09	12	24 hr		PAH	1.93E-07	13.03	0.000003	PASS	0.0%
Benzo(ghi)perylene	191242	3.86E-09			0.056	PAH	1.93E-07	2.172	0.000000	PASS	0.0%
Ideno(1,2,3-cd)pyrene	193395	1.24E-09			0.005	PAH	6.21E-08	2.172	0.000000	PASS	0.0%
Benzo(b)fluoranthene	205992	5.27E-09			0.005	PAH	2.64E-07	2.172	0.000001	PASS	0.0%
Fluoranthene	206440	2.53E-07	140	24 hr		PAH	1.26E-05	13.03	0.000165	PASS	0.0%
Fluoranthene	206440	2.53E-07			0.00625	PAH	1.26E-05	2.172	0.000027	PASS	0.4%
Benzo(k)fluoranthene	207089	1.41E-09			0.005	PAH	7.04E-08	2.172	0.000000	PASS	0.0%
Acenaphthylene	208968	2.63E-08	35	24 hr		PAH	1.32E-06	13.03	0.000017	PASS	0.0%
Chrysene	218019	8.52E-09			0.5	PAH	4.26E-07	2.172	0.000001	PASS	0.0%
1,3-Dichlorobenezene	541731		3	annual		VOC		2.172		PASS	0.0%
Iso-Veraldehyde	590863	2.71E-05	800	annual		Aldehyde	1.36E-03	2.172	0.002945	PASS	0.0%
2-Hexanone	591786	9.09E-06	30	24 hr		VOC	4.54E-04	13.03	0.005921	PASS	0.0%
1-Ethyl-4-methyl benzene	622968	5.87E-07	350	24 hr		VOC	2.94E-05	13.03	0.000383	PASS	0.0%
Tolualdehyde	1334787		440	24 hr		Aldehyde		13.03		PASS	0.0%
Methyl-t-butyl ether	1634044	1.03E-06	3000	24 hr		VOC	5.13E-05	13.03	0.000669	PASS	0.0%
Crotonaldehyde	4170303		9	1 hr		Aldehyde		21.72		PASS	0.0%
2,5-Dimethylbenzaldehyde	5779942		0.1	annual		Aldehyde		2.172		PASS	0.0%
m,p-Xylene	1.8E+08	5.24E-06	100	24 hr		VOC	2.62E-04	13.03	0.003416	PASS	0.0%

Table 2. Soy BioDiesel Process: 100mmbtu, 60 foot stack

Chemical	CAS	100mmbtu Soy BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Formaldehyde	50000	3.08E-03	9	8 hr		Aldehyde	3.08E-01	12.95	3.9924906	PASS	44.4%
Formaldehyde	50000	3.08E-03			0.08	Aldehyde	3.08E-01	1.439	0.4436443	FAIL	554.6%
Benzo(a)pyrene	50328	1.08E-09			0.0005	PAH	1.08E-07	1.439	0.0000002	PASS	0.0%
Dibenzo(a,h)anthracene	53703	1.09E-09			0.0005	PAH	1.09E-07	1.439	0.0000002	PASS	0.0%
Benzo(a)anthracene	56553	3.38E-09			0.005	PAH	3.38E-07	1.439	0.0000005	PASS	0.0%
Ethanol	64175	9.91E-05	19000	8 hr		VOC	9.91E-03	12.95	0.1282893	PASS	0.0%
Hexanal	66251		2	annual		Aldehyde		1.439		PASS	0.0%
Isopropyl alcohol	67630	3.29E-06	220	24 hr		VOC	3.29E-04	8.636	0.0028410	PASS	0.0%
Acetone	67641	7.54E-04	5900	8 hr		VOC	7.54E-02	12.95	0.9760455	PASS	0.0%
Chloroform	67663	3.61E-06			0.4	VOC	3.61E-04	1.439	0.0005202	PASS	0.1%
Benzene	71432	7.22E-06	30	annual		VOC	7.22E-04	1.439	0.0010385	PASS	0.0%
Benzene	71432	7.22E-06	30	24 hr		VOC	7.22E-04	8.636	0.0062326	PASS	0.0%
Benzene	71432	7.22E-06			0.1	VOC	7.22E-04	1.439	0.0010385	PASS	1.0%
Bromomethane	74839		5	24 hr		VOC		8.636		PASS	0.0%
Chloromethane	74873		90	24 hr		VOC		8.636		PASS	0.0%
Chloromethane	74873				1.6	VOC		1.439		PASS	0.0%
Chloroethane	75003	1.94E-06	10000	24 hr		VOC	1.94E-04	8.636	0.0016773	PASS	0.0%
Acetaldehyde	75070	3.38E-03	9	24 hr		Aldehyde	3.38E-01	8.636	2.9223699	PASS	32.5%
Acetaldehyde	75070	3.38E-03			0.5	Aldehyde	3.38E-01	1.439	0.4869488	PASS	97.4%
Carbon disulfide	75150	1.59E-04	700	24 hr		VOC	1.59E-02	8.636	0.1375866	PASS	0.0%
Tribromomethane	75252	1.44E-05			0.9	VOC	1.44E-03	1.439	0.0020772	PASS	0.2%
2-Butanone	78933	5.29E-06	5000	24 hr		VOC	5.29E-04	8.636	0.0045708	PASS	0.0%
Trichloroethylene	79016	6.25E-06	2	annual		VOC	6.25E-04	1.439	0.0009000	PASS	0.0%
Trichloroethylene	79016	6.25E-06	10000	24 hr		VOC	6.25E-04	8.636	0.0054014	PASS	0.0%
Trichloroethylene	79016	6.25E-06			0.2	VOC	6.25E-04	1.439	0.0009000	PASS	0.5%
1,1,2,2-Tetrachloroethane	79345				0.02	VOC		1.439		PASS	0.0%
Acenaphthene	83329	6.06E-09	210	24 hr		PAH	6.06E-07	8.636	0.0000052	PASS	0.0%
Phenanthrene	85018	1.85E-06	0.1	annual		PAH	1.85E-04	1.439	0.0002655	PASS	0.3%

Table 2. Soy BioDiesel Process: 100mmbtu, 60 foot stack

Chemical	CAS	100mmbtu Soy BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Fluorene	86737	1.09E-09	140	24 hr		PAH	1.09E-07	8.636	0.0000009	PASS	0.0%
Naphthalene	91203	2.12E-07	3	24 hr		PAH	2.12E-05	8.636	0.0001834	PASS	0.0%
Naphthalene	91203	2.12E-07			0.08	PAH	2.12E-05	1.439	0.0000306	PASS	0.0%
2-Methylnapthalene	91576	1.24E-07	10	annual		PAH	1.24E-05	1.439	0.0000179	PASS	0.0%
o-Xylene	95476		100	24 hr		VOC		8.636		PASS	0.0%
1,2-Dichlorobenzene	95501	2.40E-03	300	24 hr		VOC	2.40E-01	8.636	2.0741452	PASS	0.7%
1,2,4-Trimethylbenzene	95636	7.75E-07	50	annual		VOC	7.75E-05	1.439	0.0001116	PASS	0.0%
1,2,4-Trimethylbenzene	95636	7.75E-07	1200	8 hr		VOC	7.75E-05	12.95	0.0010040	PASS	0.0%
Ethylbenzene	100414	2.70E-06	1000	24 hr		VOC	2.70E-04	8.636	0.0023350	PASS	0.0%
Ethylbenzene	100414	2.70E-06			3	VOC	2.70E-04	1.439	0.0003891	PASS	0.0%
Styrene	100425	2.25E-06	1000	24 hr		VOC	2.25E-04	8.636	0.0019435	PASS	0.0%
Styrene	100425	2.25E-06			1.7	VOC	2.25E-04	1.439	0.0003238	PASS	0.0%
Benzaldehyde	100527				0.4	Aldehyde		1.439		PASS	0.0%
1,4-Dichlorobenezene	106467		800	24 hr		VOC		8.636		PASS	0.0%
1,4-Dichlorobenezene	106467				0.14	VOC		1.439		PASS	0.0%
Vinyl acetate	108054		200	24 hr		VOC		8.636		PASS	0.0%
4-Methyl-2-pentanone	108101	3.55E-05	3000	24 hr		VOC	3.55E-03	8.636	0.0306604	PASS	0.0%
1,3,5-Trimethylbenzene	108678	5.87E-07	50	annual		VOC	5.87E-05	1.439	0.0000845	PASS	0.0%
1,3,5-Trimethylbenzene	108678	5.87E-07	1200	8 hr		VOC	5.87E-05	12.95	0.0007606	PASS	0.0%
Toluene	108883	8.10E-07	5000	24 hr		VOC	8.10E-05	8.636	0.0006999	PASS	0.0%
Chlorobenzene	108907	1.86E-06	50	annual		VOC	1.86E-04	1.439	0.0002682	PASS	0.0%
Chlorobenzene	108907	1.86E-06	4400	8 hr		VOC	1.86E-04	12.95	0.0024135	PASS	0.0%
Tetrahydrofuran	109999	2.71E-06	8000	annual		VOC	2.71E-04	1.439	0.0003906	PASS	0.0%
Veraldehyde	110623		1760	8 hr		Aldehyde	0.00E+00	12.95		PASS	0.0%
Cyclohexane	110827	1.19E-05	6000	24 hr		VOC	1.19E-03	8.636	0.0102689	PASS	0.0%
Anthracene	120127	1.66E-08	1000	24 hr		PAH	1.66E-06	8.636	0.0000143	PASS	0.0%
Propionaldehyde	123386		8	24 hr		Aldehyde		8.636		PASS	0.0%
Butylaldehyde	123728		7	24 hr		Aldehyde		8.636		PASS	0.0%
1,4 Dioxane	123911		100	24 hr		VOC		8.636		PASS	0.0%

Table 2. Soy BioDiesel Process: 100mmbtu, 60 foot stack

Chemical	CAS	100mmbtu Soy BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
1,4 Dioxane	123911				0.04	VOC		1.493		PASS	0.0%
Pyrene	129000	1.21E-07	100	24 hr		PAH	1.21E-05	8.636	0.0001044	PASS	0.0%
Ethyl acetate	141786	1.03E-05	3200	24 hr		VOC	1.03E-03	8.636	0.0089103	PASS	0.0%
Benzo(ghi)perylene	191242	3.86E-09	12	24 hr		PAH	3.86E-07	8.636	0.0000033	PASS	0.0%
Benzo(ghi)perylene	191242	3.86E-09			0.056	PAH	3.86E-07	1.439	0.0000006	PASS	0.0%
Ideno(1,2,3-cd)pyrene	193395	1.24E-09			0.005	PAH	1.24E-07	1.439	0.0000002	PASS	0.0%
Benzo(b)fluoranthene	205992	5.27E-09			0.005	PAH	5.27E-07	1.439	0.0000008	PASS	0.0%
Fluoranthene	206440	2.53E-07	140	24 hr		PAH	2.53E-05	8.636	0.0002181	PASS	0.0%
Fluoranthene	206440	2.53E-07			0.00625	PAH	2.53E-05	1.439	0.0000363	PASS	0.6%
Benzo(k)fluoranthene	207089	1.41E-09			0.005	PAH	1.41E-07	1.439	0.0000002	PASS	0.0%
Acenaphthylene	208968	2.63E-08	35	24 hr		PAH	2.63E-06	8.636	0.0000228	PASS	0.0%
Chrysene	218019	8.52E-09			0.5	PAH	8.52E-07	1.439	0.0000012	PASS	0.0%
1,3-Dichlorobenezene	541731		3	annual		VOC		1.439		PASS	0.0%
Iso-Veraldehyde	590863	2.71E-05	800	annual		Aldehyde	2.71E-03	1.439	0.0039017	PASS	0.0%
2-Hexanone	591786	9.09E-06	30	24 hr		VOC	9.09E-04	8.636	0.0078487	PASS	0.0%
1-Ethyl-4-methyl benzene	622968	5.87E-07	350	24 hr		VOC	5.87E-05	8.636	0.0005072	PASS	0.0%
Tolualdehyde	1334787		440	24 hr		Aldehyde		8.636		PASS	0.0%
Methyl-t-butyl ether	1634044	1.03E-06	3000	24 hr		VOC	1.03E-04	8.636	0.0008869	PASS	0.0%
Crotonaldehyde	4170303		9	1 hr		Aldehyde		14.39		PASS	0.0%
2,5-Dimethylbenzaldehyde	5779942		0.1	annual		Aldehyde		1.439		PASS	0.0%
m,p-Xylene	1.8E+08	5.24E-06	100	24 hr		VOC	5.24E-04	8.636	0.0045280	PASS	0.0%

Table 3. Soy BioDiesel Process: 500mmbtu, 80 foot stack

Chemical	CAS	500mmbtu Soy BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Formaldehyde	50000	3.08E-03	9	8 hr		Aldehyde	1.54E+00	9.16	14.1	FAIL	156.9%
Formaldehyde	50000	3.08E-03			0.08	Aldehyde	1.54E+00	1.018	1.57	FAIL	1961.6%
Benzo(a)pyrene	50328	1.08E-09			0.0005	PAH	5.40E-07	1.018	0.000001	PASS	0.1%
Dibenzo(a,h)anthracene	53703	1.09E-09			0.0005	PAH	5.47E-07	1.018	0.000001	PASS	0.1%
Benzo(a)anthracene	56553	3.38E-09			0.005	PAH	1.69E-06	1.018	0.000002	PASS	0.0%
Ethanol	64175	9.91E-05	19000	8 hr		VOC	4.95E-02	9.16	0.45372	PASS	0.0%
Hexanal	66251		2	annual		Aldehyde		1.018		PASS	0.0%
Isopropyl alcohol	67630	3.29E-06	220	24 hr		VOC	1.64E-03	6.107	0.010	PASS	0.0%
Acetone	67641	7.54E-04	5900	8 hr		VOC	3.77E-01	9.16	3.452	PASS	0.1%
Chloroform	67663	3.61E-06			0.4	VOC	1.81E-03	1.018	0.002	PASS	0.5%
Benzene	71432	7.22E-06	30	annual		VOC	3.61E-03	1.018	0.0037	PASS	0.0%
Benzene	71432	7.22E-06	30	24 hr		VOC	3.61E-03	6.107	0.02204	PASS	0.1%
Benzene	71432	7.22E-06			0.1	VOC	3.61E-03	1.018	0.00367	PASS	3.7%
Bromomethane	74839		5	24 hr		VOC		6.107		PASS	0.0%
Chloromethane	74873		90	24 hr		VOC		6.107		PASS	0.0%
Chloromethane	74873				1.6	VOC		1.018		PASS	0.0%
Chloroethane	75003	1.94E-06	10000	24 hr		VOC	9.71E-04	6.107	0.00593	PASS	0.0%
Acetaldehyde	75070	3.38E-03	9	24 hr		Aldehyde	1.69E+00	6.107	10.3	FAIL	114.8%
Acetaldehyde	75070	3.38E-03			0.5	Aldehyde	1.69E+00	1.018	1.72243	FAIL	344.5%
Carbon disulfide	75150	1.59E-04	700	24 hr		VOC	7.97E-02	6.107	0.48648	PASS	0.1%
Tribromomethane	75252	1.44E-05			0.9	VOC	7.22E-03	1.018		PASS	0.0%
2-Butanone	78933	5.29E-06	5000	24 hr		VOC	2.65E-03	6.107	0.01616	PASS	0.0%
Trichloroethylene	79016	6.25E-06	2	annual		VOC	3.13E-03	1.018	0.00318	PASS	0.2%
Trichloroethylene	79016	6.25E-06	10000	24 hr		VOC	3.13E-03	6.107	0.01910	PASS	0.0%
Trichloroethylene	79016	6.25E-06			0.2	VOC	3.13E-03	1.018	0.00318	PASS	1.6%
1,1,2,2-Tetrachloroethane	79345				0.02	VOC		1.018		PASS	0.0%
Acenaphthene	83329	6.06E-09	210	24 hr		PAH	3.03E-06	6.107	0.00002	PASS	0.0%
Phenanthrene	85018	1.85E-06	0.1	annual		PAH	9.23E-04	1.018	0.00094	PASS	0.9%
Fluorene	86737	1.09E-09	140	24 hr		PAH	5.47E-07	6.107	0.000003	PASS	0.0%

Table 3. Soy BioDiesel Process: 500mmbtu, 80 foot stack

Chemical	CAS	500mmbtu Soy BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Naphthalene	91203	2.12E-07	3	24 hr		PAH	1.06E-04	6.107	0.001	PASS	0.0%
Naphthalene	91203	2.12E-07			0.08	PAH	1.06E-04	1.018	0.0001	PASS	0.1%
2-Methylnapthalene	91576	1.24E-07	10	annual		PAH	6.21E-05	1.018	0.00006	PASS	0.0%
o-Xylene	95476		100	24 hr		VOC		6.107		PASS	0.0%
1,2-Dichlorobenzene	95501	2.40E-03	300	24 hr		VOC	1.20E+00	6.107	7.3337	PASS	2.4%
1,2,4-Trimethylbenzene	95636	7.75E-07	50	annual		VOC	3.88E-04	1.018	0.0004	PASS	0.0%
1,2,4-Trimethylbenzene	95636	7.75E-07	1200	8 hr		VOC	3.88E-04	9.16	0.0036	PASS	0.0%
Ethylbenzene	100414	2.70E-06	1000	24 hr		VOC	1.35E-03	6.107	0.008	PASS	0.0%
Ethylbenzene	100414	2.70E-06			3	VOC	1.35E-03	1.018	0.0014	PASS	0.0%
Styrene	100425	2.25E-06	1000	24 hr		VOC	1.13E-03	6.107	0.0069	PASS	0.0%
Styrene	100425	2.25E-06			1.7	VOC	1.13E-03	1.018	0.00115	PASS	0.1%
Benzaldehyde	100527				0.4	Aldehyde		1.018		PASS	0.0%
1,4-Dichlorobenezene	106467		800	24 hr		VOC		6.107		PASS	0.0%
1,4-Dichlorobenezene	106467				0.14	VOC		1.018		PASS	0.0%
Vinyl acetate	108054		200	24 hr		VOC		6.107		PASS	0.0%
4-Methyl-2-pentanone	108101	3.55E-05	3000	24 hr		VOC	1.78E-02	6.107	0.108	PASS	0.0%
1,3,5-Trimethylbenzene	108678	5.87E-07	50	annual		VOC	2.94E-04	1.018	0.00030	PASS	0.0%
1,3,5-Trimethylbenzene	108678	5.87E-07	1200	8 hr		VOC	2.94E-04	9.16	0.003	PASS	0.0%
Toluene	108883	8.10E-07	5000	24 hr		VOC	4.05E-04	6.107	0.002	PASS	0.0%
Chlorobenzene	108907	1.86E-06	50	annual		VOC	9.32E-04	1.018	0.00095	PASS	0.0%
Chlorobenzene	108907	1.86E-06	4400	8 hr		VOC	9.32E-04	9.16	0.00854	PASS	0.0%
Tetrahydrofuran	109999	2.71E-06	8000	annual		VOC	1.36E-03	1.018	0.00138	PASS	0.0%
Veraldehyde	110623		1760	8 hr		Aldehyde		9.16		PASS	0.0%
Cyclohexane	110827	1.19E-05	6000	24 hr		VOC	5.95E-03	6.107	0.03631	PASS	0.0%
Anthracene	120127	1.66E-08	1000	24 hr		PAH	8.28E-06	6.107	0.00005	PASS	0.0%
Propionaldehyde	123386		8	24 hr		Aldehyde		6.107		PASS	0.0%
Butylaldehyde	123728		7	24 hr		Aldehyde		6.107		PASS	0.0%
1,4 Dioxane	123911		100	24 hr		VOC		6.107		PASS	0.0%
1,4 Dioxane	123911				0.04	VOC		1.018		PASS	0.0%

Table 3. Soy BioDiesel Process: 500mmbtu, 80 foot stack

Chemical	CAS	500mmbtu Soy BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Pyrene	129000	1.21E-07	100	24 hr		PAH	6.05E-05	6.107	0.00037	PASS	0.0%
Ethyl acetate	141786	1.03E-05	3200	24 hr		VOC	5.16E-03	6.107	0.03150	PASS	0.0%
Benzo(ghi)perylene	191242	3.86E-09	12	24 hr		PAH	1.93E-06	6.107	0.000012	PASS	0.0%
Benzo(ghi)perylene	191242	3.86E-09			0.056	PAH	1.93E-06	1.018	0.000002	PASS	0.0%
Ideno(1,2,3-cd)pyrene	193395	1.24E-09			0.005	PAH	6.21E-07	1.018	0.000001	PASS	0.0%
Benzo(b)fluoranthene	205992	5.27E-09			0.005	PAH	2.64E-06	1.018	0.000003	PASS	0.1%
Fluoranthene	206440	2.53E-07	140	24 hr		PAH	1.26E-04	6.107	0.00077	PASS	0.0%
Fluoranthene	206440	2.53E-07			0.00625	PAH	1.26E-04	1.018	0.0001	PASS	2.1%
Benzo(k)fluoranthene	207089	1.41E-09			0.005	PAH	7.04E-07	1.018	0.000001	PASS	0.0%
Acenaphthylene	208968	2.63E-08	35	24 hr		PAH	1.32E-05	6.107	0.00008	PASS	0.0%
Chrysene	218019	8.52E-09			0.5	PAH	4.26E-06	1.018	0.000004	PASS	0.0%
1,3-Dichlorobenezene	541731		3	annual		VOC		1.018		PASS	0.0%
Iso-Veraldehyde	590863	2.71E-05	800	annual		Aldehyde	1.36E-02	1.018	0.014	PASS	0.0%
2-Hexanone	591786	9.09E-06	30	24 hr		VOC	4.54E-03	6.107	0.02775	PASS	0.1%
1-Ethyl-4-methyl benzene	622968	5.87E-07	350	24 hr		VOC	2.94E-04	6.107	0.00179	PASS	0.0%
Tolualdehyde	1334787		440	24 hr		Aldehyde		6.107		PASS	0.0%
Methyl-t-butyl ether	1634044	1.03E-06	3000	24 hr		VOC	5.13E-04	6.107	0.00314	PASS	0.0%
Crotonaldehyde	4170303		9	1 hr		Aldehyde		10.18		PASS	0.0%
2,5-Dimethylbenzaldehyde	5779942		0.1	annual		Aldehyde		1.018		PASS	0.0%
m,p-Xylene	1.8E+08	5.24E-06	100	24 hr		VOC	2.62E-03	6.107	0.016	PASS	0.0%

Table 4. Animal BioDiesel Process: 50mmbtu, 40 foot stack

Chemical	CAS	Animal BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Formaldehyde	50000	2.95E-04	9	8 hr		Aldehyde	1.47E-02	19.55	0.288011	PASS	3.2%
Formaldehyde	50000	2.95E-04			0.08	Aldehyde	1.47E-02	2.172	0.031998	PASS	40.0%
Benzo(a)pyrene	50328	4.49E-10			0.0005	PAH	2.24E-08	2.172	0.000000	PASS	0.0%
Dibenzo(a,h)anthracene	53703	1.07E-09			0.0005	PAH	5.34E-08	2.172	0.000000	PASS	0.0%
Benzo(a)anthracene	56553	1.43E-09			0.005	PAH	7.16E-08	2.172	0.000000	PASS	0.0%
Ethanol	64175	2.65E-04	19000	8 hr		VOC	1.32E-02	19.55	0.258774	PASS	0.0%
Hexanal	66251		2	annual		Aldehyde		2.172		PASS	0.0%
Isopropyl alcohol	67630	1.42E-05	220	24 hr		VOC	7.08E-04	13.03	0.009219	PASS	0.0%
Acetone	67641	5.41E-04	5900	8 hr		VOC	2.71E-02	19.55	0.529067	PASS	0.0%
Chloroform	67663	4.06E-06			0.4	VOC	2.03E-04	2.172	0.000441	PASS	0.1%
Benzene	71432	4.53E-05	30	annual		VOC	2.26E-03	2.172	0.004918	PASS	0.0%
Benzene	71432	4.53E-05	30	24 hr		VOC	2.26E-03	13.03	0.029502	PASS	0.1%
Benzene	71432	4.53E-05			0.1	VOC	2.26E-03	2.172	0.004918	PASS	4.9%
Bromomethane	74839	3.12E-06	5	24 hr		VOC	1.56E-04	13.03	0.002031	PASS	0.0%
Chloromethane	74873		90	24 hr		VOC		13.03		PASS	0.0%
Chloromethane	74873				1.6	VOC		2.172		PASS	0.0%
Chloroethane	75003	1.22E-06	10000	24 hr		VOC	6.09E-05	13.03	0.000793	PASS	0.0%
Acetaldehyde	75070	4.34E-05	9	24 hr		Aldehyde	2.17E-03	13.03	0.028291	PASS	0.3%
Acetaldehyde	75070	4.34E-05			0.5	Aldehyde	2.17E-03	2.172	0.004716	PASS	0.9%
Carbon disulfide	75150	4.52E-04	700	24 hr		VOC	2.26E-02	13.03	0.294714	PASS	0.0%
Tribromomethane	75252	8.84E-06			0.9	VOC	4.42E-04	2.172	0.000960	PASS	0.1%
2-Butanone	78933	2.81E-05	5000	24 hr		VOC	1.40E-03	13.03	0.018287	PASS	0.0%
Trichloroethylene	79016	1.12E-05	2	annual		VOC	5.58E-04	2.172	0.001212	PASS	0.1%
Trichloroethylene	79016	1.12E-05	10000	24 hr		VOC	5.58E-04	13.03	0.007269	PASS	0.0%
Trichloroethylene	79016	1.12E-05			0.2	VOC	5.58E-04	2.172	0.001212	PASS	0.6%
1,1,2,2-Tetrachloroethane	79345	5.72E-06			0.02	VOC	2.86E-04	2.172	0.000621	PASS	3.1%
Acenaphthene	83329	2.63E-09	210	24 hr		PAH	1.32E-07	13.03	0.000002	PASS	0.0%
Phenanthrene	85018	8.64E-07	0.1	annual		PAH	4.32E-05	2.172	0.000094	PASS	0.1%

Table 4. Animal BioDiesel Process: 50mmbtu, 40 foot stack

Chemical	CAS	Animal BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Fluorene	86737	1.07E-09	140	24 hr		PAH	5.34E-08	13.03	0.000001	PASS	0.0%
Naphthalene	91203	1.50E-07	3	24 hr		PAH	7.52E-06	13.03	0.000098	PASS	0.0%
Naphthalene	91203	1.50E-07			0.08	PAH	7.52E-06	2.172	0.000016	PASS	0.0%
2-Methylnapthalene	91576	5.08E-08	10	annual		PAH	2.54E-06	2.172	0.000006	PASS	0.0%
o-Xylene	95476	3.26E-06	100	24 hr		VOC	1.63E-04	13.03	0.002123	PASS	0.0%
1,2-Dichlorobenzene	95501	6.11E-04	300	24 hr		VOC	3.06E-02	13.03	0.398255	PASS	0.1%
1,2,4-Trimethylbenzene	95636	2.87E-06	50	annual		VOC	1.43E-04	2.172	0.000311	PASS	0.0%
1,2,4-Trimethylbenzene	95636	2.87E-06	1200	8 hr		VOC	1.43E-04	19.55	0.002801	PASS	0.0%
Ethylbenzene	100414	4.18E-06	1000	24 hr		VOC	2.09E-04	13.03	0.002726	PASS	0.0%
Ethylbenzene	100414	4.18E-06			3	VOC	2.09E-04	2.172	0.000454	PASS	0.0%
Styrene	100425	7.99E-07	1000	24 hr		VOC	3.99E-05	13.03	0.000521	PASS	0.0%
Styrene	100425	7.99E-07			1.7	VOC	3.99E-05	2.172	0.000087	PASS	0.0%
Benzaldehyde	100527				0.4	Aldehyde		2.172		PASS	0.0%
1,4-Dichlorobenezene	106467	5.94E-06	800	24 hr		VOC	2.97E-04	13.03	0.003872	PASS	0.0%
1,4-Dichlorobenezene	106467	5.94E-06			0.14	VOC	2.97E-04	2.172	0.000646	PASS	0.5%
Vinyl acetate	108054	7.07E-06	200	24 hr		VOC	3.54E-04	13.03	0.004608	PASS	0.0%
4-Methyl-2-pentanone	108101	5.02E-06	3000	24 hr		VOC	2.51E-04	13.03	0.003268	PASS	0.0%
1,3,5-Trimethylbenzene	108678	1.87E-06	50	annual		VOC	9.36E-05	2.172	0.000203	PASS	0.0%
1,3,5-Trimethylbenzene	108678	1.87E-06	1200	8 hr		VOC	9.36E-05	19.55	0.001830	PASS	0.0%
Toluene	108883	1.08E-05	5000	24 hr		VOC	5.38E-04	13.03	0.007016	PASS	0.0%
Chlorobenzene	108907	7.31E-06	50	annual		VOC	3.66E-04	2.172	0.000794	PASS	0.0%
Chlorobenzene	108907	7.31E-06	4400	8 hr		VOC	3.66E-04	19.55	0.007146	PASS	0.0%
Tetrahydrofuran	109999	1.21E-05	8000	annual		VOC	6.07E-04	2.172	0.001318	PASS	0.0%
Veraldehyde	110623		1760	8 hr		Aldehyde		19.55		PASS	0.0%
Cyclohexane	110827	8.83E-06	6000	24 hr		VOC	4.41E-04	13.03	0.005752	PASS	0.0%
Anthracene	120127	4.52E-09	1000	24 hr		PAH	2.26E-07	13.03	0.000003	PASS	0.0%
Propionaldehyde	123386		8	24 hr		Aldehyde		13.03		PASS	0.0%
Butylaldehyde	123728		7	24 hr		Aldehyde		13.03		PASS	0.0%

Table 4. Animal BioDiesel Process: 50mmbtu, 40 foot stack

Chemical	CAS	Animal BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
1,4 Dioxane	123911	2.27E-06	100	24 hr		VOC	1.13E-04	13.03	0.001477	PASS	0.0%
1,4 Dioxane	123911	2.27E-06			0.04	VOC	1.13E-04	2.172	0.000246	PASS	0.6%
Pyrene	129000	4.58E-08	100	24 hr		PAH	2.29E-06	13.03	0.000030	PASS	0.0%
Ethyl acetate	141786	1.23E-05	3200	24 hr		VOC	6.15E-04	13.03	0.008007	PASS	0.0%
Benzo(ghi)perylene	191242	3.02E-09	12	24 hr		PAH	1.51E-07	13.03	0.000002	PASS	0.0%
Benzo(ghi)perylene	191242	3.02E-09			0.056	PAH	1.51E-07	2.172	0.000000	PASS	0.0%
Ideno(1,2,3-cd)pyrene	193395	8.56E-10			0.005	PAH	4.28E-08	2.172	0.000000	PASS	0.0%
Benzo(b)fluoranthene	205992	2.79E-09			0.005	PAH	1.40E-07	2.172	0.000000	PASS	0.0%
Fluoranthene	206440	1.29E-07	140	24 hr		PAH	6.47E-06	13.03	0.000084	PASS	0.0%
Fluoranthene	206440	1.29E-07			0.00625	PAH	6.47E-06	2.172	0.000014	PASS	0.2%
Benzo(k)fluoranthene	207089	7.26E-10			0.005	PAH	3.63E-08	2.172	0.0000001	PASS	0.0%
Acenaphthylene	208968	5.79E-09	35	24 hr		PAH	2.90E-07	13.03	0.000004	PASS	0.0%
Chrysene	218019	3.99E-09			0.5	PAH	1.99E-07	2.172	0.0000004	PASS	0.0%
1,3-Dichlorobenezene	541731	3.26E-06	3	annual		VOC	1.63E-04	2.172	0.000354	PASS	0.0%
Iso-Veraldehyde	590863	5.64E-06	800	annual		Aldehyde	2.82E-04	2.172	0.000613	PASS	0.0%
2-Hexanone	591786		30	24 hr		VOC		13.03		PASS	0.0%
1-Ethyl-4-methyl benzene	622968	5.97E-07	350	24 hr		VOC	2.99E-05	13.03	0.000389	PASS	0.0%
Tolualdehyde	1334787		440	24 hr		Aldehyde		13.03		PASS	0.0%
Methyl-t-butyl ether	1634044	2.69E-06	3000	24 hr		VOC	1.35E-04	13.03	0.001754	PASS	0.0%
Crotonaldehyde	4170303	4.06E-06	9	1 hr		Aldehyde	2.03E-04	21.72	0.004414	PASS	0.0%
2,5-Dimethylbenzaldehyde	5779942		0.1	annual		Aldehyde		2.172		PASS	0.0%
m,p-Xylene	1.8E+08	9.15E-06	100	24 hr		VOC	4.58E-04	13.03	0.005963	PASS	0.0%

Table 5. Animal BioDiesel Process: 100mmbtu, 60 foot stack

Chemical	CAS	Animal BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Formaldehyde	50000	2.95E-04	9	8 hr		Aldehyde	2.95E-02	12.95	0.381559	PASS	4.2%
Formaldehyde	50000	2.95E-04			0.08	Aldehyde	2.95E-02	1.439	0.042399	PASS	53.0%
Benzo(a)pyrene	50328	4.49E-10			0.0005	PAH	4.49E-08	1.439	0.000000	PASS	0.0%
Dibenzo(a,h)anthracene	53703	1.07E-09			0.0005	PAH	1.07E-07	1.439	0.000000	PASS	0.0%
Benzo(a)anthracene	56553	1.43E-09			0.005	PAH	1.43E-07	1.439	0.000000	PASS	0.0%
Ethanol	64175	2.65E-04	19000	8 hr		VOC	2.65E-02	12.95	0.342825	PASS	0.0%
Hexanal	66251		2	annual		Aldehyde		1.439		PASS	0.0%
Isopropyl alcohol	67630	1.42E-05	220	24 hr		VOC	1.42E-03	8.636	0.012221	PASS	0.0%
Acetone	67641	5.41E-04	5900	8 hr		VOC	5.41E-02	12.95	0.700912	PASS	0.0%
Chloroform	67663	4.06E-06			0.4	VOC	4.06E-04	1.439	0.000584	PASS	0.1%
Benzene	71432	4.53E-05	30	annual		VOC	4.53E-03	1.439	0.006516	PASS	0.0%
Benzene	71432	4.53E-05	30	24 hr		VOC	4.53E-03	8.636	0.039106	PASS	0.1%
Benzene	71432	4.53E-05			0.1	VOC	4.53E-03	1.439	0.006516	PASS	6.5%
Bromomethane	74839	3.12E-06	5	24 hr		VOC	3.12E-04	8.636	0.002692	PASS	0.1%
Chloromethane	74873		90	24 hr		VOC		8.636		PASS	0.0%
Chloromethane	74873				1.6	VOC		1.439		PASS	0.0%
Chloroethane	75003	1.22E-06	10000	24 hr		VOC	1.22E-04	8.636	0.001052	PASS	0.0%
Acetaldehyde	75070	4.34E-05	9	24 hr		Aldehyde	4.34E-03	8.636	0.037501	PASS	0.4%
Acetaldehyde	75070	4.34E-05			0.5	Aldehyde	4.34E-03	1.439	0.006249	PASS	1.2%
Carbon disulfide	75150	4.52E-04	700	24 hr		VOC	4.52E-02	8.636	0.390659	PASS	0.1%
Tribromomethane	75252	8.84E-06			0.9	VOC	8.84E-04	1.439	0.001272	PASS	0.1%
2-Butanone	78933	2.81E-05	5000	24 hr		VOC	2.81E-03	8.636	0.024240	PASS	0.0%
Trichloroethylene	79016	1.12E-05	2	annual		VOC	1.12E-03	1.439	0.001605	PASS	0.1%
Trichloroethylene	79016	1.12E-05	10000	24 hr		VOC	1.12E-03	8.636	0.009635	PASS	0.0%
Trichloroethylene	79016	1.12E-05			0.2	VOC	1.12E-03	1.439	0.001605	PASS	0.8%
1,1,2,2-Tetrachloroethane	79345	5.72E-06			0.02	VOC	5.72E-04	1.439	0.000823	PASS	4.1%
Acenaphthene	83329	2.63E-09	210	24 hr		PAH	2.63E-07	8.636	0.000002	PASS	0.0%
Phenanthrene	85018	8.64E-07	0.1	annual		PAH	8.64E-05	1.439	0.000124	PASS	0.1%

Table 5. Animal BioDiesel Process: 100mmbtu, 60 foot stack

Chemical	CAS	Animal BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Fluorene	86737	1.07E-09	140	24 hr		PAH	1.07E-07	8.636	0.000001	PASS	0.0%
Naphthalene	91203	1.50E-07	3	24 hr		PAH	1.50E-05	8.636	0.000130	PASS	0.0%
Naphthalene	91203	1.50E-07			0.08	PAH	1.50E-05	1.439	0.000022	PASS	0.0%
2-Methylnapthalene	91576	5.08E-08	10	annual		PAH	5.08E-06	1.439	0.000007	PASS	0.0%
o-Xylene	95476	3.26E-06	100	24 hr		VOC	3.26E-04	8.636	0.002814	PASS	0.0%
1,2-Dichlorobenzene	95501	6.11E-04	300	24 hr		VOC	6.11E-02	8.636	0.527909	PASS	0.2%
1,2,4-Trimethylbenzene	95636	2.87E-06	50	annual		VOC	2.87E-04	1.439	0.000412	PASS	0.0%
1,2,4-Trimethylbenzene	95636	2.87E-06	1200	8 hr		VOC	2.87E-04	12.95	0.003711	PASS	0.0%
Ethylbenzene	100414	4.18E-06	1000	24 hr		VOC	4.18E-04	8.636	0.003613	PASS	0.0%
Ethylbenzene	100414	4.18E-06			3	VOC	4.18E-04	1.439	0.000602	PASS	0.0%
Styrene	100425	7.99E-07	1000	24 hr		VOC	7.99E-05	8.636	0.000690	PASS	0.0%
Styrene	100425	7.99E-07			1.7	VOC	7.99E-05	1.439	0.000115	PASS	0.0%
Benzaldehyde	100527				0.4	Aldehyde		1.439		PASS	0.0%
1,4-Dichlorobenezene	106467	5.94E-06	800	24 hr		VOC	5.94E-04	8.636	0.005133	PASS	0.0%
1,4-Dichlorobenezene	106467	5.94E-06			0.14	VOC	5.94E-04	1.439	0.000855	PASS	0.6%
Vinyl acetate	108054	7.07E-06	200	24 hr		VOC	7.07E-04	8.636	0.006109	PASS	0.0%
4-Methyl-2-pentanone	108101	5.02E-06	3000	24 hr		VOC	5.02E-04	8.636	0.004333	PASS	0.0%
1,3,5-Trimethylbenzene	108678	1.87E-06	50	annual		VOC	1.87E-04	1.439	0.000269	PASS	0.0%
1,3,5-Trimethylbenzene	108678	1.87E-06	1200	8 hr		VOC	1.87E-04	12.95	0.002424	PASS	0.0%
Toluene	108883	1.08E-05	5000	24 hr		VOC	1.08E-03	8.636	0.009299	PASS	0.0%
Chlorobenzene	108907	7.31E-06	50	annual		VOC	7.31E-04	1.439	0.001052	PASS	0.0%
Chlorobenzene	108907	7.31E-06	4400	8 hr		VOC	7.31E-04	12.95	0.009467	PASS	0.0%
Tetrahydrofuran	109999	1.21E-05	8000	annual		VOC	1.21E-03	1.439	0.001746	PASS	0.0%
Veraldehyde	110623		1760	8 hr		Aldehyde		12.95		PASS	0.0%
Cyclohexane	110827	8.83E-06	6000	24 hr		VOC	8.83E-04	8.636	0.007624	PASS	0.0%
Anthracene	120127	4.52E-09	1000	24 hr		PAH	4.52E-07	8.636	0.000004	PASS	0.0%
Propionaldehyde	123386		8	24 hr		Aldehyde		8.636		PASS	0.0%
Butylaldehyde	123728		7	24 hr		Aldehyde		8.636		PASS	0.0%

Table 5. Animal BioDiesel Process: 100mmbtu, 60 foot stack

Chemical	CAS	Animal BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
1,4 Dioxane	123911	2.27E-06	100	24 hr		VOC	2.27E-04	8.636	0.001958	PASS	0.0%
1,4 Dioxane	123911	2.27E-06			0.04	VOC	2.27E-04	1.439	0.000326	PASS	0.8%
Pyrene	129000	4.58E-08	100	24 hr		PAH	4.58E-06	8.636	0.000040	PASS	0.0%
Ethyl acetate	141786	1.23E-05	3200	24 hr		VOC	1.23E-03	8.636	0.010614	PASS	0.0%
Benzo(ghi)perylene	191242	3.02E-09	12	24 hr		PAH	3.02E-07	8.636	0.000003	PASS	0.0%
Benzo(ghi)perylene	191242	3.02E-09			0.056	PAH	3.02E-07	1.439	0.0000004	PASS	0.0%
Ideno(1,2,3-cd)pyrene	193395	8.56E-10			0.005	PAH	8.56E-08	1.439	0.0000001	PASS	0.0%
Benzo(b)fluoranthene	205992	2.79E-09			0.005	PAH	2.79E-07	1.439	0.0000004	PASS	0.0%
Fluoranthene	206440	1.29E-07	140	24 hr		PAH	1.29E-05	8.636	0.000112	PASS	0.0%
Fluoranthene	206440	1.29E-07			0.00625	PAH	1.29E-05	1.439	0.000019	PASS	0.3%
Benzo(k)fluoranthene	207089	7.26E-10			0.005	PAH	7.26E-08	1.439	0.0000001	PASS	0.0%
Acenaphthylene	208968	5.79E-09	35	24 hr		PAH	5.79E-07	8.636	0.000005	PASS	0.0%
Chrysene	218019	3.99E-09			0.5	PAH	3.99E-07	1.439	0.000001	PASS	0.0%
1,3-Dichlorobenezene	541731	3.26E-06	3	annual		VOC	3.26E-04	1.439	0.000469	PASS	0.0%
Iso-Veraldehyde	590863	5.64E-06	800	annual		Aldehyde	5.64E-04	1.439	0.000812	PASS	0.0%
2-Hexanone	591786		30	24 hr		VOC		8.636		PASS	0.0%
1-Ethyl-4-methyl benzene	622968	5.97E-07	350	24 hr		VOC	5.97E-05	8.636	0.000516	PASS	0.0%
Tolualdehyde	1334787		440	24 hr		Aldehyde		8.636		PASS	0.0%
Methyl-t-butyl ether	1634044	2.69E-06	3000	24 hr		VOC	2.69E-04	8.636	0.002325	PASS	0.0%
Crotonaldehyde	4170303	4.06E-06	9	1 hr		Aldehyde	4.06E-04	14.39	0.005849	PASS	0.1%
2,5-Dimethylbenzaldehyde	5779942		0.1	annual		Aldehyde	0.00E+00	1.439	0.000000	PASS	0.0%
m,p-Xylene	1.8E+08	9.15E-06	100	24 hr		VOC	9.15E-04	8.636	0.007905	PASS	0.0%

Table 6. Animal BioDiesel Process: 500mmbtu, 80 foot stack

Chemical	CAS	Animal BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Formaldehyde	50000	2.95E-04	9	8 hr		Aldehyde	1.47E-01	9.16	1.349453	PASS	15.0%
Formaldehyde	50000	2.95E-04			0.08	Aldehyde	1.47E-01	1.018	0.149972	FAIL	187.5%
Benzo(a)pyrene	50328	4.49E-10			0.0005	PAH	2.24E-07	1.018	0.0000002	PASS	0.0%
Dibenzo(a,h)anthracene	53703	1.07E-09			0.0005	PAH	5.34E-07	1.018	0.000001	PASS	0.1%
Benzo(a)anthracene	56553	1.43E-09			0.005	PAH	7.16E-07	1.018	0.000001	PASS	0.0%
Ethanol	64175	2.65E-04	19000	8 hr		VOC	1.32E-01	9.16	1.212464	PASS	0.0%
Hexanal	66251		2	annual		Aldehyde	0.00E+00	1.018		PASS	0.0%
Isopropyl alcohol	67630	1.42E-05	220	24 hr		VOC	7.08E-03	6.107	0.043210	PASS	0.0%
Acetone	67641	5.41E-04	5900	8 hr		VOC	2.71E-01	9.16	2.478902	PASS	0.0%
Chloroform	67663	4.06E-06			0.4	VOC	2.03E-03	1.018	0.002066	PASS	0.5%
Benzene	71432	4.53E-05	30	annual		VOC	2.26E-02	1.018	0.023049	PASS	0.1%
Benzene	71432	4.53E-05	30	24 hr		VOC	2.26E-02	6.107	0.138272	PASS	0.5%
Benzene	71432	4.53E-05			0.1	VOC	2.26E-02	1.018	0.023049	PASS	23.0%
Bromomethane	74839	3.12E-06	5	24 hr		VOC	1.56E-03	6.107	0.009519	PASS	0.2%
Chloromethane	74873		90	24 hr		VOC	0.00E+00	6.107		PASS	0.0%
Chloromethane	74873				1.6	VOC	0.00E+00	1.018		PASS	0.0%
Chloroethane	75003	1.22E-06	10000	24 hr		VOC	6.09E-04	6.107	0.003719	PASS	0.0%
Acetaldehyde	75070	4.34E-05	9	24 hr		Aldehyde	2.17E-02	6.107	0.132596	PASS	1.5%
Acetaldehyde	75070	4.34E-05			0.5	Aldehyde	2.17E-02	1.018	0.022103	PASS	4.4%
Carbon disulfide	75150	4.52E-04	700	24 hr		VOC	2.26E-01	6.107	1.381286	PASS	0.2%
Tribromomethane	75252	8.84E-06			0.9	VOC	4.42E-03	1.018		PASS	0.0%
2-Butanone	78933	2.81E-05	5000	24 hr		VOC	1.40E-02	6.107	0.085708	PASS	0.0%
Trichloroethylene	79016	1.12E-05	2	annual		VOC	5.58E-03	1.018	0.005679	PASS	0.3%
Trichloroethylene	79016	1.12E-05	10000	24 hr		VOC	5.58E-03	6.107	0.034068	PASS	0.0%
Trichloroethylene	79016	1.12E-05			0.2	VOC	5.58E-03	1.018	0.005679	PASS	2.8%
1,1,2,2-Tetrachloroethane	79345	5.72E-06			0.02	VOC	2.86E-03	1.018	0.002911	PASS	14.6%
Acenaphthene	83329	2.63E-09	210	24 hr		PAH	1.32E-06	6.107	0.000008	PASS	0.0%
Phenanthrene	85018	8.64E-07	0.1	annual		PAH	4.32E-04	1.018	0.000440	PASS	0.4%

Table 6. Animal BioDiesel Process: 500mmbtu, 80 foot stack

Chemical	CAS	Animal BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Fluorene	86737	1.07E-09	140	24 hr		PAH	5.34E-07	6.107	0.000003	PASS	0.0%
Naphthalene	91203	1.50E-07	3	24 hr		PAH	7.52E-05	6.107	0.000459	PASS	0.0%
Naphthalene	91203	1.50E-07			0.08	PAH	7.52E-05	1.018	0.000077	PASS	0.1%
2-Methylnapthalene	91576	5.08E-08	10	annual		PAH	2.54E-05	1.018	0.000026	PASS	0.0%
o-Xylene	95476	3.26E-06	100	24 hr		VOC	1.63E-03	6.107	0.009949	PASS	0.0%
1,2-Dichlorobenzene	95501	6.11E-04	300	24 hr		VOC	3.06E-01	6.107	1.866571	PASS	0.6%
1,2,4-Trimethylbenzene	95636	2.87E-06	50	annual		VOC	1.43E-03	1.018	0.001459	PASS	0.0%
1,2,4-Trimethylbenzene	95636	2.87E-06	1200	8 hr		VOC	1.43E-03	9.16	0.013125	PASS	0.0%
Ethylbenzene	100414	4.18E-06	1000	24 hr		VOC	2.09E-03	6.107	0.012775	PASS	0.0%
Ethylbenzene	100414	4.18E-06			3	VOC	2.09E-03	1.018	0.002129	PASS	0.1%
Styrene	100425	7.99E-07	1000	24 hr		VOC	3.99E-04	6.107	0.002440	PASS	0.0%
Styrene	100425	7.99E-07			1.7	VOC	3.99E-04	1.018	0.000407	PASS	0.0%
Benzaldehyde	100527				0.4	Aldehyde	0.00E+00	1.018	0.000000	PASS	0.0%
1,4-Dichlorobenezene	106467	5.94E-06	800	24 hr		VOC	2.97E-03	6.107	0.018150	PASS	0.0%
1,4-Dichlorobenezene	106467	5.94E-06			0.14	VOC	2.97E-03	1.018	0.003025	PASS	2.2%
Vinyl acetate	108054	7.07E-06	200	24 hr		VOC	3.54E-03	6.107	0.021598	PASS	0.0%
4-Methyl-2-pentanone	108101	5.02E-06	3000	24 hr		VOC	2.51E-03	6.107	0.015319	PASS	0.0%
1,3,5-Trimethylbenzene	108678	1.87E-06	50	annual		VOC	9.36E-04	1.018	0.000953	PASS	0.0%
1,3,5-Trimethylbenzene	108678	1.87E-06	1200	8 hr		VOC	9.36E-04	9.16	0.008574	PASS	0.0%
Toluene	108883	1.08E-05	5000	24 hr		VOC	5.38E-03	6.107	0.032881	PASS	0.0%
Chlorobenzene	108907	7.31E-06	50	annual		VOC	3.66E-03	1.018	0.003721	PASS	0.0%
Chlorobenzene	108907	7.31E-06	4400	8 hr		VOC	3.66E-03	9.16	0.033482	PASS	0.0%
Tetrahydrofuran	109999	1.21E-05	8000	annual		VOC	6.07E-03	1.018	0.006176	PASS	0.0%
Veraldehyde	110623		1760	8 hr		Aldehyde		9.16		PASS	0.0%
Cyclohexane	110827	8.83E-06	6000	24 hr		VOC	4.41E-03	6.107	0.026958	PASS	0.0%
Anthracene	120127	4.52E-09	1000	24 hr		PAH	2.26E-06	6.107	0.000014	PASS	0.0%
Propionaldehyde	123386		8	24 hr		Aldehyde	0.00E+00	6.107		PASS	0.0%
Butylaldehyde	123728		7	24 hr		Aldehyde	0.00E+00	6.107		PASS	0.0%

Table 6. Animal BioDiesel Process: 500mmbtu, 80 foot stack

Chemical	CAS	Animal BD Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
1,4 Dioxane	123911	2.27E-06	100	24 hr		VOC	1.13E-03	6.107	0.006923	PASS	0.0%
1,4 Dioxane	123911	2.27E-06			0.04	VOC	1.13E-03	1.018	0.001154	PASS	2.9%
Pyrene	129000	4.58E-08	100	24 hr		PAH	2.29E-05	6.107	0.000140	PASS	0.0%
Ethyl acetate	141786	1.23E-05	3200	24 hr		VOC	6.15E-03	6.107	0.037528	PASS	0.0%
Benzo(ghi)perylene	191242	3.02E-09	12	24 hr		PAH	1.51E-06	6.107	0.000009	PASS	0.0%
Benzo(ghi)perylene	191242	3.02E-09			0.056	PAH	1.51E-06	1.018	0.000002	PASS	0.0%
Ideno(1,2,3-cd)pyrene	193395	8.56E-10			0.005	PAH	4.28E-07	1.018	0.0000004	PASS	0.0%
Benzo(b)fluoranthene	205992	2.79E-09			0.005	PAH	1.40E-06	1.018	0.000001	PASS	0.0%
Fluoranthene	206440	1.29E-07	140	24 hr		PAH	6.47E-05	6.107	0.000395	PASS	0.0%
Fluoranthene	206440	1.29E-07			0.00625	PAH	6.47E-05	1.018	0.000066	PASS	1.1%
Benzo(k)fluoranthene	207089	7.26E-10			0.005	PAH	3.63E-07	1.018	0.0000004	PASS	0.0%
Acenaphthylene	208968	5.79E-09	35	24 hr		PAH	2.90E-06	6.107	0.000018	PASS	0.0%
Chrysene	218019	3.99E-09			0.5	PAH	1.99E-06	1.018	0.000002	PASS	0.0%
1,3-Dichlorobenezene	541731	3.26E-06	3	annual		VOC	1.63E-03	1.018	0.001658	PASS	0.1%
Iso-Veraldehyde	590863	5.64E-06	800	annual		Aldehyde	2.82E-03	1.018	0.002872	PASS	0.0%
2-Hexanone	591786		30	24 hr		VOC	0.00E+00	6.107		PASS	0.0%
1-Ethyl-4-methyl benzene	622968	5.97E-07	350	24 hr		VOC	2.99E-04	6.107	0.001823	PASS	0.0%
Tolualdehyde	1334787		440	24 hr		Aldehyde	0.00E+00	6.107		PASS	0.0%
Methyl-t-butyl ether	1634044	2.69E-06	3000	24 hr		VOC	1.35E-03	6.107	0.008220	PASS	0.0%
Crotonaldehyde	4170303	4.06E-06	9	1 hr		Aldehyde	2.03E-03	10.18	0.020689	PASS	0.2%
2,5-Dimethylbenzaldehyde	5779942		0.1	annual		Aldehyde	0.00E+00	1.018		PASS	0.0%
m,p-Xylene	1.8E+08	9.15E-06	100	24 hr		VOC	4.58E-03	6.107	0.027950	PASS	0.0%

Table 7: Diesel (No. 2) process: 50mmbtu, 40 foot stack

Chemical	CAS	Diesel Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	TYPE	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Formaldehyde	50000	6.96E-05	9	8 hr		Aldehyde	3.48E-03	19.55	0.068048	PASS	0.8%
Formaldehyde	50000	6.96E-05			0.08	Aldehyde	3.48E-03	2.172	0.007560	PASS	9.5%
Benzo(a)pyrene	50328	3.84E-10			0.0005	PAH	1.92E-08	2.172	0.0000000	PASS	0.0%
Dibenzo(a,h)anthracene	53703	1.02E-09			0.0005	PAH	5.11E-08	2.172	0.0000001	PASS	0.0%
Benzo(a)anthracene	56553	6.94E-10			0.005	PAH	3.47E-08	2.172	0.0000001	PASS	0.0%
Ethanol	64175	2.95E-05	19000	8 hr		VOC	1.48E-03	19.55	0.028873	PASS	0.0%
Hexanal	66251	6.70E-06	2	annual		Aldehyde	3.35E-04	2.172	0.000727	PASS	0.0%
Isopropyl alcohol	67630	4.35E-06	220	24 hr		VOC	2.18E-04	13.03	0.002836	PASS	0.0%
Acetone	67641	3.03E-03	5900	8 hr		VOC	1.52E-01	19.55	2.964549	PASS	0.1%
Chloroform	67663	1.90E-06			0.4	VOC	9.52E-05	2.172	0.000207	PASS	0.1%
Benzene	71432	6.95E-06	30	annual		VOC	3.47E-04	2.172	0.000754	PASS	0.0%
Benzene	71432	6.95E-06	30	24 hr		VOC	3.47E-04	13.03	0.004526	PASS	0.0%
Benzene	71432	6.95E-06			0.1	VOC	3.47E-04	2.172	0.000754	PASS	0.8%
Bromomethane	74839	7.33E-07	5	24 hr		VOC	3.67E-05	13.03	0.000478	PASS	0.0%
Chloromethane	74873	1.16E-06	90	24 hr		VOC	5.82E-05	13.03	0.000759	PASS	0.0%
Chloromethane	74873	1.16E-06			1.6	VOC	5.82E-05	2.172	0.000127	PASS	0.0%
Chloroethane	75003	9.64E-07	10000	24 hr		VOC	4.82E-05	13.03	0.000628	PASS	0.0%
Acetaldehyde	75070	3.70E-05	9	24 hr		Aldehyde	1.85E-03	13.03	0.024135	PASS	0.3%
Acetaldehyde	75070	3.70E-05			0.5	Aldehyde	1.85E-03	2.172	0.004023	PASS	0.8%
Carbon disulfide	75150	4.47E-05	700	24 hr		VOC	2.23E-03	13.03	0.029107	PASS	0.0%
Tribromomethane	75252	6.45E-06			0.9	VOC	3.23E-04	2.172	0.000701	PASS	0.1%
2-Butanone	78933	1.20E-05	5000	24 hr		VOC	6.02E-04	13.03	0.007842	PASS	0.0%
Trichloroethylene	79016	5.13E-06	2	annual		VOC	2.56E-04	2.172	0.000557	PASS	0.0%
Trichloroethylene	79016	5.13E-06	10000	24 hr		VOC	2.56E-04	13.03	0.003341	PASS	0.0%
Trichloroethylene	79016	5.13E-06			0.2	VOC	2.56E-04	2.172	0.000557	PASS	0.3%
1,1,2,2-Tetrachloroethane	79345				0.02	VOC		2.172		PASS	0.0%
Acenaphthene	83329	8.41E-09	210	24 hr		PAH	4.20E-07	13.03	0.000005	PASS	0.0%
Phenanthrene	85018	2.44E-06	0.1	annual		PAH	1.22E-04	2.172	0.000265	PASS	0.3%
Fluorene	86737	1.02E-09	140	24 hr		PAH	5.11E-08	13.03	0.000001	PASS	0.0%

Table 7: Diesel (No. 2) process: 50mmbtu, 40 foot stack

Chemical	CAS	Diesel Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	TYPE	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Naphthalene	91203	3.08E-07	3	24 hr		PAH	1.54E-05	13.03	0.000201	PASS	0.0%
Naphthalene	91203	3.08E-07			0.08	PAH	1.54E-05	2.172	0.000033	PASS	0.0%
2-Methylnapthalene	91576	2.23E-07	10	annual		PAH	1.12E-05	2.172	0.000024	PASS	0.0%
o-Xylene	95476	1.56E-06	100	24 hr		VOC	7.78E-05	13.03	0.001014	PASS	0.0%
1,2-Dichlorobenzene	95501	1.21E-03	300	24 hr		VOC	6.04E-02	13.03	0.787657	PASS	0.3%
1,2,4-Trimethylbenzene	95636	3.78E-06	50	annual		VOC	1.89E-04	2.172	0.000410	PASS	0.0%
1,2,4-Trimethylbenzene	95636	3.78E-06	1200	8 hr		VOC	1.89E-04	19.55	0.003694	PASS	0.0%
Ethylbenzene	100414	2.58E-06	1000	24 hr		VOC	1.29E-04	13.03	0.001680	PASS	0.0%
Ethylbenzene	100414	2.58E-06			3	VOC	1.29E-04	2.172	0.000280	PASS	0.0%
Styrene	100425	1.45E-06	1000	24 hr		VOC	7.25E-05	13.03	0.000945	PASS	0.0%
Styrene	100425	1.45E-06			1.7	VOC	7.25E-05	2.172	0.000158	PASS	0.0%
Benzaldehyde	100527	7.63E-06			0.4	Aldehyde	3.82E-04	2.172	0.000829	PASS	0.2%
1,4-Dichlorobenezene	106467	4.64E-06	800	24 hr		VOC	2.32E-04	13.03	0.003020	PASS	0.0%
1,4-Dichlorobenezene	106467	4.64E-06			0.14	VOC	2.32E-04	2.172	0.000503	PASS	0.4%
Vinyl acetate	108054		200	24 hr		VOC		13.03		PASS	0.0%
4-Methyl-2-pentanone	108101	3.76E-06	3000	24 hr		VOC	1.88E-04	13.03	0.002451	PASS	0.0%
1,3,5-Trimethylbenzene	108678	1.72E-06	50	annual		VOC	8.60E-05	2.172	0.000187	PASS	0.0%
1,3,5-Trimethylbenzene	108678	1.72E-06	1200	8 hr		VOC	8.60E-05	19.55	0.001681	PASS	0.0%
Toluene	108883	2.32E-06	5000	24 hr		VOC	1.16E-04	13.03	0.001513	PASS	0.0%
Chlorobenzene	108907	3.08E-06	50	annual		VOC	1.54E-04	2.172	0.000335	PASS	0.0%
Chlorobenzene	108907	3.08E-06	4400	8 hr		VOC	1.54E-04	19.55	0.003013	PASS	0.0%
Tetrahydrofuran	109999	3.73E-06	8000	annual		VOC	1.87E-04	2.172	0.000405	PASS	0.0%
Veraldehyde	110623	5.96E-06	1760	8 hr		Aldehyde	2.98E-04	19.55	0.005823	PASS	0.0%
Cyclohexane	110827	4.13E-06	6000	24 hr		VOC	2.06E-04	13.03	0.002688	PASS	0.0%
Anthracene	120127	6.30E-09	1000	24 hr		PAH	3.15E-07	13.03	0.000004	PASS	0.0%
Propionaldehyde	123386	4.83E-06	8	24 hr		Aldehyde	2.41E-04	13.03	0.003146	PASS	0.0%
Butylaldehyde	123728	4.21E-06	7	24 hr		Aldehyde	2.11E-04	13.03	0.002744	PASS	0.0%
1,4 Dioxane	123911		100	24 hr		VOC		13.03		PASS	0.0%
1,4 Dioxane	123911				0.04	VOC		2.172		PASS	0.0%

Table 7: Diesel (No. 2) process: 50mmbtu, 40 foot stack

Chemical	CAS	Diesel Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	TYPE	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Pyrene	129000	1.66E-08	100	24 hr		PAH	8.30E-07	13.03	0.000011	PASS	0.0%
Ethyl acetate	141786	1.36E-05	3200	24 hr		VOC	6.82E-04	13.03	0.008887	PASS	0.0%
Benzo(ghi)perylene	191242	2.16E-09	12	24 hr		PAH	1.08E-07	13.03	0.000001	PASS	0.0%
Benzo(ghi)perylene	191242	2.16E-09			0.056	PAH	1.08E-07	2.172	0.0000002	PASS	0.0%
Ideno(1,2,3-cd)pyrene	193395	7.71E-10			0.005	PAH	3.85E-08	2.172	0.0000001	PASS	0.0%
Benzo(b)fluoranthene	205992	3.24E-09			0.005	PAH	1.62E-07	2.172	0.0000004	PASS	0.0%
Fluoranthene	206440	2.59E-07	140	24 hr		PAH	1.29E-05	13.03	0.000169	PASS	0.0%
Fluoranthene	206440	2.59E-07			0.00625	PAH	1.29E-05	2.172	0.000028	PASS	0.4%
Benzo(k)fluoranthene	207089	5.28E-10			0.005	PAH	2.64E-08	2.172	0.0000001	PASS	0.0%
Acenaphthylene	208968	2.25E-08	35	24 hr		PAH	1.12E-06	13.03	0.000015	PASS	0.0%
Chrysene	218019	4.26E-09			0.5	PAH	2.13E-07	2.172	0.0000005	PASS	0.0%
1,3-Dichlorobenezene	541731	4.48E-06	3	annual		VOC	2.24E-04	2.172	0.000486	PASS	0.0%
Iso-Veraldehyde	590863	2.71E-05	800	annual		Aldehyde	1.35E-03	2.172	0.002942	PASS	0.0%
2-Hexanone	591786	1.77E-05	30	24 hr		VOC	8.83E-04	13.03	0.011505	PASS	0.0%
1-Ethyl-4-methyl benzene	622968	1.67E-06	350	24 hr		VOC	8.37E-05	13.03	0.001091	PASS	0.0%
Tolualdehyde	1334787	2.56E-05	440	24 hr		Aldehyde	1.28E-03	13.03	0.016649	PASS	0.0%
Methyl-t-butyl ether	1634044		3000	24 hr		VOC		13.03		PASS	0.0%
Crotonaldehyde	4170303	8.60E-06	9	1 hr		Aldehyde	4.30E-04	21.72	0.009340	PASS	0.1%
2,5-Dimethylbenzaldehyde	5779942	9.45E-06	0.1	annual		Aldehyde	4.72E-04	2.172	0.001026	PASS	1.0%
m,p-Xylene	179601231	4.60E-06	100	24 hr		VOC	2.30E-04	13.03	0.002998	PASS	0.0%

Table 8. Diesel (No. 2) process: 100mmbtu, 60 foot stack

Chemical	CAS	Diesel Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Formaldehyde	50000	6.96E-05	9	8 hr		Aldehyde	6.96E-03	12.95	0.090150	PASS	1.0%
Formaldehyde	50000	6.96E-05			0.08	Aldehyde	6.96E-03	1.439	0.010017	PASS	12.5%
Benzo(a)pyrene	50328	3.84E-10			0.0005	PAH	3.84E-08	1.439	0.0000001	PASS	0.0%
Dibenzo(a,h)anthracene	53703	1.02E-09			0.0005	PAH	1.02E-07	1.439	0.0000001	PASS	0.0%
Benzo(a)anthracene	56553	6.94E-10			0.005	PAH	6.94E-08	1.439	0.0000001	PASS	0.0%
Ethanol	64175	2.95E-05	19000	8 hr		VOC	2.95E-03	12.95	0.038251	PASS	0.0%
Hexanal	66251	6.70E-06	2	annual		Aldehyde	6.70E-04	1.439	0.000964	PASS	0.0%
Isopropyl alcohol	67630	4.35E-06	220	24 hr		VOC	4.35E-04	8.636	0.003759	PASS	0.0%
Acetone	67641	3.03E-03	5900	8 hr		VOC	3.03E-01	12.95	3.927458	PASS	0.1%
Chloroform	67663	1.90E-06			0.4	VOC	1.90E-04	1.439	0.000274	PASS	0.1%
Benzene	71432	6.95E-06	30	annual		VOC	6.95E-04	1.439	0.001000	PASS	0.0%
Benzene	71432	6.95E-06	30	24 hr		VOC	6.95E-04	8.636	0.006000	PASS	0.0%
Benzene	71432	6.95E-06			0.1	VOC	6.95E-04	1.439	0.001000	PASS	1.0%
Bromomethane	74839	7.33E-07	5	24 hr		VOC	7.33E-05	8.636	0.000633	PASS	0.0%
Chloromethane	74873	1.16E-06	90	24 hr		VOC	1.16E-04	8.636	0.001006	PASS	0.0%
Chloromethane	74873	1.16E-06			1.6	VOC	1.16E-04	1.439	0.000168	PASS	0.0%
Chloroethane	75003	9.64E-07	10000	24 hr		VOC	9.64E-05	8.636	0.000833	PASS	0.0%
Acetaldehyde	75070	3.70E-05	9	24 hr		Aldehyde	3.70E-03	8.636	0.031992	PASS	0.4%
Acetaldehyde	75070	3.70E-05			0.5	Aldehyde	3.70E-03	1.439	0.005331	PASS	1.1%
Carbon disulfide	75150	4.47E-05	700	24 hr		VOC	4.47E-03	8.636	0.038582	PASS	0.0%
Tribromomethane	75252	6.45E-06			0.9	VOC	6.45E-04	1.439		PASS	0.0%
2-Butanone	78933	1.20E-05	5000	24 hr		VOC	1.20E-03	8.636	0.010395	PASS	0.0%
Trichloroethylene	79016	5.13E-06	2	annual		VOC	5.13E-04	1.439	0.000738	PASS	0.0%
Trichloroethylene	79016	5.13E-06	10000	24 hr		VOC	5.13E-04	8.636	0.004429	PASS	0.0%
Trichloroethylene	79016	5.13E-06			0.2	VOC	5.13E-04	1.439	0.000738	PASS	0.4%
1,1,2,2-Tetrachloroethane	79345				0.02	VOC		1.439		PASS	0.0%
Acenaphthene	83329	8.41E-09	210	24 hr		PAH	8.41E-07	8.636	0.000007	PASS	0.0%
Phenanthrene	85018	2.44E-06	0.1	annual		PAH	2.44E-04	1.439	0.000351	PASS	0.4%

Table 8. Diesel (No. 2) process: 100mmbtu, 60 foot stack

Chemical	CAS	Diesel Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Fluorene	86737	1.02E-09	140	24 hr		PAH	1.02E-07	8.636	0.000001	PASS	0.0%
Naphthalene	91203	3.08E-07	3	24 hr		PAH	3.08E-05	8.636	0.000266	PASS	0.0%
Naphthalene	91203	3.08E-07			0.08	PAH	3.08E-05	1.439	0.000044	PASS	0.1%
2-Methylnapthalene	91576	2.23E-07	10	annual		PAH	2.23E-05	1.439	0.000032	PASS	0.0%
o-Xylene	95476	1.56E-06	100	24 hr		VOC	1.56E-04	8.636	0.001344	PASS	0.0%
1,2-Dichlorobenzene	95501	1.21E-03	300	24 hr		VOC	1.21E-01	8.636	1.044084	PASS	0.3%
1,2,4-Trimethylbenzene	95636	3.78E-06	50	annual		VOC	3.78E-04	1.439	0.000544	PASS	0.0%
1,2,4-Trimethylbenzene	95636	3.78E-06	1200	8 hr		VOC	3.78E-04	12.95	0.004893	PASS	0.0%
Ethylbenzene	100414	2.58E-06	1000	24 hr		VOC	2.58E-04	8.636	0.002227	PASS	0.0%
Ethylbenzene	100414	2.58E-06			3	VOC	2.58E-04	1.439	0.000371	PASS	0.0%
Styrene	100425	1.45E-06	1000	24 hr		VOC	1.45E-04	8.636	0.001253	PASS	0.0%
Styrene	100425	1.45E-06			1.7	VOC	1.45E-04	1.439	0.000209	PASS	0.0%
Benzaldehyde	100527	7.63E-06			0.4	Aldehyde	7.63E-04	1.439	0.001098	PASS	0.3%
1,4-Dichlorobenezene	106467	4.64E-06	800	24 hr		VOC	4.64E-04	8.636	0.004003	PASS	0.0%
1,4-Dichlorobenezene	106467	4.64E-06			0.14	VOC	4.64E-04	1.439	0.000667	PASS	0.5%
Vinyl acetate	108054		200	24 hr		VOC		8.636		PASS	0.0%
4-Methyl-2-pentanone	108101	3.76E-06	3000	24 hr		VOC	3.76E-04	8.636	0.003249	PASS	0.0%
1,3,5-Trimethylbenzene	108678	1.72E-06	50	annual		VOC	1.72E-04	1.439	0.000248	PASS	0.0%
1,3,5-Trimethylbenzene	108678	1.72E-06	1200	8 hr		VOC	1.72E-04	12.95	0.002228	PASS	0.0%
Toluene	108883	2.32E-06	5000	24 hr		VOC	2.32E-04	8.636	0.002006	PASS	0.0%
Chlorobenzene	108907	3.08E-06	50	annual		VOC	3.08E-04	1.439	0.000444	PASS	0.0%
Chlorobenzene	108907	3.08E-06	4400	8 hr		VOC	3.08E-04	12.95	0.003992	PASS	0.0%
Tetrahydrofuran	109999	3.73E-06	8000	annual		VOC	3.73E-04	1.439	0.000537	PASS	0.0%
Veraldehyde	110623	5.96E-06	1760	8 hr		Aldehyde	5.96E-04	12.95	0.007714	PASS	0.0%
Cyclohexane	110827	4.13E-06	6000	24 hr		VOC	4.13E-04	8.636	0.003563	PASS	0.0%
Anthracene	120127	6.30E-09	1000	24 hr		PAH	6.30E-07	8.636	0.000005	PASS	0.0%
Propionaldehyde	123386	4.83E-06	8	24 hr		Aldehyde	4.83E-04	8.636	0.004170	PASS	0.1%

Table 8. Diesel (No. 2) process: 100mmbtu, 60 foot stack

Chemical	CAS	Diesel Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Butylaldehyde	123728	4.21E-06	7	24 hr		Aldehyde	4.21E-04	8.636	0.003638	PASS	0.1%
1,4 Dioxane	123911		100	24 hr		VOC		8.636		PASS	0.0%
1,4 Dioxane	123911				0.04	VOC		1.439		PASS	0.0%
Pyrene	129000	1.66E-08	100	24 hr		PAH	1.66E-06	8.636	0.000014	PASS	0.0%
Ethyl acetate	141786	1.36E-05	3200	24 hr		VOC	1.36E-03	8.636	0.011780	PASS	0.0%
Benzo(ghi)perylene	191242	2.16E-09	12	24 hr		PAH	2.16E-07	8.636	0.000002	PASS	0.0%
Benzo(ghi)perylene	191242	2.16E-09			0.056	PAH	2.16E-07	1.439	0.0000003	PASS	0.0%
Ideno(1,2,3-cd)pyrene	193395	7.71E-10			0.005	PAH	7.71E-08	1.439	0.0000001	PASS	0.0%
Benzo(b)fluoranthene	205992	3.24E-09			0.005	PAH	3.24E-07	1.439	0.0000005	PASS	0.0%
Fluoranthene	206440	2.59E-07	140	24 hr		PAH	2.59E-05	8.636	0.000223	PASS	0.0%
Fluoranthene	206440	2.59E-07			0.00625	PAH	2.59E-05	1.439	0.000037	PASS	0.6%
Benzo(k)fluoranthene	207089	5.28E-10			0.005	PAH	5.28E-08	1.439	0.0000001	PASS	0.0%
Acenaphthylene	208968	2.25E-08	35	24 hr		PAH	2.25E-06	8.636	0.000019	PASS	0.0%
Chrysene	218019	4.26E-09			0.5	PAH	4.26E-07	1.439	0.000001	PASS	0.0%
1,3-Dichlorobenezene	541731	4.48E-06	3	annual		VOC	4.48E-04	1.439	0.000644	PASS	0.0%
Iso-Veraldehyde	590863	2.71E-05	800	annual		Aldehyde	2.71E-03	1.439	0.003898	PASS	0.0%
2-Hexanone	591786	1.77E-05	30	24 hr		VOC	1.77E-03	8.636	0.015250	PASS	0.1%
1-Ethyl-4-methyl benzene	622968	1.67E-06	350	24 hr		VOC	1.67E-04	8.636	0.001446	PASS	0.0%
Tolualdehyde	1334787	2.56E-05	440	24 hr		Aldehyde	2.56E-03	8.636	0.022069	PASS	0.0%
Methyl-t-butyl ether	1634044		3000	24 hr		VOC		8.636		PASS	0.0%
Crotonaldehyde	4170303	8.60E-06	9	1 hr		Aldehyde	8.60E-04	14.39	0.012376	PASS	0.1%
2,5-Dimethylbenzaldehyde	5779942	9.45E-06	0.1	annual		Aldehyde	9.45E-04	1.439	0.001359	PASS	1.4%
m,p-Xylene	1.8E+08	4.60E-06	100	24 hr		VOC	4.60E-04	8.636	0.003974	PASS	0.0%

Table 9. Diesel (No. 2) process: 500mmbtu, 80 foot stack

Chemical	CAS	Diesel Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Formaldehyde	50000	6.96E-05	9	8 hr		Aldehyde	3.48E-02	9.16	0.318832	PASS	3.5%
Formaldehyde	50000	6.96E-05			0.08	Aldehyde	3.48E-02	1.018	0.035433	PASS	44.3%
Benzo(a)pyrene	50328	3.84E-10			0.0005	PAH	1.92E-07	1.018	0.0000002	PASS	0.0%
Dibenzo(a,h)anthracene	53703	1.02E-09			0.0005	PAH	5.11E-07	1.018	0.000001	PASS	0.1%
Benzo(a)anthracene	56553	6.94E-10			0.005	PAH	3.47E-07	1.018	0.000000	PASS	0.0%
Ethanol	64175	2.95E-05	19000	8 hr		VOC	1.48E-02	9.16	0.135281	PASS	0.0%
Hexanal	66251	6.70E-06	2	annual		Aldehyde	3.35E-03	1.018	0.003409	PASS	0.2%
Isopropyl alcohol	67630	4.35E-06	220	24 hr		VOC	2.18E-03	6.107	0.013292	PASS	0.0%
Acetone	67641	3.03E-03	5900	8 hr		VOC	1.52E+00	9.16	13.890162	PASS	0.2%
Chloroform	67663	1.90E-06			0.4	VOC	9.52E-04	1.018	0.000969	PASS	0.2%
Benzene	71432	6.95E-06	30	annual		VOC	3.47E-03	1.018	0.003536	PASS	0.0%
Benzene	71432	6.95E-06	30	24 hr		VOC	3.47E-03	6.107	0.021214	PASS	0.1%
Benzene	71432	6.95E-06			0.1	VOC	3.47E-03	1.018	0.003536	PASS	3.5%
Bromomethane	74839	7.33E-07	5	24 hr		VOC	3.67E-04	6.107	0.002239	PASS	0.0%
Chloromethane	74873	1.16E-06	90	24 hr		VOC	5.82E-04	6.107	0.003557	PASS	0.0%
Chloromethane	74873	1.16E-06			1.6	VOC	5.82E-04	1.018	0.000593	PASS	0.0%
Chloroethane	75003	9.64E-07	10000	24 hr		VOC	4.82E-04	6.107	0.002944	PASS	0.0%
Acetaldehyde	75070	3.70E-05	9	24 hr		Aldehyde	1.85E-02	6.107	0.113117	PASS	1.3%
Acetaldehyde	75070	3.70E-05			0.5	Aldehyde	1.85E-02	1.018	0.018856	PASS	3.8%
Carbon disulfide	75150	4.47E-05	700	24 hr		VOC	2.23E-02	6.107	0.136419	PASS	0.0%
Tribromomethane	75252	6.45E-06			0.9	VOC	3.23E-03	1.018	0.003283	PASS	0.4%
2-Butanone	78933	1.20E-05	5000	24 hr		VOC	6.02E-03	6.107	0.036755	PASS	0.0%
Trichloroethylene	79016	5.13E-06	2	annual		VOC	2.56E-03	1.018	0.002610	PASS	0.1%
Trichloroethylene	79016	5.13E-06	10000	24 hr		VOC	2.56E-03	6.107	0.015660	PASS	0.0%
Trichloroethylene	79016	5.13E-06			0.2	VOC	2.56E-03	1.018	0.002610	PASS	1.3%
1,1,2,2-Tetrachloroethane	79345				0.02	VOC		1.018		PASS	0.0%
Acenaphthene	83329	8.41E-09	210	24 hr		PAH	4.20E-06	6.107	0.000026	PASS	0.0%
Phenanthrene	85018	2.44E-06	0.1	annual		PAH	1.22E-03	1.018	0.001242	PASS	1.2%

Table 9. Diesel (No. 2) process: 500mmbtu, 80 foot stack

Chemical	CAS	Diesel Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Fluorene	86737	1.02E-09	140	24 hr		PAH	5.11E-07	6.107	0.000003	PASS	0.0%
Naphthalene	91203	3.08E-07	3	24 hr		PAH	1.54E-04	6.107	0.000941	PASS	0.0%
Naphthalene	91203	3.08E-07			0.08	PAH	1.54E-04	1.018	0.000157	PASS	0.2%
2-Methylnapthalene	91576	2.23E-07	10	annual		PAH	1.12E-04	1.018	0.000114	PASS	0.0%
o-Xylene	95476	1.56E-06	100	24 hr		VOC	7.78E-04	6.107	0.004752	PASS	0.0%
1,2-Dichlorobenzene	95501	1.21E-03	300	24 hr		VOC	6.04E-01	6.107	3.691653	PASS	1.2%
1,2,4-Trimethylbenzene	95636	3.78E-06	50	annual		VOC	1.89E-03	1.018	0.001923	PASS	0.0%
1,2,4-Trimethylbenzene	95636	3.78E-06	1200	8 hr		VOC	1.89E-03	9.16	0.017306	PASS	0.0%
Ethylbenzene	100414	2.58E-06	1000	24 hr		VOC	1.29E-03	6.107	0.007873	PASS	0.0%
Ethylbenzene	100414	2.58E-06			3	VOC	1.29E-03	1.018	0.001312	PASS	0.0%
Styrene	100425	1.45E-06	1000	24 hr		VOC	7.25E-04	6.107	0.004429	PASS	0.0%
Styrene	100425	1.45E-06			1.7	VOC	7.25E-04	1.018	0.000738	PASS	0.0%
Benzaldehyde	100527	7.63E-06			0.4	Aldehyde	3.82E-03	1.018	0.003884	PASS	1.0%
1,4-Dichlorobenezene	106467	4.64E-06	800	24 hr		VOC	2.32E-03	6.107	0.014153	PASS	0.0%
1,4-Dichlorobenezene	106467	4.64E-06			0.14	VOC	2.32E-03	1.018	0.002359	PASS	1.7%
Vinyl acetate	108054		200	24 hr		VOC		6.107		PASS	0.0%
4-Methyl-2-pentanone	108101	3.76E-06	3000	24 hr		VOC	1.88E-03	6.107	0.011489	PASS	0.0%
1,3,5-Trimethylbenzene	108678	1.72E-06	50	annual		VOC	8.60E-04	1.018	0.000876	PASS	0.0%
1,3,5-Trimethylbenzene	108678	1.72E-06	1200	8 hr		VOC	8.60E-04	9.16	0.007878	PASS	0.0%
Toluene	108883	2.32E-06	5000	24 hr		VOC	1.16E-03	6.107	0.007093	PASS	0.0%
Chlorobenzene	108907	3.08E-06	50	annual		VOC	1.54E-03	1.018	0.001569	PASS	0.0%
Chlorobenzene	108907	3.08E-06	4400	8 hr		VOC	1.54E-03	9.16	0.014117	PASS	0.0%
Tetrahydrofuran	109999	3.73E-06	8000	annual		VOC	1.87E-03	1.018	0.001900	PASS	0.0%
Veraldehyde	110623	5.96E-06	1760	8 hr		Aldehyde	2.98E-03	9.16	0.027282	PASS	0.0%
Cyclohexane	110827	4.13E-06	6000	24 hr		VOC	2.06E-03	6.107	0.012598	PASS	0.0%
Anthracene	120127	6.30E-09	1000	24 hr		PAH	3.15E-06	6.107	0.000019	PASS	0.0%
Propionaldehyde	123386	4.83E-06	8	24 hr		Aldehyde	2.41E-03	6.107	0.014745	PASS	0.2%
Butylaldehyde	123728	4.21E-06	7	24 hr		Aldehyde	2.11E-03	6.107	0.012862	PASS	0.2%
1,4 Dioxane	123911		100	24 hr		VOC		6.107		PASS	0.0%

Table 9. Diesel (No. 2) process: 500mmbtu, 80 foot stack

Chemical	CAS	Diesel Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Diesel Emissions (lb/hr) - MMBtu/hr	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
1,4 Dioxane	123911				0.04	VOC		1.018		PASS	0.0%
Pyrene	129000	1.66E-08	100	24 hr		PAH	8.30E-06	6.107	0.000051	PASS	0.0%
Ethyl acetate	141786	1.36E-05	3200	24 hr		VOC	6.82E-03	6.107	0.041652	PASS	0.0%
Benzo(ghi)perylene	191242	2.16E-09	12	24 hr		PAH	1.08E-06	6.107	0.000007	PASS	0.0%
Benzo(ghi)perylene	191242	2.16E-09			0.056	PAH	1.08E-06	1.018	0.000001	PASS	0.0%
Ideno(1,2,3-cd)pyrene	193395	7.71E-10			0.005	PAH	3.85E-07	1.018	0.0000004	PASS	0.0%
Benzo(b)fluoranthene	205992	3.24E-09			0.005	PAH	1.62E-06	1.018	0.000002	PASS	0.0%
Fluoranthene	206440	2.59E-07	140	24 hr		PAH	1.29E-04	6.107	0.000790	PASS	0.0%
Fluoranthene	206440	2.59E-07			0.00625	PAH	1.29E-04	1.018	0.000132	PASS	2.1%
Benzo(k)fluoranthene	207089	5.28E-10			0.005	PAH	2.64E-07	1.018	0.0000003	PASS	0.0%
Acenaphthylene	208968	2.25E-08	35	24 hr		PAH	1.12E-05	6.107	0.000069	PASS	0.0%
Chrysene	218019	4.26E-09			0.5	PAH	2.13E-06	1.018	0.000002	PASS	0.0%
1,3-Dichlorobenezene	541731	4.48E-06	3	annual		VOC	2.24E-03	1.018	0.002279	PASS	0.1%
Iso-Veraldehyde	590863	2.71E-05	800	annual		Aldehyde	1.35E-02	1.018	0.013788	PASS	0.0%
2-Hexanone	591786	1.77E-05	30	24 hr		VOC	8.83E-03	6.107	0.053922	PASS	0.2%
1-Ethyl-4-methyl benzene	622968	1.67E-06	350	24 hr		VOC	8.37E-04	6.107	0.005112	PASS	0.0%
Tolualdehyde	1334787	2.56E-05	440	24 hr		Aldehyde	1.28E-02	6.107	0.078031	PASS	0.0%
Methyl-t-butyl ether	1634044		3000	24 hr		VOC		6.107		PASS	0.0%
Crotonaldehyde	4170303	8.60E-06	9	1 hr		Aldehyde	4.30E-03	10.18	0.043776	PASS	0.5%
2,5-Dimethylbenzaldehyde	5779942	9.45E-06	0.1	annual		Aldehyde	4.72E-03	1.018	0.004808	PASS	4.8%
m,p-Xylene	1.8E+08	4.60E-06	100	24 hr		VOC	2.30E-03	6.107	0.014051	PASS	0.0%

APPENDIX H:

CLEAN FUELS: EMISSION FACTORS AND AMBIENT IMPACTS FOR WOOD, NATURAL GAS, AND DIESEL

Appendix G and H were originally provided to the ATW in spreadsheet format with underlying formulas and supporting information. The data tables provided here were referenced in ATW discussions, whereas the supplementary data, also in the spreadsheet, was provided for workgroup members who wanted to see the raw data and format. Only the pertinent data from the spreadsheets are provided here. The original spreadsheets with all data and formulas are available upon request.

Appendix H – Copy of Clean Fuels: Wood, NatGas, and Diesel EFs, and Ambient Impacts

Table 1. Diesel Processes: 50mmbtu, 40 foot stack											
Chemical	**CAS**	**Diesel Process EF* (lb/mmbtu)**	**ITSL (µg/m³)**	**Avg Time**	**IRSL (µg/m³)**	**Worst Process**	**Emissions (lb/hr)**	**Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)**	**Predicted Ambient Impacts (µg/m^3)**	PASS/ FAIL	% of screening
1,3-Butadiene	106990	0.0000391			0.03	Engine Recip	1.96E-03	2.172	0.0042463	PASS	14.2%
1,3-Butadiene	106990	0.0000391	2	24 hr		Engine Recip	1.96E-03	13.03	0.02547	PASS	1.3%
Acenaphthene	83329	0.00000468	210	24 hr		Engine Large Bore	2.34E-04	13.03	0.00305	PASS	0.0%
Acenaphthylene	208968	0.00000923	35	24 hr		Engine Large Bore	4.62E-04	13.03	0.006	PASS	0.0%
Acetaldehyde	75070	0.00107			0.5	Engine Recip	5.35E-02	2.172	0.11620	PASS	23.2%
Acetaldehyde	75070	0.00107	9	24 hr		Engine Recip	5.35E-02	13.03	0.69711	PASS	7.7%
Acrolein	107028	0.0000925	5	1 hr		Engine Recip	4.63E-03	21.72	0.10046	PASS	2.0%
Acrolein	107028	0.0000925	0.02	annual		Engine Recip	4.63E-03	2.172	0.010	PASS	50.2%
Anthracene	120127	0.00000187	1000	24 hr		Engine Recip	9.35E-05	13.03	0.001	PASS	0.0%
Arsenic	7440382	0.000011			0.0002	Engine Turbine	5.50E-04	2.172	0.001	FAIL	597.3%
Benzene	71432	0.00092751	30	24 hr		Engine Recip	4.64E-02	13.03	0.60	PASS	2.0%
Benzene	71432	0.00092751	30	annual		Engine Recip	4.64E-02	2.172	0.10073	PASS	0.3%
Benzene	71432	0.00092751			0.1	Engine Recip	4.64E-02	2.172	0.10073	FAIL	100.7%
Benzo (a) anthracene	56553	0.00000269			0.005	Engine Recip	1.35E-04	2.172	0.00029	PASS	5.8%
Benzo (a) pyrene	50328	0.000000429			0.0005	Engine Recip	2.15E-05	2.172	0.00005	PASS	9.3%
Benzo (b) fluoranthene	205992	0.00000111			0.005	Engine Large Bore	5.55E-05	2.172	0.00012	PASS	2.4%
Benzo (g,h,i) perylene	191242	0.000000556	12	24 hr		Engine Large Bore	2.78E-05	13.03	0.00036	PASS	0.0%
Benzo (g,h,i) perylene	191242	0.000000556			0.05556	Engine Large Bore	2.78E-05	2.172	0.00006	PASS	0.1%
Benzo (k) fluoranthene	207089	0.000000218			0.05	Engine Large Bore	1.09E-05	2.172	0.00002	PASS	0.0%
Beryllium	7440417	0.000003			0.0004	Boiler	1.50E-04	2.172	0.00033	PASS	81.5%
Beryllium	7440417	0.000003	0.02	24 hr		Boiler	1.50E-04	13.03	0.00195	PASS	9.8%
Cadmium	7440439	0.0000048			0.0006	Engine Turbine	2.40E-04	2.172	0.00052	PASS	86.9%
Chromium (10% hex)	7440473	0.0000011			8.3E-05	Engine Turbine	5.50E-05	2.172	0.00012	FAIL	143.9%

Table 1. Diesel Processes: 50mmbtu, 40 foot stack											
Chemical	**CAS**	**Diesel Process EF* (lb/mmbtu)**	**ITSL (µg/m³)**	**Avg Time**	**IRSL (µg/m³)**	**Worst Process**	**Emissions (lb/hr)**	**Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)**	**Predicted Ambient Impacts (µg/m^3)**	PASS/ FAIL	% of screening
Chrysene	218019	8.628E-08			0.5	Engine Recip	4.31E-06	2.172	0.00001	PASS	0.0%
Copper	7440508	0.000006	2	8 hr		Boiler	3.00E-04	19.55	0.00587	PASS	0.3%
Dibenzo(a,h) anthracene	53703	0.000000583			0.0005	Engine Recip	2.92E-05	2.172	0.00006	PASS	12.7%
Ethylbenzene	100414	2.20733E-05			3	Engine Recip	1.10E-03	2.172	0.00240	PASS	0.1%
Ethylbenzene	100414	2.20733E-05	1000	24 hr		Engine Recip	1.10E-03	13.03	0.01438	PASS	0.0%
Fluoranthene	206440	9.4189E-07			0.00625	Engine Recip	4.71E-05	2.172	0.0001	PASS	1.6%
Fluoranthene	206440	9.4189E-07	140	24 hr		Engine Recip	4.71E-05	13.03	0.001	PASS	0.0%
Fluorene	86737	0.0000292	140	24 hr		Engine Recip	1.46E-03	13.03	0.0190	PASS	0.0%
Formaldehyde	50000	1.18E-03			0.08	Engine Recip	5.90E-02	2.172	0.13	FAIL	160.2%
Formaldehyde	50000	1.18E-03	9	8 hr		Engine Recip	5.90E-02	19.55	1.15345	PASS	12.8%
Indeno(1,2,3-cd)pyrene	193395	0.000000414			0.005	Engine Large Bore	2.07E-05	2.172	0.0000	PASS	0.9%
Isomers of xylene	1330207	4.91796E-05	100	24 hr		Engine Recip	2.46E-03	13.03	0.03	PASS	0.0%
Manganese	7439965	0.00079	0.05	annual		Engine Turbine	3.95E-02	2.172	0.09	FAIL	171.6%
Mercury	7439976	0.000003	0.3	annual		Boiler	1.50E-04	2.172	0.0003	PASS	0.1%
Naphthalene	91203	0.000092751			0.08	Engine Recip	4.64E-03	2.172	0.01	PASS	12.6%
Naphthalene	91203	0.000092751	3	24 hr		Engine Recip	4.64E-03	13.03	0.1	PASS	2.0%
Nickel	7440020	0.0000046			0.0042	Engine Turbine	2.30E-04	2.172	0.00050	PASS	11.9%
Phenanthrene	85018	0.0000408	0.1	annual		Engine Large Bore	2.04E-03	2.172	0.00443	PASS	4.4%
Propylene	115071	0.00279	1500	24 hr		Engine Large Bore	1.40E-01	13.03	1.81769	PASS	0.1%
Pyrene	129000	0.00000478	100	24 hr		Engine Recip	2.39E-04	13.03	0.00311	PASS	0.0%
Selenium	7782492	0.000025	2	8 hr		Engine Turbine	1.25E-03	19.55	0.02444	PASS	1.2%
Styrene	100425	0.00000931			1.7	Engine Large Bore	4.66E-04	2.172	0.001	PASS	0.1%
Styrene	100425	0.00000931	1000	24 hr		Engine Large Bore	4.66E-04	13.03	0.006	PASS	0.0%
Toluene	108883	0.000277534	5000	24 hr		Engine Recip	1.39E-02	13.03	0.181	PASS	0.0%

Table 2. Natural Gas Fuel, 50mmbtu, 60 foot stack

Chemical	CAS	Nat Gas EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Dibenzo(a,h) anthracene	53703	1.2E-09			0.0005	Boiler	6.00E-08	2.172	0.0000001	PASS	0.0%
Benzo (a) anthracene	56553	1.8E-09			0.005	Boiler	9.00E-08	2.172	0.0000002	PASS	0.0%
Methyl alcohol	67561	0.00306	3250	1 hr		Recip Engine	1.53E-01	21.72	3.32316	PASS	0.1%
Ethyl chloride	75003	0.00000187	10000	24 hr		Recip Engine	9.35E-05	13.03	0.00122	PASS	0.0%
Isobutane	75285	0.00375	23800	8 hr		Recip Engine	1.88E-01	19.55	3.666	PASS	0.0%
1,1-Dichloroethane	75343	0.0000391	500	24 hr		Recip Engine	1.96E-03	13.03	0.02547	PASS	0.0%
Isobutyraldehyde	78842	0.000437	160	24 hr		Recip Engine	2.19E-02	13.03	0.28471	PASS	0.2%
Propylene dichloride	78875	0.0000446	4	24 hr		Recip Engine	2.23E-03	13.03	0.02906	PASS	0.7%
Acenaphthene	83329	1.8E-09	210	24 hr		Boiler	9.00E-08	13.03	0.000001	PASS	0.0%
Phenanthrene	85018	0.000000017	0.1	annual		Boiler	8.50E-07	2.172	0.000002	PASS	0.0%
Fluorene	86737	2.8E-09	140	24 hr		Boiler	1.40E-07	13.03	0.000002	PASS	0.0%
2-Methyl Naphthalene	91576	0.000000024	10	annual		Boiler	1.20E-06	2.172	0.000003	PASS	0.0%
Biphenyl	92524	0.000212	13	8 hr		Recip Engine	1.06E-02	19.55	0.20723	PASS	1.6%
1,2,4-Trimethylbenzene	95636	0.000111	1200	8 hr		Recip Engine	5.55E-03	19.55	0.10850	PASS	0.0%
1,2,4-Trimethylbenzene	95636	0.000111	50	annual		Recip Engine	5.55E-03	2.172	0.01205	PASS	0.0%
n-Butane	106978	0.0021	23800	8 hr		Boiler	1.05E-01	19.55	2.053	PASS	0.0%
Acrolein	107028	0.00778	5	1 hr		Recip Engine	3.89E-01	21.72	8.449	FAIL	169.0%
Acrolein	107028	0.00778	0.02	annual		Recip Engine	3.89E-01	2.172	0.84	FAIL	4224.5%
1,3,5-Trimethylbenzene	108678	0.0000338	1200	8 hr		Recip Engine	1.69E-03	19.55	0.033	PASS	0.0%
1,3,5-Trimethylbenzene	108678	0.0000338	50	annual		Recip Engine	1.69E-03	2.172	0.004	PASS	0.0%
Methylcyclohexane	108872	0.00123	16000	8 hr		Recip Engine	6.15E-02	19.55	1.202	PASS	0.0%
Toluene	108883	0.0000034	5000	24 hr		Boiler	1.70E-04	13.03	0.002	PASS	0.0%
Chlorobenzene	108907	0.0000444	70	24 hr		Recip Engine	2.22E-03	13.03	0.02893	PASS	0.0%
Phenol	108952	0.0000421	190	8 hr		Recip Engine	2.11E-03	19.55	0.04115	PASS	0.0%
N-Pentane	109660	0.0026	17700	8 hr		Boiler	1.30E-01	19.55	2.54150	PASS	0.0%
N-Hexane	110543	0.0018	700	24 hr		Boiler	9.00E-02	13.03	1.17270	PASS	0.2%
Cyclohexane	110827	0.000308	6000	24 hr		Recip Engine	1.54E-02	13.03	0.20066	PASS	0.0%
N-Nonane	111842	0.00011	550	24 hr		Recip Engine	5.50E-03	13.03	0.07167	PASS	0.0%
Anthracene	120127	2.4E-09	1000	24 hr		Boiler	1.20E-07	13.03	0.0000016	PASS	0.0%

Table 2. Natural Gas Fuel, 50mmbtu, 60 foot stack

Chemical	CAS	Nat Gas EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Pyrene	129000	0.000000005	100	24 hr		Boiler	2.50E-07	13.03	0.0000033	PASS	0.0%
Benzo (g,h,i) perylene	191242	1.20E-06			0.056	Boiler	6.00E-05	2.172	0.0001303	PASS	0.2%
Benzo (g,h,i) perylene	191242	0.0021	12	24 hr		Boiler	1.05E-01	13.03	1.3682	PASS	11.4%
Indeno(1,2,3-cd)pyrene	193395	1.8E-09			0.005	Boiler	9.00E-08	2.172	0.0000002	PASS	0.0%
Benzo (b) fluoranthene	205992	1.8E-09			0.005	Boiler	9.00E-08	2.172	0.0000002	PASS	0.0%
Fluoranthene	206440	0.000000003			0.00625	Boiler	1.50E-07	2.172	0.0000003	PASS	0.0%
Fluoranthene	206440	0.000000003	140	24 hr		Boiler	1.50E-07	13.03	0.000002	PASS	0.0%
Benzo (k) fluoranthene	207089	1.8E-09			0.05	Boiler	9.00E-08	2.172	0.0000002	PASS	0.0%
Acenaphthylene	208968	1.8E-09	35	24 hr		Boiler	9.00E-08	13.03	0.000001	PASS	0.0%
Chrysene	218019	1.8E-09			0.5	Boiler	9.00E-08	2.172	0.0000002	PASS	0.0%
Cyclopentane	287923	0.000227	17200	8 hr		Recip Engine	1.14E-02	19.55	0.22	PASS	0.0%
1,2,3-Trimethylbenzene	526738	0.0000354	1200	8 hr		Recip Engine	1.77E-03	19.55	0.0	PASS	0.0%
1,2,3-Trimethylbenzene	526738	0.0000354	50	annual		Recip Engine	1.77E-03	2.172	0.00384	PASS	0.0%
2,2,4-Trimethylpentane	540841	0.000846	3500	8 hr		Recip Engine	4.23E-02	19.55	0.82697	PASS	0.0%
Isomers of xylene	1330207	0.000268	100	24 hr		Recip Engine	1.34E-02	13.03	0.17460	PASS	0.2%
Manganese	7439965	0.00000038	0.05	annual		Boiler	1.90E-05	2.172	0.00004	PASS	0.1%
Mercury	7439976	0.00000026	0.3	24 hr		Boiler	1.30E-05	13.03	0.00017	PASS	0.1%
Molybdenum	7439987	0.0000011	30	8 hr		Boiler	5.50E-05	19.55	0.001	PASS	0.0%
Barium	7440393	0.0000044	5	8 hr		Boiler	2.20E-04	19.55	0.004	PASS	0.1%
Chromium	7440473	0.00000014			8.3E-05	Boiler	7.00E-06	2.172	0.00002	PASS	18.3%
Cobalt	7440484	0.000000084	0.2	8 hr		Boiler	4.20E-06	19.55	0.0001	PASS	0.0%
Copper	7440508	0.00000085	2	8 hr		Boiler	4.25E-05	19.55	0.0008	PASS	0.0%
Selenium	7782492	0.000000024	2	8 hr		Boiler	1.20E-06	19.55	0.0000235	PASS	0.0%
Arsenic	7440382	0.0000002			0.0002	Boiler	1.00E-05	2.172	0.0000217	PASS	10.9%
Beryllium	7440417	0.000000012			0.0004	Boiler	5.45E-08	2.172	0.0000001	PASS	0.0%
Beryllium	7440417	0.000000012	0.02	24 hr		Boiler	5.45E-08	13.03	0.0000007	PASS	0.0%
Benzo (a) pyrene	50328	1.2E-09			0.0005	Boiler	6.00E-08	2.172	0.0000001	PASS	0.0%
Cadmium	7440439	0.0000011			0.0006	Boiler	5.50E-05	2.172	0.00012	PASS	19.9%
Ethylene dibromide	106934	0.0000734			0.002	Recip Engine	3.67E-03	2.172	0.008	FAIL	398.6%

Table 2. Natural Gas Fuel, 50mmbtu, 60 foot stack

Chemical	CAS	Nat Gas EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Ethylene dibromide	106934	0.0000734	9	24 hr		Recip Engine	3.67E-03	13.03	0.048	PASS	0.5%
Nickel	7440020	0.0000021			0.0042	Boiler	1.05E-04	2.172	0.00023	PASS	5.4%
1,1,2,2-Tetrachloroethane	79345	0.0000663			0.02	Recip Engine	3.32E-03	2.172	0.007	PASS	36.0%
1,3-Butadiene	106990	0.00082			0.03	Recip Engine	4.10E-02	2.172	0.089	FAIL	296.8%
1,3-Butadiene	106990	0.00082	2	24 hr		Recip Engine	4.10E-02	13.03	0.534	PASS	26.7%
Ethylene dichloride	107062	0.0000422			0.04	Recip Engine	2.11E-03	2.172	0.005	PASS	11.5%
1,1,2-Trichloroethane	79005	0.0000527			0.06	Recip Engine	2.64E-03	2.172	0.006	PASS	9.5%
Formaldehyde	50000	0.000075			0.08	Boiler	3.75E-03	2.172	0.008	PASS	10.2%
Formaldehyde	50000	0.000075	9	8 hr		Boiler	3.75E-03	19.55	0.073	PASS	0.8%
Naphthalene	91203	0.00000061			0.08	Boiler	3.05E-05	2.172	0.00007	PASS	0.1%
Naphthalene	91203	0.00000061	3	24 hr		Boiler	3.05E-05	13.03	0.00040	PASS	0.0%
Benzene	71432	0.0000021	30	24 hr		Boiler	1.05E-04	13.03	0.001	PASS	0.0%
Benzene	71432	0.0000021	30	annual		Boiler	1.05E-04	2.172	0.00023	PASS	0.0%
Benzene	71432	0.0000021			0.1	Boiler	1.05E-04	2.172	0.00023	PASS	0.2%
Vinyl chloride	75014	0.0000247			0.11	Recip Engine	1.24E-03	2.172	0.003	PASS	2.4%
Vinyl chloride	75014	0.0000247	100	24 hr		Recip Engine	1.24E-03	13.03	0.016	PASS	0.0%
Carbon tetrachloride	56235	0.0000607			0.17	Recip Engine	3.04E-03	2.172	0.007	PASS	3.9%
Carbon tetrachloride	56235	0.0000607	100	24 hr		Recip Engine	3.04E-03	13.03	0.040	PASS	0.0%
1,3-Dichloropropene	542756	0.0000438			0.2	Recip Engine	2.19E-03	2.172	0.005	PASS	2.4%
1,3-Dichloropropene	542756	0.0000438	20	24 hr		Recip Engine	2.19E-03	13.03	0.029	PASS	0.1%
Propylene oxide	75569	0.000029			0.3	Turbine Engine	1.45E-03	2.172	0.003	PASS	1.0%
Propylene oxide	75569	0.000029	30	24 hr		Turbine Engine	1.45E-03	13.03	0.019	PASS	0.1%
Chloroform	67663	0.0000471			0.4	Recip Engine	2.36E-03	2.172	0.005	PASS	1.3%
Acetaldehyde	75070	0.00836	9	24 hr		Recip Engine	4.18E-01	13.03	5.447	PASS	60.5%
Acetaldehyde	75070	0.00836			0.5	Recip Engine	4.18E-01	2.172	0.908	FAIL	181.6%
Styrene	100425	0.0000548			1.7	Recip Engine	2.74E-03	2.172	0.006	PASS	0.4%
Styrene	100425	0.0000548	1000	24 hr		Recip Engine	2.74E-03	13.03	0.036	PASS	0.0%
Ethylbenzene	100414	0.000108			3	Recip Engine	5.40E-03	2.172	0.012	PASS	0.4%

Table 2. Natural Gas Fuel, 50mmbtu, 60 foot stack

Chemical	CAS	Nat Gas EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Ethylbenzene	100414	0.000108	1000	24 hr		Recip Engine	5.40E-03	13.03	0.070	PASS	0.0%
Perchloroethylene	127184	0.00000248			4	Recip Engine	1.24E-04	2.172	0.000	PASS	0.0%
Perchloroethylene	127184	0.00000248	40	24 hr		Recip Engine	1.24E-04	13.03	0.002	PASS	0.0%
Dichloromethane	75092	0.000147			60	Recip Engine	7.35E-03	2.172	0.016	PASS	0.0%
Dichloromethane	75092	0.000147	2000	annual		Recip Engine	7.35E-03	2.172	0.016	PASS	0.0%
Dichloromethane	75092	0.000147	14000	1 hr		Recip Engine	7.35E-03	21.72	0.160	PASS	0.0%
3-Methylcholanthrene	56495	1.8E-09			0.005	Boiler	9.00E-08	2.172	0.0000002	PASS	0.0%
Dimethylbenz(a)anthracene	57976	0.000000016			0.005	Boiler	8.00E-07	2.172	0.0000017	PASS	0.0%
N-Octane	111659	0.000351	3500	8 hr		Recip Engine	1.76E-02	19.55	0.343	PASS	0.0%
Benzo (e) pyrene	192972	0.000000415			0.05	Recip Engine	2.08E-05	2.172	0.000045	PASS	0.1%
Perylene	198550	4.97E-09			0.05	Recip Engine	2.49E-07	2.172	0.000001	PASS	0.0%
Vanadium	7440622	0.0000023	0.5	1 hr		Boiler	1.15E-04	21.72	0.002498	PASS	0.5%
Dichlorobenzene, mixed isomers	25321226	0.0000012	3	annual		Boiler	6.00E-05	2.172	0.000130	PASS	0.0%
Dichlorobenzene, mixed isomers	25321226	0.0000012			0.14	Boiler	6.00E-05	2.172	0.000130	PASS	0.1%

* Based on worse-case Emission Factor from EPA's WebFIRE database

Table 3. Wood Fuel: 50mmbtu, 40 foot stack

Chemical	CAS	Wood /Bark EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Dioxin Equiva-lent** EF (TEQ)	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
1,1,1-Trichloroethane	71556	3.10E-05	6000	24 hr			1.55E-03	13.03	0.0201965	PASS	0.0%
1,2-Ethylene dibromide	540498	5.50E-05	0.1	annual			2.75E-03	2.172	0.0059730	PASS	6.0%
2,3,7,8-Tetrachlorodibenzofuran	51207319	9.00E-12			2.3E-08	x	4.50E-10	2.172	9.77E-10	PASS	4.2%
2,3,7,8-Tetrachlorodibenzofuran	51207319	9.00E-12	2.0E-06	annual		x	4.50E-10	2.172	9.77E-10	PASS	0.0%
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746016	8.60E-12			2.3E-08	x	4.30E-10	2.172	9.34E-10	PASS	4.1%
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746016	8.60E-12	2.0E-06	annual		x	4.30E-10	2.172	9.34E-10	PASS	0.0%
2,4,4'-Trichlorobiphenyl	7012375	2.60E-09			0.002		1.30E-07	2.172	0.0000003	PASS	0.0%
2,4,6-Trichlorophenol	88062	2.20E-08			0.3		1.10E-06	2.172	0.0000024	PASS	0.0%
2,4-Dinitrophenol	51285	1.80E-07	7	24 hr			9.00E-06	13.03	0.0001173	PASS	0.0%
2-Chlorophenol	95578	2.40E-08	18	24 hr			1.20E-06	13.03	0.0000156	PASS	0.0%
2-Methyl Naphthalene	91576	1.60E-07	10	annual			8.00E-06	2.172	0.0000174	PASS	0.0%
2-Monochlorobiphenyl	2051607	2.20E-10			0.002		1.10E-08	2.172	2.39E-08	PASS	0.0%
2-Nitrophenol	88755	2.40E-07	0.7	annual			1.20E-05	2.172	0.00003	PASS	0.0%
4-Nitrophenol	100027	1.10E-07	0.7	annual			5.50E-06	2.172	0.00001	PASS	0.0%
Acenaphthene	83329	9.10E-07	210	24 hr			4.55E-05	13.03	0.00059	PASS	0.0%
Acenaphthylene	208968	5.00E-06	35	24 hr			2.50E-04	13.03	0.003	PASS	0.0%
Acetaldehyde	75070	8.30E-04			0.5		4.15E-02	2.172	0.090	PASS	18.0%
Acetaldehyde	75070	8.30E-04	9	24 hr			4.15E-02	13.03	0.54	PASS	6.0%
Acetone	67641	1.90E-04	5900	8 hr			9.50E-03	19.55	0.186	PASS	0.0%
Acetophenone	98862	3.20E-09	490	8 hr			1.60E-07	19.55	0.000003	PASS	0.0%
Acrolein	107028	4.00E-03	0.02	annual			2.00E-01	2.172	0.434	FAIL	2172.0%
Acrolein	107028	4.00E-03	5	1 hr			2.00E-01	21.72	4.344	PASS	86.9%
Anthracene	120127	3.00E-06	1000	24 hr			1.50E-04	13.03	0.00195	PASS	0.0%
Antimony	7440360	7.90E-06	0.2	24 hr			3.95E-04	13.03	0.00515	PASS	2.6%
Arsenic	7440382	2.20E-05			2.0E-04		1.10E-03	2.172	0.00239	FAIL	1194.6%
Barium	7440393	1.70E-04	5	8 hr			8.50E-03	19.55	0.16618	PASS	3.3%
Benzaldehyde	100527	8.50E-07			0.4		4.25E-05	2.172	0.00009	PASS	0.0%

Table 3. Wood Fuel: 50mmbtu, 40 foot stack

Chemical	CAS	Wood /Bark EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Dioxin Equiva-lent** EF (TEQ)	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Benzene	71432	4.20E-03			0.10		2.10E-01	2.172	0.45612	FAIL	456.1%
Benzene	71432	4.20E-03	30	24 hr			2.10E-01	13.03	2.7363000	PASS	9.1%
Benzene	71432	4.20E-03	30	annual			2.10E-01	2.172	0.4561200	PASS	1.5%
Benzo (a) anthracene	56553	6.50E-08			0.005		3.25E-06	2.172	0.0000071	PASS	0.1%
Benzo (a) pyrene	50328	2.60E-06			0.0005		1.30E-04	2.172	0.0003	PASS	56.5%
Benzo (b) fluoranthene	205992	1.00E-07			0.005		5.00E-06	2.172	0.0000109	PASS	0.2%
Benzo (g,h,i) perylene	191242	9.30E-08			0.0556		4.65E-06	2.172	0.0000101	PASS	0.0%
Benzo (g,h,i) perylene	191242	9.30E-08	12	24 hr			4.65E-06	13.03	0.000061	PASS	0.0%
Benzo (k) fluoranthene	207089	3.60E-08			0.05		1.80E-06	2.172	0.000004	PASS	0.0%
Benzoic acid	65850	4.70E-08	12	annual			2.35E-06	2.172	0.0000051	PASS	0.0%
Beryllium	7440417	1.10E-06			0.0004		5.50E-05	2.172	0.000119	PASS	29.9%
Beryllium	7440417	1.10E-06	0.02	24 hr			5.50E-05	13.03	0.0007167	PASS	3.6%
Cadmium	7440439	4.10E-06			0.0006		2.05E-04	2.172	0.00045	PASS	74.2%
Carbazole	86748	1.80E-06			0.4		9.00E-05	2.172	0.00020	PASS	0.0%
Carbon tetrachloride	56235	4.50E-05	100	24 hr	0.17		2.25E-03	13.03	0.02932	PASS	0.0%
Chlorine	7782505	7.90E-04	0.3	annual			3.95E-02	2.172	0.08579	PASS	28.6%
Chlorine	7782505	7.90E-04	500	8 hr			3.95E-02	19.55	0.77223	PASS	0.2%
Chlorobenzene	108907	3.30E-05	70	24 hr			1.65E-03	13.03	0.02150	PASS	0.0%
Chloroform	67663	2.80E-05			0.4		1.40E-03	2.172	0.00304	PASS	0.8%
Chromium (VI)	18540299	3.50E-06			8.3E-05		1.75E-04	2.172	0.00038	FAIL	458.0%
Chromium (VI)	18540299	3.50E-06	0.01	24 hr			1.75E-04	13.03	0.002	PASS	28.5%
Chrysene	218019	3.80E-08			0.5		1.90E-06	2.172	0.000	PASS	0.0%
Cobalt	7440484	6.50E-06	0.2	8 hr			3.25E-04	19.55	0.0064	PASS	3.2%
Copper	7440508	4.90E-05	2	8 hr			2.45E-03	19.55	0.0479	PASS	2.4%
Crotonaldehyde	123739	9.90E-06	9	1 hr			4.95E-04	21.72	0.0107514	PASS	0.1%
Decachlorobiphenyl	2051243	2.70E-10			0.002		1.35E-08	2.172	2.93E-08	PASS	0.0%
Dibenzo(a,h) anthracene	53703	9.10E-09			0.0005		4.14E-08	2.172	0.0000001	PASS	0.0%
Dichlorobiphenyl	25512429	7.40E-10			0.002		3.36E-09	2.172	0.00000001	PASS	0.0%

Table 3. Wood Fuel: 50mmbtu, 40 foot stack

Chemical	CAS	Wood /Bark EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Dioxin Equiva-lent** EF (TEQ)	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Dichloromethane	75092	2.90E-04			60		1.45E-02	2.172	0.0314940	PASS	0.1%
Dichloromethane	75092	2.90E-04	2000	annual			1.45E-02	2.172	0.03149	PASS	0.0%
Dichloromethane	75092	2.90E-04	14000	1 hr			1.45E-02	21.72	0.315	PASS	0.0%
Dioctyl phthalate	117817	4.70E-08			0.2		2.35E-06	2.172	0.00001	PASS	0.0%
Ethylbenzene	100414	3.10E-05			3		1.55E-03	2.172	0.00337	PASS	0.1%
Ethylbenzene	100414	3.10E-05	1000	24 hr			1.55E-03	13.03	0.020	PASS	0.0%
Ethylene dichloride	107062	2.90E-05			0.04		1.45E-03	2.172	0.003	PASS	7.9%
Fluoranthene	206440	1.60E-07			0.006		8.00E-06	2.172	0.00002	PASS	0.3%
Fluoranthene	206440	1.60E-07	140	24 hr			8.00E-06	13.03	0.00010	PASS	0.0%
Fluorene	86737	3.40E-06	140	24 hr			1.70E-04	13.03	0.002	PASS	0.0%
Formaldehyde	50000	4.40E-03			0.08		2.20E-01	2.172	0.478	FAIL	597.3%
Formaldehyde	50000	4.40E-03	9	8 hr			2.20E-01	19.55	4.301	PASS	47.8%
Heptachlorobiphenyls, total	28655712	6.60E-11			0.002		3.30E-09	2.172	0.0000000	PASS	0.0%
Hexachlorobiphenyls, total	26601649	5.50E-10			0.002		2.75E-08	2.172	0.0000001	PASS	0.0%
Hexachlorodibenzo-p-dioxins, total	34465468	1.60E-07			2.3E-08	x	8.00E-06	2.172	0.00002	FAIL	75547.8%
Hexachlorodibenzo-p-dioxins, total	34465468	1.60E-07	2.0E-06	annual		x	8.00E-06	2.172	0.00002	FAIL	868.8%
Hexanal	66251	7.00E-06	2	annual			3.50E-04	2.172	0.00076	PASS	0.0%
Hydrogen chloride	7647010	1.90E-02	20	annual			9.50E-01	2.172	2.063	PASS	10.3%
Hydrogen chloride	7647010	1.90E-02	2100	1 hr			9.50E-01	21.72	20.634	PASS	1.0%
Indeno(1,2,3-cd)pyrene	193395	8.70E-08			0.005		4.35E-06	2.172	0.000	PASS	0.2%
Isobutyraldehyde	78842	1.20E-05	160	24 hr			6.00E-04	13.03	0.008	PASS	0.0%
Manganese	7439965	1.60E-03	0.05	annual			8.00E-02	2.172	0.174	FAIL	347.5%
Mercury	7439976	3.50E-06	0.3	24 hr			1.75E-04	13.03	0.002	PASS	0.8%
Methyl bromide	74839	1.50E-05	5	24 hr			7.50E-04	13.03	0.010	PASS	0.2%
Methyl chloride	74873	2.30E-05			1.6		1.15E-03	2.172	0.002	PASS	0.2%
Methyl chloride	74873	2.30E-05	90	24 hr			1.15E-03	13.03	0.015	PASS	0.0%
Methyl ethyl ketone	78933	5.40E-06	5000	24 hr			2.70E-04	13.03	0.004	PASS	0.0%

Table 3. Wood Fuel: 50mmbtu, 40 foot stack

Chemical	CAS	Wood /Bark EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Dioxin Equiva-lent** EF (TEQ)	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Molybdenum	7439987	2.10E-06	30	8 hr			1.05E-04	19.55	0.002	PASS	0.0%
Naphthalene	91203	9.70E-05			0.08		4.85E-03	2.172	0.011	PASS	13.2%
Naphthalene	91203	9.70E-05	3	24 hr			4.85E-03	13.03	0.063	PASS	2.1%
Nickel	7440020	3.30E-05			0.0042		1.65E-03	2.172	0.004	PASS	85.3%
Octachlorodibenzo-p-dioxins, total	3268879	6.60E-12			2.3E-08	x	3.30E-10	2.172	7.17E-10	PASS	3.1%
Octachlorodibenzo-p-dioxins, total	3268879	6.60E-12	2.0E-06	annual		x	3.30E-10	2.172	7.17E-10	PASS	0.0%
o-Tolualdehyde	529204	7.20E-06	440	24 hr			3.60E-04	13.03	0.005	PASS	0.0%
o-Xylene	95476	2.50E-05	100	24 hr			1.25E-03	13.03	0.016	PASS	0.0%
Pentachlorobiphenyls, total	25429292	1.20E-09			0.002		6.00E-08	2.172	1.30E-07	PASS	0.0%
Pentachlorodibenzofurans, total		2.10E-10			2.3E-08	x	1.05E-08	2.172	2.28E-08	PASS	99.2%
Pentachlorodibenzofurans, total		2.10E-10	2.0E-06	annual		x	1.05E-08	2.172	2.28E-08	PASS	1.1%
Pentachlorodibenzo-p-dioxins, total		1.50E-09			2.3E-08	x	7.50E-08	2.172	0.0000002	FAIL	708.3%
Pentachlorodibenzo-p-dioxins, total		1.50E-09	2.0E-06	annual		x	7.50E-08	2.172	0.000	PASS	8.1%
Pentachlorophenol (PCP)	87865	5.10E-08			0.009		2.55E-06	2.172	0.000006	PASS	0.1%
Pentachlorophenol (PCP)	87865	5.10E-08	20	24 hr			2.55E-06	13.03	0.000033	PASS	0.0%
Perchloroethylene	127184	3.80E-05			4		1.90E-03	2.172	0.004127	PASS	0.1%
Perchloroethylene	127184	3.80E-05	40	24 hr			1.90E-03	13.03	0.024757	PASS	0.1%
Phenanthrene	85018	7.00E-06	0.1	annual			3.50E-04	2.172	0.000760	PASS	0.8%
Phenol	108952	5.10E-05	190	8 hr			2.55E-03	19.55	0.050	PASS	0.0%
Phosphorus (yellow or white)	7723140	2.70E-05	1	8 hr			1.35E-03	19.55	0.026	PASS	2.6%
Propionaldehyde	123386	6.10E-05	8	24 hr			3.05E-03	13.03	0.040	PASS	0.5%
Propylene dichloride	78875	3.30E-05	4	24 hr			1.65E-03	13.03	0.021	PASS	0.5%
p-Tolualdehyde	104870	1.10E-05	440	24 hr			5.50E-04	13.03	0.007	PASS	0.0%
Pyrene	129000	3.70E-06	100	24 hr			1.85E-04	13.03	0.002	PASS	0.0%
Selenium	7782492	2.80E-06	2	8 hr			1.40E-04	19.55	0.003	PASS	0.1%
Silver	7440224	1.70E-03	0.1	8 hr			8.50E-02	19.55	1.662	FAIL	1661.8%
Strontium	7440246	1.00E-05	2000	24 hr			5.00E-04	13.03	0.007	PASS	0.0%

Table 3. Wood Fuel: 50mmbtu, 40 foot stack											
Chemical	**CAS**	**Wood /Bark EF* (lb/mmbtu)**	**ITSL (µg/m³)**	**Avg Time**	**IRSL (µg/m³)**	**Dioxin Equiva-lent** EF (TEQ)**	**Emissions (lb/hr)**	**Generic 1- lb/hr Impacts AERSCREEN (µg/m^3 / lb/hr)**	**Predicted Ambient Impacts (µg/m^3)**	PASS/ FAIL	% of screening
Styrene	100425	1.90E-03			1.7		9.50E-02	2.172	0.206	PASS	12.1%
Styrene	100425	1.90E-03	1000	24 hr			9.50E-02	13.03	1.238	PASS	0.1%
Tetrachlorobiphenyls, total	26914330	2.50E-09			0.002		1.25E-07	2.172	2.72E-07	PASS	0.0%
Tetrachlorodibenzofurans, total		7.50E-11			2.3E-08	x	3.75E-09	2.172	8.15E-09	PASS	35.4%
Tetrachlorodibenzofurans, total		7.50E-11	2.0E-06	annual		x	3.75E-09	2.172	8.15E-09	PASS	0.4%
Tetrachlorodibenzo-p-dioxins, total		4.70E-10			2.3E-08	x	2.35E-08	2.172	5.10E-08	FAIL	221.9%
Tetrachlorodibenzo-p-dioxins, total		4.70E-10	2.0E-06	annual		x	2.35E-08	2.172	5.10E-08	PASS	2.6%
Tin	7440315	2.30E-05	20	8 hr			1.15E-03	19.55	0.022483	PASS	0.1%
Toluene	108883	9.20E-04	5000	24 hr			4.60E-02	13.03	0.599380	PASS	0.0%
Trichloroethylene	79016	3.00E-05			0.2		1.50E-03	2.172	0.003258	PASS	1.6%
Trichloroethylene	79016	3.00E-05	2	annual			1.50E-03	2.172	0.0032580	PASS	0.2%
Trichloroethylene	79016	3.00E-05	10000	24 hr			1.50E-03	13.03	0.0195450	PASS	0.0%
Trichlorofluoromethane	75694	4.10E-05	56200	1 hr			2.05E-03	21.72	0.045	PASS	0.0%
Vanadium	7440622	9.80E-07	0.5	1 hr			4.90E-05	21.72	0.001064	PASS	0.2%
Vinyl chloride	75014	1.80E-05			0.11		9.00E-04	2.172	0.001955	PASS	1.8%
Vinyl chloride	75014	1.80E-05	100	24 hr			9.00E-04	13.03	0.011727	PASS	0.0%
Yttrium	7440655	3.00E-07	10	8 hr			1.50E-05	19.55	0.000293	PASS	0.0%
Zinc	7440666	4.20E-04	50	8 hr			2.10E-02	19.55	0.410550	PASS	0.8%
* Based on worse-case Emission Factor from EPA's WebFIRE database											
** Dioxin Equivalent (Factor): each dioxin congener is equated to 2,3,7,7-TCDD by multiplying the EF by the Toxic Equivalency Factor (EPA, 2010).											

Table 4. Diesel Processes: 100mmbtu, 60 foot stack

Chemical	CAS	Diesel Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
1,3-Butadiene	106990	0.0000391			0.03	Engine Recip	3.91E-03	1.439	0.0056265	PASS	18.8%
1,3-Butadiene	106990	0.0000391	2	24 hr		Engine Recip	3.91E-03	8.636	0.03377	PASS	1.7%
Acenaphthene	83329	0.00000468	210	24 hr		Engine Large Bore	4.68E-04	8.636	0.00404	PASS	0.0%
Acenaphthylene	208968	0.00000923	35	24 hr		Engine Large Bore	9.23E-04	8.636	0.008	PASS	0.0%
Acetaldehyde	75070	0.00107			0.5	Engine Recip	1.07E-01	1.439	0.15397	PASS	30.8%
Acetaldehyde	75070	0.00107	9	24 hr		Engine Recip	1.07E-01	8.636	0.92405	PASS	10.3%
Acrolein	107028	0.0000925	5	1 hr		Engine Recip	9.25E-03	14.39	0.13311	PASS	2.7%
Acrolein	107028	0.0000925	0.02	annual		Engine Recip	9.25E-03	1.439	0.013	PASS	66.6%
Anthracene	120127	0.00000187	1000	24 hr		Engine Recip	1.87E-04	8.636	0.002	PASS	0.0%
Arsenic	7440382	0.000011			0.0002	Engine Turbine	1.10E-03	1.439	0.002	FAIL	791.5%
Benzene	71432	0.00092751	30	24 hr		Engine Recip	9.28E-02	8.636	0.80	PASS	2.7%
Benzene	71432	0.00092751	30	annual		Engine Recip	9.28E-02	1.439	0.13347	PASS	0.4%
Benzene	71432	0.00092751			0.1	Engine Recip	9.28E-02	1.439	0.13347	FAIL	133.5%
Benzo (a) anthracene	56553	0.00000269			0.005	Engine Recip	2.69E-04	1.439	0.00039	PASS	7.7%
Benzo (a) pyrene	50328	0.000000429			0.0005	Engine Recip	4.29E-05	1.439	0.00006	PASS	12.3%
Benzo (b) fluoranthene	205992	0.00000111			0.005	Engine Large Bore	1.11E-04	1.439	0.00016	PASS	3.2%
Benzo (g,h,i) perylene	191242	0.000000556	12	24 hr		Engine Large Bore	5.56E-05	8.636	0.00048	PASS	0.0%
Benzo (g,h,i) perylene	191242	0.000000556			0.05556	Engine Large Bore	5.56E-05	1.439	0.00008	PASS	0.1%
Benzo (k) fluoranthene	207089	0.000000218			0.05	Engine Large Bore	2.18E-05	1.439	0.00003	PASS	0.1%
Beryllium	7440417	0.000003			0.0004	Boiler	3.00E-04	1.439	0.00043	FAIL	107.9%
Beryllium	7440417	0.000003	0.02	24 hr		Boiler	3.00E-04	8.636	0.00259	PASS	13.0%
Cadmium	7440439	0.0000048			0.0006	Engine Turbine	4.80E-04	1.439	0.00069	FAIL	115.1%
Chromium (10% hex)	7440473	0.0000011			8.3E-05	Engine Turbine	1.10E-04	1.439	0.00016	FAIL	190.7%
Chrysene	218019	8.628E-08			0.5	Engine Recip	8.63E-06	1.439	0.00001	PASS	0.0%
Copper	7440508	0.000006	2	8 hr		Boiler	6.00E-04	12.95	0.00777	PASS	0.4%
Dibenzo(a,h) anthracene	53703	0.000000583			0.0005	Engine Recip	5.83E-05	1.439	0.00008	PASS	16.8%
Ethylbenzene	100414	2.20733E-05			3	Engine Recip	2.21E-03	1.439	0.00318	PASS	0.1%

Table 4. Diesel Processes: 100mmbtu, 60 foot stack

Chemical	CAS	Diesel Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Ethylbenzene	100414	2.20733E-05	1000	24 hr		Engine Recip	2.21E-03	8.636	0.01906	PASS	0.0%
Fluoranthene	206440	9.4189E-07			0.00625	Engine Recip	9.42E-05	1.439	0.0001	PASS	2.2%
Fluoranthene	206440	9.4189E-07	140	24 hr		Engine Recip	9.42E-05	8.636	0.001	PASS	0.0%
Fluorene	86737	0.0000292	140	24 hr		Engine Recip	2.92E-03	8.636	0.0252	PASS	0.0%
Formaldehyde	50000	1.18E-03			0.08	Engine Recip	1.18E-01	1.439	0.17	FAIL	212.3%
Formaldehyde	50000	1.18E-03	9	8 hr		Engine Recip	1.18E-01	12.95	1.52810	PASS	17.0%
Indeno(1,2,3-cd)pyrene	193395	0.000000414			0.005	Engine Large Bore	4.14E-05	1.439	0.0001	PASS	1.2%
Isomers of xylene	1330207	4.91796E-05	100	24 hr		Engine Recip	4.92E-03	8.636	0.04	PASS	0.0%
Manganese	7439965	0.00079	0.05	annual		Engine Turbine	7.90E-02	1.439	0.11	FAIL	227.4%
Mercury	7439976	0.000003	0.3	annual		Boiler	3.00E-04	1.439	0.000	PASS	0.1%
Naphthalene	91203	0.000092751			0.08	Engine Recip	9.28E-03	1.439	0.01	PASS	16.7%
Naphthalene	91203	0.000092751	3	24 hr		Engine Recip	9.28E-03	8.636	0.1	PASS	2.7%
Nickel	7440020	0.0000046			0.0042	Engine Turbine	4.60E-04	1.439	0.00066	PASS	15.8%
Phenanthrene	85018	0.0000408	0.1	annual		Engine Large Bore	4.08E-03	1.439	0.00587	PASS	5.9%
Propylene	115071	0.00279	1500	24 hr		Engine Large Bore	2.79E-01	8.636	2.40944	PASS	0.2%
Pyrene	129000	0.00000478	100	24 hr		Engine Recip	4.78E-04	8.636	0.00413	PASS	0.0%
Selenium	7782492	0.000025	2	8 hr		Engine Turbine	2.50E-03	12.95	0.03238	PASS	1.6%
Styrene	100425	0.00000931			1.7	Engine Large Bore	9.31E-04	1.439	0.001	PASS	0.1%
Styrene	100425	0.00000931	1000	24 hr		Engine Large Bore	9.31E-04	8.636	0.008	PASS	0.0%
Toluene	108883	0.000277534	5000	24 hr		Engine Recip	2.78E-02	8.636	0.240	PASS	0.0%

Table 5. Natural Gas Processes: 100mmbtu, 60 foot stack

Chemical	CAS	Nat Gas EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m³/ lb/hr)	Predicted Ambient Impacts (µg/m³)	PASS/ FAIL	% of screening
Dibenzo(a,h) anthracene	53703	1.2E-09			0.0005	Boiler	1.20E-07	1.439	1.73E-07	PASS	0.0%
Benzo (a) anthracene	56553	1.8E-09			0.005	Boiler	1.80E-07	1.439	2.59E-07	PASS	0.0%
Methyl alcohol	67561	0.00306	3250	1 hr		Recip Engine	3.06E-01	14.39	4.403340	PASS	0.1%
Ethyl chloride	75003	0.00000187	10000	24 hr		Recip Engine	1.87E-04	8.636	0.001615	PASS	0.0%
Isobutane	75285	0.00375	23800	8 hr		Recip Engine	3.75E-01	12.95	4.856250	PASS	0.0%
1,1-Dichloroethane	75343	0.0000391	500	24 hr		Recip Engine	3.91E-03	8.636	0.033767	PASS	0.0%
Isobutyraldehyde	78842	0.000437	160	24 hr		Recip Engine	4.37E-02	8.636	0.377393	PASS	0.2%
Propylene dichloride	78875	0.0000446	4	24 hr		Recip Engine	4.46E-03	8.636	0.038517	PASS	1.0%
Acenaphthene	83329	1.8E-09	210	24 hr		Boiler	1.80E-07	8.636	0.000002	PASS	0.0%
Phenanthrene	85018	0.000000017	0.1	annual		Boiler	1.70E-06	1.439	0.000002	PASS	0.0%
Fluorene	86737	2.8E-09	140	24 hr		Boiler	2.80E-07	8.636	0.000002	PASS	0.0%
2-Methyl Naphthalene	91576	0.000000024	10	annual		Boiler	2.40E-06	1.439	0.000003	PASS	0.0%
Biphenyl	92524	0.000212	13	8 hr		Recip Engine	2.12E-02	12.95	0.274540	PASS	2.1%
1,2,4-Trimethylbenzene	95636	0.000111	1200	8 hr		Recip Engine	1.11E-02	12.95	0.143745	PASS	0.0%
1,2,4-Trimethylbenzene	95636	0.000111	50	annual		Recip Engine	1.11E-02	1.439	0.015973	PASS	0.0%
n-Butane	106978	0.0021	23800	8 hr		Boiler	2.10E-01	12.95	2.719500	PASS	0.0%
Acrolein	107028	0.00778	5	1 hr		Recip Engine	7.78E-01	14.39	11.195420	FAIL	223.9%
Acrolein	107028	0.00778	0.02	annual		Recip Engine	7.78E-01	1.439	1.119542	FAIL	5597.7%
1,3,5-Trimethylbenzene	108678	0.0000338	1200	8 hr		Recip Engine	3.38E-03	12.95	0.043771	PASS	0.0%
1,3,5-Trimethylbenzene	108678	0.0000338	50	annual		Recip Engine	3.38E-03	1.439	0.004864	PASS	0.0%
Methylcyclohexane	108872	0.00123	16000	8 hr		Recip Engine	1.23E-01	12.95	1.592850	PASS	0.0%
Toluene	108883	0.0000034	5000	24 hr		Boiler	3.40E-04	8.636	0.002936	PASS	0.0%
Chlorobenzene	108907	0.0000444	70	24 hr		Recip Engine	4.44E-03	8.636	0.038344	PASS	0.1%
Phenol	108952	0.0000421	190	8 hr		Recip	4.21E-03	12.95	0.054520	PASS	0.0%

Table 5. Natural Gas Processes: 100mmbtu, 60 foot stack

Chemical	CAS	Nat Gas EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
						Engine					
N-Pentane	109660	0.0026	17700	8 hr		Boiler	2.60E-01	12.95	3.367000	PASS	0.0%
N-Hexane	110543	0.0018	700	24 hr		Boiler	1.80E-01	8.636	1.554480	PASS	0.2%
Cyclohexane	110827	0.000308	6000	24 hr		Recip Engine	3.08E-02	8.636	0.265989	PASS	0.0%
N-Nonane	111842	0.00011	550	24 hr		Recip Engine	1.10E-02	8.636	0.094996	PASS	0.0%
Anthracene	120127	2.4E-09	1000	24 hr		Boiler	2.40E-07	8.636	0.000002	PASS	0.0%
Pyrene	129000	0.000000005	100	24 hr		Boiler	5.00E-07	8.636	0.000004	PASS	0.0%
Benzo (g,h,i) perylene	191242	1.20E-06			0.056	Boiler	1.20E-04	1.439	0.000173	PASS	0.3%
Benzo (g,h,i) perylene	191242	0.0021	12	24 hr		Boiler	2.10E-01	8.636	1.813560	PASS	15.1%
Indeno(1,2,3-cd)pyrene	193395	1.8E-09			0.005	Boiler	1.80E-07	1.439	2.59E-07	PASS	0.0%
Benzo (b) fluoranthene	205992	1.8E-09			0.005	Boiler	1.80E-07	1.439	2.59E-07	PASS	0.0%
Fluoranthene	206440	0.000000003			0.00625	Boiler	3.00E-07	1.439	4.32E-07	PASS	0.0%
Fluoranthene	206440	0.000000003	140	24 hr		Boiler	3.00E-07	8.636	2.59E-06	PASS	0.0%
Benzo (k) fluoranthene	207089	1.8E-09			0.05	Boiler	1.80E-07	1.439	2.59E-07	PASS	0.0%
Acenaphthylene	208968	1.8E-09	35	24 hr		Boiler	1.80E-07	8.636	0.000002	PASS	0.0%
Chrysene	218019	1.8E-09			0.5	Boiler	1.80E-07	1.439	2.59E-07	PASS	0.0%
Cyclopentane	287923	0.000227	17200	8 hr		Recip Engine	2.27E-02	12.95	0.293965	PASS	0.0%
1,2,3-Trimethylbenzene	526738	0.0000354	1200	8 hr		Recip Engine	3.54E-03	12.95	0.045843	PASS	0.0%
1,2,3-Trimethylbenzene	526738	0.0000354	50	annual		Recip Engine	3.54E-03	1.439	0.005094	PASS	0.0%
2,2,4-Trimethylpentane	540841	0.000846	3500	8 hr		Recip Engine	8.46E-02	12.95	1.095570	PASS	0.0%
Isomers of xylene	1330207	0.000268	100	24 hr		Recip Engine	2.68E-02	8.636	0.231445	PASS	0.2%
Manganese	7439965	0.00000038	0.05	annual		Boiler	3.80E-05	1.439	0.000055	PASS	0.1%
Mercury	7439976	0.00000026	0.3	24 hr		Boiler	2.60E-05	8.636	0.000225	PASS	0.1%
Molybdenum	7439987	0.0000011	30	8 hr		Boiler	1.10E-04	12.95	0.001425	PASS	0.0%
Barium	7440393	0.0000044	5	8 hr		Boiler	4.40E-04	12.95	0.005698	PASS	0.1%
Chromium	7440473	0.00000014			8.3E-05	Boiler	1.40E-05	1.439	0.000020	PASS	24.3%
Cobalt	7440484	0.000000084	0.2	8 hr		Boiler	8.40E-06	12.95	0.000109	PASS	0.1%

Table 5. Natural Gas Processes: 100mmbtu, 60 foot stack

Chemical	CAS	Nat Gas EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m³/ lb/hr)	Predicted Ambient Impacts (µg/m³)	PASS/ FAIL	% of screening
Copper	7440508	0.00000085	2	8 hr		Boiler	8.50E-05	12.95	0.001101	PASS	0.1%
Selenium	7782492	0.000000024	2	8 hr		Boiler	2.40E-06	12.95	0.000031	PASS	0.0%
Arsenic	7440382	0.0000002			0.0002	Boiler	2.00E-05	1.439	0.000029	PASS	14.4%
Beryllium	7440417	0.000000012			0.0004	Boiler	1.09E-07	1.439	1.57E-07	PASS	0.0%
Beryllium	7440417	0.000000012	0.02	24 hr		Boiler	1.09E-07	8.636	9.42E-07	PASS	0.0%
Benzo (a) pyrene	50328	1.2E-09			0.0005	Boiler	1.20E-07	1.439	1.73E-07	PASS	0.0%
Cadmium	7440439	0.0000011			0.0006	Boiler	1.10E-04	1.439	0.000158	PASS	26.4%
Ethylene dibromide	106934	0.0000734			0.002	Recip Engine	7.34E-03	1.439	0.010562	FAIL	528.1%
Ethylene dibromide	106934	0.0000734	9	24 hr		Recip Engine	7.34E-03	8.636	0.063388	PASS	0.7%
Nickel	7440020	0.0000021			0.0042	Boiler	2.10E-04	1.439	0.000302	PASS	7.2%
1,1,2,2-Tetrachloroethane	79345	0.0000663			0.02	Recip Engine	6.63E-03	1.439	0.009541	PASS	47.7%
1,3-Butadiene	106990	0.00082			0.03	Recip Engine	8.20E-02	1.439	0.117998	FAIL	393.3%
1,3-Butadiene	106990	0.00082	2	24 hr		Recip Engine	8.20E-02	8.636	0.708152	PASS	35.4%
Ethylene dichloride	107062	0.0000422			0.04	Recip Engine	4.22E-03	1.439	0.006073	PASS	15.2%
1,1,2-Trichloroethane	79005	0.0000527			0.06	Recip Engine	5.27E-03	1.439	0.007584	PASS	12.6%
Formaldehyde	50000	0.000075			0.08	Boiler	7.50E-03	1.439	0.010793	PASS	13.5%
Formaldehyde	50000	0.000075	9	8 hr		Boiler	7.50E-03	12.95	0.097125	PASS	1.1%
Naphthalene	91203	0.00000061			0.08	Boiler	6.10E-05	1.439	0.000088	PASS	0.1%
Naphthalene	91203	0.00000061	3	24 hr		Boiler	6.10E-05	8.636	0.000527	PASS	0.0%
Benzene	71432	0.0000021	30	24 hr		Boiler	2.10E-04	8.636	0.001814	PASS	0.0%
Benzene	71432	0.0000021	30	annual		Boiler	2.10E-04	1.439	0.000302	PASS	0.0%
Benzene	71432	0.0000021			0.1	Boiler	2.10E-04	1.439	0.000302	PASS	0.3%
Vinyl chloride	75014	0.0000247			0.11	Recip Engine	2.47E-03	1.439	0.003554	PASS	3.2%
Vinyl chloride	75014	0.0000247	100	24 hr		Recip Engine	2.47E-03	8.636	0.021331	PASS	0.0%
Carbon tetrachloride	56235	0.0000607			0.17	Recip Engine	6.07E-03	1.439	0.008735	PASS	5.1%

Table 5. Natural Gas Processes: 100mmbtu, 60 foot stack

Chemical	CAS	Nat Gas EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m³/ lb/hr)	Predicted Ambient Impacts (µg/m³)	PASS/ FAIL	% of screening
Carbon tetrachloride	56235	0.0000607	100	24 hr		Recip Engine	6.07E-03	8.636	0.052421	PASS	0.1%
1,3-Dichloropropene	542756	0.0000438			0.2	Recip Engine	4.38E-03	1.439	0.006303	PASS	3.2%
1,3-Dichloropropene	542756	0.0000438	20	24 hr		Recip Engine	4.38E-03	8.636	0.037826	PASS	0.2%
Propylene oxide	75569	0.000029			0.3	Turbine Engine	2.90E-03	1.439	0.004173	PASS	1.4%
Propylene oxide	75569	0.000029	30	24 hr		Turbine Engine	2.90E-03	8.636	0.025044	PASS	0.1%
Chloroform	67663	0.0000471			0.4	Recip Engine	4.71E-03	1.439	0.006778	PASS	1.7%
Acetaldehyde	75070	0.00836	9	24 hr		Recip Engine	8.36E-01	8.636	7.219696	PASS	80.2%
Acetaldehyde	75070	0.00836			0.5	Recip Engine	8.36E-01	1.439	1.203004	FAIL	240.6%
Styrene	100425	0.0000548			1.7	Recip Engine	5.48E-03	1.439	0.007886	PASS	0.5%
Styrene	100425	0.0000548	1000	24 hr		Recip Engine	5.48E-03	8.636	0.047325	PASS	0.0%
Ethylbenzene	100414	0.000108			3	Recip Engine	1.08E-02	1.439	0.015541	PASS	0.5%
Ethylbenzene	100414	0.000108	1000	24 hr		Recip Engine	1.08E-02	8.636	0.093269	PASS	0.0%
Perchloroethylene	127184	0.00000248			4	Recip Engine	2.48E-04	1.439	0.000357	PASS	0.0%
Perchloroethylene	127184	0.00000248	40	24 hr		Recip Engine	2.48E-04	8.636	0.002142	PASS	0.0%
Dichloromethane	75092	0.000147			60	Recip Engine	1.47E-02	1.439	0.021153	PASS	0.0%
Dichloromethane	75092	0.000147	2000	annual		Recip Engine	1.47E-02	1.439	0.021153	PASS	0.0%
Dichloromethane	75092	0.000147	14000	1 hr		Recip Engine	1.47E-02	14.39	0.211533	PASS	0.0%
3-Methylcholanthrene	56495	1.8E-09			0.005	Boiler	1.80E-07	1.439	2.59E-07	PASS	0.0%
Dimethylbenz(a)anthracene	57976	0.000000016			0.005	Boiler	1.60E-06	1.439	0.000002	PASS	0.0%
N-Octane	111659	0.000351	3500	8 hr		Recip Engine	3.51E-02	12.95	0.454545	PASS	0.0%
Benzo (e) pyrene	192972	0.000000415			0.05	Recip Engine	4.15E-05	1.439	0.000060	PASS	0.1%
Perylene	198550	4.97E-09			0.05	Recip Engine	4.97E-07	1.439	0.000001	PASS	0.0%

Table 5. Natural Gas Processes: 100mmbtu, 60 foot stack											
Chemical	**CAS**	**Nat Gas EF* (lb/mmbtu)**	**ITSL (µg/m³)**	**Avg Time**	**IRSL (µg/m³)**	**Worst Process**	**Emissions (lb/hr)**	**Generic 1- lb/hr Impacts AERSCREEN (µg/m³/ lb/hr)**	**Predicted Ambient Impacts (µg/m³)**	PASS/ FAIL	% of screening
Vanadium	7440622	0.0000023	0.5	1 hr		Boiler	2.30E-04	14.39	0.003310	PASS	0.7%
Dichlorobenzene, mixed isomers	25321226	0.0000012	3	annual		Boiler	1.20E-04	1.439	0.000173	PASS	0.0%
Dichlorobenzene, mixed isomers	25321226	0.0000012			0.14	Boiler	1.20E-04	1.439	0.000173	PASS	0.1%
* Based on worse-case Emission Factor from EPA's WebFIRE database											

Table 6: Wood Processes: 100mmbtu, 60 foot stack											
Chemical	CAS	Wood & Bark EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Dioxin Equival-ent EF (TEQ)	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
1,1,1-Trichloroethane	71556	3.10E-05	6000	24 hr			3.10E-03	8.636	0.02677	PASS	0.0%
1,2-Ethylene dibromide	540498	5.50E-05	0.1	annual			5.50E-03	1.439	0.00791	PASS	7.9%
2,3,7,8-Tetrachlorodibenzofuran	51207319	9.00E-12			2.30E-08	x	9.00E-10	1.439	1.30E-09	PASS	5.6%
2,3,7,8-Tetrachlorodibenzofuran	51207319	9.00E-12	2.0E-06	annual		x	9.00E-10	1.439	1.30E-09	PASS	0.1%
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746016	8.60E-12			2.30E-08	x	8.60E-10	1.439	1.24E-09	PASS	5.4%
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746016	8.60E-12	2.0E-06	annual		x	8.60E-10	1.439	1.24E-09	PASS	0.1%
2,4,4'-Trichlorobiphenyl	7012375	2.60E-09			0.002		2.60E-07	1.439	3.74E-07	PASS	0.0%
2,4,6-Trichlorophenol	88062	2.20E-08			0.3		2.20E-06	1.439	3.17E-06	PASS	0.0%
2,4-Dinitrophenol	51285	1.80E-07	7	24 hr			1.80E-05	8.636	0.000155	PASS	0.0%
2-Chlorophenol	95578	2.40E-08	18	24 hr			2.40E-06	8.636	0.00002	PASS	0.0%
2-Methyl Naphthalene	91576	1.60E-07	10	annual			1.60E-05	1.439	0.00002	PASS	0.0%
2-Monochlorobiphenyl	2051607	2.20E-10			0.002		2.20E-08	1.439	3.17E-08	PASS	0.0%
2-Nitrophenol	88755	2.40E-07	0.7	annual			2.40E-05	1.439	0.00003	PASS	0.0%
4-Nitrophenol	100027	1.10E-07	0.7	annual			1.10E-05	1.439	0.000	PASS	0.0%
Acenaphthene	83329	9.10E-07	210	24 hr			9.10E-05	8.636	0.001	PASS	0.0%
Acenaphthylene	208968	5.00E-06	35	24 hr			5.00E-04	8.636	0.004	PASS	0.0%
Acetaldehyde	75070	8.30E-04			0.5		8.30E-02	1.439	0.12	PASS	23.9%
Acetaldehyde	75070	8.30E-04	9	24 hr			8.30E-02	8.636	0.717	PASS	8.0%
Acetone	67641	1.90E-04	5900	8 hr			1.90E-02	12.95	0.246	PASS	0.0%
Acetophenone	98862	3.20E-09	490	8 hr			3.20E-07	12.95	4.14E-06	PASS	0.0%
Acrolein	107028	4.00E-03	0.02	annual			4.00E-01	1.439	0.58	FAIL	2878.0%
Acrolein	107028	4.00E-03	5	1 hr			4.00E-01	14.39	5.756	FAIL	115.1%
Anthracene	120127	3.00E-06	1000	24 hr			3.00E-04	8.636	2.59E-03	PASS	0.0%
Antimony	7440360	7.90E-06	0.2	24 hr			7.90E-04	8.636	0.01	PASS	3.4%
Arsenic	7440382	2.20E-05			2.00E-04		2.20E-03	1.439	3.17E-03	FAIL	1582.9%
Barium	7440393	1.70E-04	5	8 hr			1.70E-02	12.95	0.22	PASS	4.4%
Benzaldehyde	100527	8.50E-07			0.4		8.50E-05	1.439	0.000	PASS	0.0%
Benzene	71432	4.20E-03			0.10		4.20E-01	1.439	0.60	FAIL	604.4%

Table 6: Wood Processes: 100mmbtu, 60 foot stack

Chemical	CAS	Wood & Bark EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Dioxin Equival-ent EF (TEQ)	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m³/ lb/hr)	Predicted Ambient Impacts (µg/m³)	PASS/ FAIL	% of screening
Benzene	71432	4.20E-03	30	24 hr			4.20E-01	8.636	3.63	PASS	12.1%
Benzene	71432	4.20E-03	30	annual			4.20E-01	1.439	0.60	PASS	2.0%
Benzo (a) anthracene	56553	6.50E-08			0.005		6.50E-06	1.439	0.00001	PASS	0.2%
Benzo (a) pyrene	50328	2.60E-06			0.0005		2.60E-04	1.439	0.0004	PASS	74.8%
Benzo (b) fluoranthene	205992	1.00E-07			0.005		1.00E-05	1.439	1.44E-05	PASS	0.3%
Benzo (g,h,i) perylene	191242	9.30E-08			0.0556		9.30E-06	1.439	1.34E-05	PASS	0.0%
Benzo (g,h,i) perylene	191242	9.30E-08	12	24 hr			9.30E-06	8.636	8.03E-05	PASS	0.0%
Benzo (k) fluoranthene	207089	3.60E-08			0.05		3.60E-06	1.439	0.00001	PASS	0.0%
Benzoic acid	65850	4.70E-08	12	annual			4.70E-06	1.439	6.76E-06	PASS	0.0%
Beryllium	7440417	1.10E-06			0.0004		1.10E-04	1.439	0.00016	PASS	39.6%
Beryllium	7440417	1.10E-06	0.02	24 hr			1.10E-04	8.636	0.001	PASS	4.7%
Cadmium	7440439	4.10E-06			0.0006		4.10E-04	1.439	5.90E-04	PASS	98.3%
Carbazole	86748	1.80E-06			0.4		1.80E-04	1.439	0.0003	PASS	0.1%
Carbon tetrachloride	56235	4.50E-05	100	24 hr	0.17		4.50E-03	8.636	0.04	PASS	0.0%
Chlorine	7782505	7.90E-04	0.3	annual			7.90E-02	1.439	0.11	PASS	37.9%
Chlorine	7782505	7.90E-04	500	8 hr			7.90E-02	12.95	1.02	PASS	0.2%
Chlorobenzene	108907	3.30E-05	70	24 hr			3.30E-03	8.636	0.03	PASS	0.0%
Chloroform	67663	2.80E-05			0.4		2.80E-03	1.439	0.004	PASS	1.0%
Chromium (VI)	18540299	3.50E-06			8.30E-05		3.50E-04	1.439	5.04E-04	FAIL	606.8%
Chromium (VI)	18540299	3.50E-06	0.01	24 hr			3.50E-04	8.636	0.003	PASS	37.8%
Chrysene	218019	3.80E-08			0.5		3.80E-06	1.439	0.0000	PASS	0.0%
Cobalt	7440484	6.50E-06	0.2	8 hr			6.50E-04	12.95	0.01	PASS	4.2%
Copper	7440508	4.90E-05	2	8 hr			4.90E-03	12.95	0.06	PASS	3.2%
Crotonaldehyde	123739	9.90E-06	9	1 hr			9.90E-04	14.39	0.014	PASS	0.2%
Decachlorobiphenyl	2051243	2.70E-10			0.002		2.70E-08	1.439	3.89E-08	PASS	0.0%
Dibenzo(a,h) anthracene	53703	9.10E-09			0.0005		9.10E-07	1.439	1.31E-06	PASS	0.3%
Dichlorobiphenyl	25512429	7.40E-10			0.002		7.40E-08	1.439	1.06E-07	PASS	0.0%
Dichloromethane	75092	2.90E-04			60		2.90E-02	1.439	0.04173	PASS	0.1%
Dichloromethane	75092	2.90E-04	2000	annual			2.90E-02	1.439	0.04173	PASS	0.0%
Dichloromethane	75092	2.90E-04	14000	1 hr			2.90E-02	14.39	0.41731	PASS	0.0%
Dioctyl phthalate	117817	4.70E-08			0.2		4.70E-06	1.439	0.00001	PASS	0.0%

Table 6: Wood Processes: 100mmbtu, 60 foot stack

Chemical	CAS	Wood & Bark EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Dioxin Equival-ent EF (TEQ)	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m³/ lb/hr)	Predicted Ambient Impacts (µg/m³)	PASS/ FAIL	% of screening
Ethylbenzene	100414	3.10E-05			3		3.10E-03	1.439	0.0045	PASS	0.1%
Ethylbenzene	100414	3.10E-05	1000	24 hr			3.10E-03	8.636	0.02677	PASS	0.0%
Ethylene dichloride	107062	2.90E-05			0.04		2.90E-03	1.439	0.00417	PASS	10.4%
Fluoranthene	206440	1.60E-07			0.006		1.60E-05	1.439	0.000	PASS	0.4%
Fluoranthene	206440	1.60E-07	140	24 hr			1.60E-05	8.636	0.00014	PASS	0.0%
Fluorene	86737	3.40E-06	140	24 hr			3.40E-04	8.636	0.00294	PASS	0.0%
Formaldehyde	50000	4.40E-03			0.08		4.40E-01	1.439	0.633	FAIL	791.5%
Formaldehyde	50000	4.40E-03	9	8 hr			4.40E-01	12.95	5.69800	PASS	63.3%
Heptachlorobiphenyls, total	28655712	6.60E-11			0.002		6.60E-09	1.439	9.50E-09	PASS	0.0%
Hexachlorobiphenyls, total	26601649	5.50E-10			0.002		5.50E-08	1.439	7.91E-08	PASS	0.0%
Hexachlorodibenzo-p-dioxins, total	34465468	1.60E-07			2.30E-08	x	1.60E-05	1.439	0.00002	FAIL	100104.3%
Hexachlorodibenzo-p-dioxins, total	34465468	1.60E-07	2.0E-06	annual		x	1.60E-05	1.439	0.00002	FAIL	1151.2%
Hexanal	66251	7.00E-06	2	annual			7.00E-04	1.439	0.00101	PASS	0.1%
Hydrogen chloride	7647010	1.90E-02	20	annual			1.90E+00	1.439	2.73	PASS	13.7%
Hydrogen chloride	7647010	1.90E-02	2100	1 hr			1.90E+00	14.39	27.3	PASS	1.3%
Indeno(1,2,3-cd)pyrene	193395	8.70E-08			0.005		8.70E-06	1.439	0.00001	PASS	0.3%
Isobutyraldehyde	78842	1.20E-05	160	24 hr			1.20E-03	8.636	0.01036	PASS	0.0%
Manganese	7439965	1.60E-03	0.05	annual			1.60E-01	1.439	0.23	FAIL	460.5%
Mercury	7439976	3.50E-06	0.3	24 hr			3.50E-04	8.636	3.02E-03	PASS	1.0%
Methyl bromide	74839	1.50E-05	5	24 hr			1.50E-03	8.636	0.01295	PASS	0.3%
Methyl chloride	74873	2.30E-05			1.6		2.30E-03	1.439	0.003	PASS	0.2%
Methyl chloride	74873	2.30E-05	90	24 hr			2.30E-03	8.636	0.02	PASS	0.0%
Methyl ethyl ketone	78933	5.40E-06	5000	24 hr			5.40E-04	8.636	0.00466	PASS	0.0%
Molybdenum	7439987	2.10E-06	30	8 hr			2.10E-04	12.95	0.00272	PASS	0.0%
Naphthalene	91203	9.70E-05			0.08		9.70E-03	1.439	0.014	PASS	17.4%
Naphthalene	91203	9.70E-05	3	24 hr			9.70E-03	8.636	0.08	PASS	2.8%
Nickel	7440020	3.30E-05			0.0042		3.30E-03	1.439	0.005	FAIL	113.1%
Octachlorodibenzo-p-dioxins, total	3268879	6.60E-12			2.30E-08	x	6.60E-10	1.439	9.50E-10	PASS	4.1%
Octachlorodibenzo-p-dioxins, total	3268879	6.60E-12	2.0E-06	annual		x	6.60E-10	1.439	9.50E-10	PASS	0.0%

Table 6: Wood Processes: 100mmbtu, 60 foot stack

Chemical	CAS	Wood & Bark EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Dioxin Equival-ent EF (TEQ)	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m³/ lb/hr)	Predicted Ambient Impacts (µg/m³)	PASS/ FAIL	% of screening
o-Tolualdehyde	529204	7.20E-06	440	24 hr			7.20E-04	8.636	0.00622	PASS	0.0%
o-Xylene	95476	2.50E-05	100	24 hr			2.50E-03	8.636	0.02159	PASS	0.0%
Pentachlorobiphenyls, total	25429292	1.20E-09			0.002		1.20E-07	1.439	1.73E-07	PASS	0.0%
Pentachlorodibenzofurans, total		2.10E-10			2.30E-08	x	2.10E-08	1.439	3.02E-08	FAIL	131.4%
Pentachlorodibenzofurans, total		2.10E-10	2.0E-06	annual		x	2.10E-08	1.439	3.02E-08	PASS	1.5%
Pentachlorodibenzo-p-dioxins, total		1.50E-09			2.30E-08	x	1.50E-07	1.439	2.16E-07	FAIL	938.5%
Pentachlorodibenzo-p-dioxins, total		1.50E-09	2.0E-06	annual		x	1.50E-07	1.439	2.16E-07	PASS	10.8%
Pentachlorophenol (PCP)	87865	5.10E-08			0.009		5.10E-06	1.439	0.00001	PASS	0.1%
Pentachlorophenol (PCP)	87865	5.10E-08	20	24 hr			5.10E-06	8.636	0.00004	PASS	0.0%
Perchloroethylene	127184	3.80E-05			4		3.80E-03	1.439	0.005	PASS	0.1%
Perchloroethylene	127184	3.80E-05	40	24 hr			3.80E-03	8.636	0.03282	PASS	0.1%
Phenanthrene	85018	7.00E-06	0.1	annual			7.00E-04	1.439	0.001	PASS	1.0%
Phenol	108952	5.10E-05	190	8 hr			5.10E-03	12.95	0.06605	PASS	0.0%
Phosphorus (yellow or white)	7723140	2.70E-05	1	8 hr			2.70E-03	12.95	0.03497	PASS	3.5%
Propionaldehyde	123386	6.10E-05	8	24 hr			6.10E-03	8.636	0.05268	PASS	0.7%
Propylene dichloride	78875	3.30E-05	4	24 hr			3.30E-03	8.636	0.02850	PASS	0.7%
p-Tolualdehyde	104870	1.10E-05	440	24 hr			1.10E-03	8.636	0.00950	PASS	0.0%
Pyrene	129000	3.70E-06	100	24 hr			3.70E-04	8.636	0.00320	PASS	0.0%
Selenium	7782492	2.80E-06	2	8 hr			2.80E-04	12.95	0.00363	PASS	0.2%
Silver	7440224	1.70E-03	0.1	8 hr			1.70E-01	12.95	2.20	FAIL	2201.5%
Strontium	7440246	1.00E-05	2000	24 hr			1.00E-03	8.636	0.00864	PASS	0.0%
Styrene	100425	1.90E-03			1.7		1.90E-01	1.439	0.27341	PASS	16.1%
Styrene	100425	1.90E-03	1000	24 hr			1.90E-01	8.636	1.641	PASS	0.2%
Tetrachlorobiphenyls, total	26914330	2.50E-09			0.002		2.50E-07	1.439	3.60E-07	PASS	0.0%
Tetrachlorodibenzofurans, total		7.50E-11			2.30E-08	x	7.50E-09	1.439	1.08E-08	PASS	46.9%
Tetrachlorodibenzofurans, total		7.50E-11	2.0E-06	annual		x	7.50E-09	1.439	1.08E-08	PASS	0.5%
Tetrachlorodibenzo-p-dioxins, total		4.70E-10			2.30E-08	x	4.70E-08	1.439	6.76E-08	FAIL	294.1%
Tetrachlorodibenzo-p-dioxins,		4.70E-10	2.0E-06	annual		x	4.70E-08	1.439	6.76E-08	PASS	3.4%

Table 6: Wood Processes: 100mmbtu, 60 foot stack											
Chemical	CAS	Wood & Bark EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Dioxin Equival-ent EF (TEQ)	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m³/ lb/hr)	Predicted Ambient Impacts (µg/m³)	PASS/ FAIL	% of screening
total											
Tin	7440315	2.30E-05	20	8 hr			2.30E-03	12.95	0.02979	PASS	0.1%
Toluene	108883	9.20E-04	5000	24 hr			9.20E-02	8.636	0.79451	PASS	0.0%
Trichloroethylene	79016	3.00E-05			0.2		3.00E-03	1.439	0.00432	PASS	2.2%
Trichloroethylene	79016	3.00E-05	2	annual			3.00E-03	1.439	0.00432	PASS	0.2%
Trichloroethylene	79016	3.00E-05	10000	24 hr			3.00E-03	8.636	0.02591	PASS	0.0%
Trichlorofluoromethane	75694	4.10E-05	56200	1 hr			4.10E-03	14.39	0.05900	PASS	0.0%
Vanadium	7440622	9.80E-07	0.5	1 hr			9.80E-05	14.39	0.00141	PASS	0.3%
Vinyl chloride	75014	1.80E-05			0.11		1.80E-03	1.439	0.00259	PASS	2.4%
Vinyl chloride	75014	1.80E-05	100	24 hr			1.80E-03	8.636	0.01554	PASS	0.0%
Yttrium	7440655	3.00E-07	10	8 hr			3.00E-05	12.95	0.00039	PASS	0.0%
Zinc	7440666	4.20E-04	50	8 hr			4.20E-02	12.95	0.54390	PASS	1.1%

Table 7: Diesel Processes: 500mmbtu, 80 foot stack

Chemical	CAS	Diesel Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
1,3-Butadiene	106990	0.0000391			0.03	Engine Recip	1.96E-02	1.018	0.0199019	PASS	66.3%
1,3-Butadiene	106990	0.0000391	2	24 hr		Engine Recip	1.96E-02	6.107	0.11939	PASS	6.0%
Acenaphthene	83329	0.00000468	210	24 hr		Engine Large Bore	2.34E-03	6.107	0.01429	PASS	0.0%
Acenaphthylene	208968	0.00000923	35	24 hr		Engine Large Bore	4.62E-03	6.107	0.028	PASS	0.1%
Acetaldehyde	75070	0.00107			0.5	Engine Recip	5.35E-01	1.018	0.54463	FAIL	108.9%
Acetaldehyde	75070	0.00107	9	24 hr		Engine Recip	5.35E-01	6.107	3.26725	PASS	36.3%
Acrolein	107028	0.0000925	5	1 hr		Engine Recip	4.63E-02	10.18	0.47083	PASS	9.4%
Acrolein	107028	0.0000925	0.02	annual		Engine Recip	4.63E-02	1.018	0.047	FAIL	235.4%
Anthracene	120127	0.00000187	1000	24 hr		Engine Recip	9.35E-04	6.107	0.006	PASS	0.0%
Arsenic	7440382	0.000011			0.0002	Engine Turbine	5.50E-03	1.018	0.006	FAIL	2799.5%
Benzene	71432	0.00092751	30	24 hr		Engine Recip	4.64E-01	6.107	2.83	PASS	9.4%
Benzene	71432	0.00092751	30	annual		Engine Recip	4.64E-01	1.018	0.47210	PASS	1.6%
Benzene	71432	0.00092751			0.1	Engine Recip	4.64E-01	1.018	0.47210	FAIL	472.1%
Benzo (a) anthracene	56553	0.00000269			0.005	Engine Recip	1.35E-03	1.018	0.00137	PASS	27.4%
Benzo (a) pyrene	50328	0.000000429			0.0005	Engine Recip	2.15E-04	1.018	0.00022	PASS	43.7%
Benzo (b) fluoranthene	205992	0.00000111			0.005	Engine Large Bore	5.55E-04	1.018	0.00056	PASS	11.3%
Benzo (g,h,i) perylene	191242	0.000000556	12	24 hr		Engine Large Bore	2.78E-04	6.107	0.00170	PASS	0.0%
Benzo (g,h,i) perylene	191242	0.000000556			0.05556	Engine Large Bore	2.78E-04	1.018	0.00028	PASS	0.5%
Benzo (k) fluoranthene	207089	0.000000218			0.05	Engine Large Bore	1.09E-04	1.018	0.00011	PASS	0.2%
Beryllium	7440417	0.000003			0.0004	Boiler	1.50E-03	1.018	0.00153	FAIL	381.8%
Beryllium	7440417	0.000003	0.02	24 hr		Boiler	1.50E-03	6.107	0.00916	PASS	45.8%
Cadmium	7440439	0.0000048			0.0006	Engine Turbine	2.40E-03	1.018	0.00244	FAIL	407.2%
Chromium (10% hex)	7440473	0.0000011			8.3E-05	Engine Turbine	5.50E-04	1.018	0.00056	FAIL	674.6%
Chrysene	218019	8.628E-08			0.5	Engine Recip	4.31E-05	1.018	0.00004	PASS	0.0%
Copper	7440508	0.000006	2	8 hr		Boiler	3.00E-03	9.16	0.02748	PASS	1.4%
Dibenzo(a,h)	53703	0.000000583			0.0005	Engine Recip	2.92E-04	1.018	0.00030	PASS	59.3%

Table 7: Diesel Processes: 500mmbtu, 80 foot stack

Chemical	CAS	Diesel Process EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
anthracene											
Ethylbenzene	100414	2.20733E-05			3	Engine Recip	1.10E-02	1.018	0.01124	PASS	0.4%
Ethylbenzene	100414	2.20733E-05	1000	24 hr		Engine Recip	1.10E-02	6.107	0.06740	PASS	0.0%
Fluoranthene	206440	9.4189E-07			0.00625	Engine Recip	4.71E-04	1.018	0.0005	PASS	7.7%
Fluoranthene	206440	9.4189E-07	140	24 hr		Engine Recip	4.71E-04	6.107	0.003	PASS	0.0%
Fluorene	86737	0.0000292	140	24 hr		Engine Recip	1.46E-02	6.107	0.0892	PASS	0.1%
Formaldehyde	50000	1.18E-03			0.08	Engine Recip	5.90E-01	1.018	0.60	FAIL	750.8%
Formaldehyde	50000	1.18E-03	9	8 hr		Engine Recip	5.90E-01	9.16	5.40440	PASS	60.0%
Indeno(1,2,3-cd)pyrene	193395	0.000000414			0.005	Engine Large Bore	2.07E-04	1.018	0.0002	PASS	4.2%
Isomers of xylene	1330207	4.91796E-05	100	24 hr		Engine Recip	2.46E-02	6.107	0.15	PASS	0.2%
Manganese	7439965	0.00079	0.05	annual		Engine Turbine	3.95E-01	1.018	0.40	FAIL	804.2%
Mercury	7439976	0.000003	0.3	annual		Boiler	1.50E-03	1.018	0.002	PASS	0.5%
Naphthalene	91203	0.000092751			0.08	Engine Recip	4.64E-02	1.018	0.05	PASS	59.0%
Naphthalene	91203	0.000092751	3	24 hr		Engine Recip	4.64E-02	6.107	0.3	PASS	9.4%
Nickel	7440020	0.0000046			0.0042	Engine Turbine	2.30E-03	1.018	0.00234	PASS	55.7%
Phenanthrene	85018	0.0000408	0.1	annual		Engine Large Bore	2.04E-02	1.018	0.02077	PASS	20.8%
Propylene	115071	0.00279	1500	24 hr		Engine Large Bore	1.40E+00	6.107	8.51927	PASS	0.6%
Pyrene	129000	0.00000478	100	24 hr		Engine Recip	2.39E-03	6.107	0.01460	PASS	0.0%
Selenium	7782492	0.000025	2	8 hr		Engine Turbine	1.25E-02	9.16	0.11450	PASS	5.7%
Styrene	100425	0.00000931			1.7	Engine Large Bore	4.66E-03	1.018	0.005	PASS	0.3%
Styrene	100425	0.00000931	1000	24 hr		Engine Large Bore	4.66E-03	6.107	0.028	PASS	0.0%
Toluene	108883	0.000277534	5000	24 hr		Engine Recip	1.39E-01	6.107	0.847	PASS	0.0%

Table 8. Natural Gas Processes: 500mmbtu, 80 foot stack

Chemical	CAS	Nat Gas EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
1,1,2,2-Tetrachloroethane	79345	6.63E-05			0.02	Recip Engine	3.32E-02	1.018	0.033747	FAIL	168.7%
1,1,2-Trichloroethane	79005	5.27E-05			0.06	Recip Engine	2.64E-02	1.018	0.026824	PASS	44.7%
1,1-Dichloroethane	75343	3.91E-05	500	24 hr		Recip Engine	1.96E-02	6.107	0.119392	PASS	0.0%
1,2,3-Trimethylbenzene	526738	3.54E-05	1200	8 hr		Recip Engine	1.77E-02	9.16	0.162132	PASS	0.0%
1,2,3-Trimethylbenzene	526738	3.54E-05	50	annual		Recip Engine	1.77E-02	1.018	0.018019	PASS	0.0%
1,2,4-Trimethylbenzene	95636	1.11E-04	1200	8 hr		Recip Engine	5.55E-02	9.16	0.508380	PASS	0.0%
1,2,4-Trimethylbenzene	95636	1.11E-04	50	annual		Recip Engine	5.55E-02	1.018	0.056499	PASS	0.1%
1,3,5-Trimethylbenzene	108678	3.38E-05	1200	8 hr		Recip Engine	1.69E-02	9.16	0.154804	PASS	0.0%
1,3,5-Trimethylbenzene	108678	3.38E-05	50	annual		Recip Engine	1.69E-02	1.018	0.017204	PASS	0.0%
1,3-Butadiene	106990	8.20E-04			0.03	Recip Engine	4.10E-01	1.018	0.417380	FAIL	1391.3%
1,3-Butadiene	106990	8.20E-04	2	24 hr		Recip Engine	4.10E-01	6.107	2.503870	FAIL	125.2%
1,3-Dichloropropene	542756	4.38E-05			0.2	Recip Engine	2.19E-02	1.018	0.022294	PASS	11.1%
1,3-Dichloropropene	542756	4.38E-05	20	24 hr		Recip Engine	2.19E-02	6.107	0.133743	PASS	0.7%
2,2,4-Trimethylpentane	540841	8.46E-04	3500	8 hr		Recip Engine	4.23E-01	9.16	3.874680	PASS	0.1%
2-Methyl Naphthalene	91576	2.40E-08	10	annual		Boiler	1.20E-05	1.018	0.000012	PASS	0.0%
3-Methylcholanthrene	56495	1.80E-09			0.005	Boiler	9.00E-07	1.018	0.000001	PASS	0.0%
Acenaphthene	83329	1.80E-09	210	24 hr		Boiler	9.00E-07	6.107	0.000005	PASS	0.0%
Acenaphthylene	208968	1.80E-09	35	24 hr		Boiler	9.00E-07	6.107	0.000005	PASS	0.0%
Acetaldehyde	75070	8.36E-03	9	24 hr		Recip Engine	4.18E+00	6.107	25.527260	FAIL	283.6%
Acetaldehyde	75070	8.36E-03			0.5	Recip Engine	4.18E+00	1.018	4.255240	FAIL	851.0%
Acrolein	107028	7.78E-03	5	1 hr		Recip Engine	3.89E+00	10.18	39.600200	FAIL	792.0%
Acrolein	107028	7.78E-03	0.02	annual		Recip Engine	3.89E+00	1.018	3.960020	FAIL	19800.1%

Table 8. Natural Gas Processes: 500mmbtu, 80 foot stack

Chemical	CAS	Nat Gas EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m³/ lb/hr)	Predicted Ambient Impacts (µg/m³)	PASS/ FAIL	% of screening
Anthracene	120127	2.40E-09	1000	24 hr		Boiler	1.20E-06	6.107	0.000007	PASS	0.0%
Arsenic	7440382	2.00E-07			0.0002	Boiler	1.00E-04	1.018	0.000102	PASS	50.9%
Barium	7440393	4.40E-06	5	8 hr		Boiler	2.20E-03	9.16	0.020152	PASS	0.4%
Benzene	71432	2.10E-06	30	24 hr		Boiler	1.05E-03	6.107	0.006412	PASS	0.0%
Benzene	71432	2.10E-06	30	annual		Boiler	1.05E-03	1.018	0.001069	PASS	0.0%
Benzene	71432	2.10E-06			0.1	Boiler	1.05E-03	1.018	0.001069	PASS	1.1%
Benzo (a) anthracene	56553	1.80E-09			0.005	Boiler	9.00E-07	1.018	0.000001	PASS	0.0%
Benzo (a) pyrene	50328	1.20E-09			0.0005	Boiler	6.00E-07	1.018	0.000001	PASS	0.1%
Benzo (b) fluoranthene	205992	1.80E-09			0.005	Boiler	9.00E-07	1.018	0.000001	PASS	0.0%
Benzo (e) pyrene	192972	4.15E-07			0.05	Recip Engine	2.08E-04	1.018	0.000211	PASS	0.4%
Benzo (g,h,i) perylene	191242	1.20E-06			0.056	Boiler	6.00E-04	1.018	0.000611	PASS	1.1%
Benzo (g,h,i) perylene	191242	2.10E-03	12	24 hr		Boiler	1.05E+00	6.107	6.412350	PASS	53.4%
Benzo (k) fluoranthene	207089	1.80E-09			0.05	Boiler	9.00E-07	1.018	0.000001	PASS	0.0%
Beryllium	7440417	1.20E-08			0.0004	Boiler	5.45E-07	1.018	0.000001	PASS	0.1%
Beryllium	7440417	1.20E-08	0.02	24 hr		Boiler	5.45E-07	6.107	0.000003	PASS	0.0%
Biphenyl	92524	2.12E-04	13	8 hr		Recip Engine	1.06E-01	9.16	0.970960	PASS	7.5%
Cadmium	7440439	1.10E-06			0.0006	Boiler	5.50E-04	1.018	0.000560	PASS	93.3%
Carbon tetrachloride	56235	6.07E-05			0.2	Recip Engine	3.04E-02	1.018	0.030896	PASS	15.4%
Carbon tetrachloride	56235	6.07E-05	100	24 hr		Recip Engine	3.04E-02	6.107	0.185347	PASS	0.2%
Chlorobenzene	108907	4.44E-05	70	24 hr		Recip Engine	2.22E-02	6.107	0.135575	PASS	0.2%
Chloroform	67663	4.71E-05			0.4	Recip Engine	2.36E-02	1.018	0.023974	PASS	6.0%
Chromium	7440473	1.40E-07			8.3E-05	Boiler	7.00E-05	1.018	0.000071	PASS	85.9%
Chrysene	218019	1.80E-09			0.5	Boiler	9.00E-07	1.018	0.000001	PASS	0.0%
Cobalt	7440484	8.40E-08	0.2	8 hr		Boiler	4.20E-05	9.16	0.000385	PASS	0.2%
Copper	7440508	8.50E-07	2	8 hr		Boiler	4.25E-04	9.16	0.003893	PASS	0.2%
Cyclohexane	110827	3.08E-04	6000	24 hr		Recip Engine	1.54E-01	6.107	0.940478	PASS	0.0%

Table 8. Natural Gas Processes: 500mmbtu, 80 foot stack

Chemical	CAS	Nat Gas EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m³/ lb/hr)	Predicted Ambient Impacts (µg/m³)	PASS/ FAIL	% of screening
Cyclopentane	287923	2.27E-04	17200	8 hr		Recip Engine	1.14E-01	9.16	1.039660	PASS	0.0%
Dibenzo(a,h) anthracene	53703	1.20E-09			0.0005	Boiler	6.00E-07	1.018	0.000001	PASS	0.1%
Dichlorobenzene, mixed isomers	25321226	1.20E-06	3	annual		Boiler	6.00E-04	1.018	0.000611	PASS	0.0%
Dichlorobenzene, mixed isomers	25321226	1.20E-06			0.14	Boiler	6.00E-04	1.018	0.000611	PASS	0.4%
Dichloromethane	75092	1.47E-04	2000	annual		Recip Engine	7.35E-02	1.018	0.074823	PASS	0.0%
Dichloromethane	75092	1.47E-04	14000	1 hr		Recip Engine	7.35E-02	10.18	0.748230	PASS	0.0%
Dichloromethane	75092	1.47E-04			60	Recip Engine	7.35E-02	1.018	0.074823	PASS	0.1%
Dimethylbenz(a)anthracene	57976	1.60E-08			0.005	Boiler	8.00E-06	1.018	0.000008	PASS	0.2%
Ethyl chloride	75003	1.87E-06	10000	24 hr		Recip Engine	9.35E-04	6.107	0.005710	PASS	0.0%
Ethylbenzene	100414	1.08E-04			3	Recip Engine	5.40E-02	1.018	0.054972	PASS	1.8%
Ethylbenzene	100414	1.08E-04	1000	24 hr		Recip Engine	5.40E-02	6.107	0.329778	PASS	0.0%
Ethylene dibromide	106934	7.34E-05			0.002	Recip Engine	3.67E-02	1.018	0.037361	FAIL	1868.0%
Ethylene dibromide	106934	7.34E-05	9	24 hr		Recip Engine	3.67E-02	6.107	0.224127	PASS	2.5%
Ethylene dichloride	107062	4.22E-05			0.04	Recip Engine	2.11E-02	1.018	0.021480	PASS	53.7%
Fluoranthene	206440	3.00E-09			0.00625	Boiler	1.50E-06	1.018	0.000002	PASS	0.0%
Fluoranthene	206440	3.00E-09	140	24 hr		Boiler	1.50E-06	6.107	0.000009	PASS	0.0%
Fluorene	86737	2.80E-09	140	24 hr		Boiler	1.40E-06	6.107	0.000009	PASS	0.0%
Formaldehyde	50000	7.50E-05			0.08	Boiler	3.75E-02	1.018	0.038175	PASS	47.7%
Formaldehyde	50000	7.50E-05	9	8 hr		Boiler	3.75E-02	9.16	0.343500	PASS	3.8%
Indeno(1,2,3-cd)pyrene	193395	1.80E-09			0.005	Boiler	9.00E-07	1.018	0.000001	PASS	0.0%
Isobutane	75285	3.75E-03	23800	8 hr		Recip Engine	1.88E+00	9.16	17.175000	PASS	0.1%
Isobutyraldehyde	78842	4.37E-04	160	24 hr		Recip Engine	2.19E-01	6.107	1.334380	PASS	0.8%
Isomers of xylene	1330207	2.68E-04	100	24 hr		Recip Engine	1.34E-01	6.107	0.818338	PASS	0.8%

Table 8. Natural Gas Processes: 500mmbtu, 80 foot stack

Chemical	CAS	Nat Gas EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Worst Process	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Manganese	7439965	3.80E-07	0.05	annual		Boiler	1.90E-04	1.018	0.000193	PASS	0.4%
Mercury	7439976	2.60E-07	0.3	24 hr		Boiler	1.30E-04	6.107	0.000794	PASS	0.3%
Methyl alcohol	67561	3.06E-03	3250	1 hr		Recip Engine	1.53E+00	10.18	15.575400	PASS	0.5%
Methylcyclohexane	108872	1.23E-03	16000	8 hr		Recip Engine	6.15E-01	9.16	5.633400	PASS	0.0%
Molybdenum	7439987	1.10E-06	30	8 hr		Boiler	5.50E-04	9.16	0.005038	PASS	0.0%
Naphthalene	91203	6.10E-07			0.08	Boiler	3.05E-04	1.018	0.000310	PASS	0.4%
Naphthalene	91203	6.10E-07	3	24 hr		Boiler	3.05E-04	6.107	0.001863	PASS	0.1%
n-Butane	106978	2.10E-03	23800	8 hr		Boiler	1.05E+00	9.16	9.618000	PASS	0.0%
N-Hexane	110543	1.80E-03	700	24 hr		Boiler	9.00E-01	6.107	5.496300	PASS	0.8%
Nickel	7440020	2.10E-06			0.0042	Boiler	1.05E-03	1.018	0.001069	PASS	25.5%
N-Nonane	111842	1.10E-04	550	24 hr		Recip Engine	5.50E-02	6.107	0.335885	PASS	0.1%
N-Octane	111659	3.51E-04	3500	8 hr		Recip Engine	1.76E-01	9.16	1.607580	PASS	0.0%
N-Pentane	109660	2.60E-03	17700	8 hr		Boiler	1.30E+00	9.16	11.908000	PASS	0.1%
Perchloroethylene	127184	2.48E-06			4	Recip Engine	1.24E-03	1.018	0.001262	PASS	0.0%
Perchloroethylene	127184	2.48E-06	40	24 hr		Recip Engine	1.24E-03	6.107	0.007573	PASS	0.0%
Perylene	198550	4.97E-09			0.05	Recip Engine	2.49E-06	1.018	0.000003	PASS	0.0%
Phenanthrene	85018	1.70E-08	0.1	annual		Boiler	8.50E-06	1.018	0.000009	PASS	0.0%
Phenol	108952	4.21E-05	190	8 hr		Recip Engine	2.11E-02	9.16	0.192818	PASS	0.1%
Propylene dichloride	78875	4.46E-05	4	24 hr		Recip Engine	2.23E-02	6.107	0.136186	PASS	3.4%
Propylene oxide	75569	2.90E-05			0.3	Turbine Engine	1.45E-02	1.018	0.014761	PASS	4.9%
Propylene oxide	75569	2.90E-05	30	24 hr		Turbine Engine	1.45E-02	6.107	0.088552	PASS	0.3%
Pyrene	129000	5.00E-09	100	24 hr		Boiler	2.50E-06	6.107	0.000015	PASS	0.0%
Selenium	7782492	2.40E-08	2	8 hr		Boiler	1.20E-05	9.16	0.000110	PASS	0.0%
Styrene	100425	5.48E-05			1.7	Recip Engine	2.74E-02	1.018	0.027893	PASS	1.6%

Table 8. Natural Gas Processes: 500mmbtu, 80 foot stack											
Chemical	**CAS**	**Nat Gas EF* (lb/mmbtu)**	**ITSL (µg/m³)**	**Avg Time**	**IRSL (µg/m³)**	**Worst Process**	**Emissions (lb/hr)**	**Generic 1- lb/hr Impacts AERSCREEN (µg/m³/ lb/hr)**	**Predicted Ambient Impacts (µg/m³)**	PASS/ FAIL	% of screening
Styrene	100425	5.48E-05	1000	24 hr		Recip Engine	2.74E-02	6.107	0.167332	PASS	0.0%
Toluene	108883	3.40E-06	5000	24 hr		Boiler	1.70E-03	6.107	0.010382	PASS	0.0%
Vanadium	7440622	2.30E-06	0.5	1 hr		Boiler	1.15E-03	10.18	0.011707	PASS	2.3%
Vinyl chloride	75014	2.47E-05			0.11	Recip Engine	1.24E-02	1.018	0.012572	PASS	11.4%
Vinyl chloride	75014	2.47E-05	100	24 hr		Recip Engine	1.24E-02	6.107	0.075421	PASS	0.1%
* Based on worse-case Emission Factor from EPA's WebFIRE database											

Table 9. Wood Processes: 500mmbtu, 80 foot stack

Chemical	CAS	Wood /Bark EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Dioxin Equiva-lent EF (TEQ)	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
1,1,1-Trichloroethane	71556	3.10E-05	6000	24 hr			1.55E-02	6.107	0.094659	PASS	0.0%
1,2-Ethylene dibromide	540498	5.50E-05	0.1	annual			2.75E-02	1.018	0.027995	PASS	28.0%
2,3,7,8-Tetrachlorodibenzofuran	51207319	9.00E-12			2.3E-08	x	4.50E-09	1.018	0.000000	PASS	19.9%
2,3,7,8-Tetrachlorodibenzofuran	51207319	9.00E-12	2.0E-06	annual		x	4.50E-09	1.018	0.000000	PASS	0.2%
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746016	8.60E-12			2.3E-08	x	4.30E-09	1.018	0.000000	PASS	19.0%
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746016	8.60E-12	2.0E-06	annual		x	4.30E-09	1.018	0.000000	PASS	0.2%
2,4,4'-Trichlorobiphenyl	7012375	2.60E-09			0.002		1.30E-06	1.018	0.000001	PASS	0.1%
2,4,6-Trichlorophenol	88062	2.20E-08			0.3		1.10E-05	1.018	0.000011	PASS	0.0%
2,4-Dinitrophenol	51285	1.80E-07	7	24 hr			9.00E-05	6.107	0.000550	PASS	0.0%
2-Chlorophenol	95578	2.40E-08	18	24 hr			1.20E-05	6.107	0.000073	PASS	0.0%
2-Methyl Naphthalene	91576	1.60E-07	10	annual			8.00E-05	1.018	0.000081	PASS	0.0%
2-Monochlorobiphenyl	2051607	2.20E-10			0.002		1.10E-07	1.018	0.000000	PASS	0.0%
2-Nitrophenol	88755	2.40E-07	0.7	annual			1.20E-04	1.018	0.000122	PASS	0.0%
4-Nitrophenol	100027	1.10E-07	0.7	annual			5.50E-05	1.018	0.000056	PASS	0.0%
Acenaphthene	83329	9.10E-07	210	24 hr			4.55E-04	6.107	0.002779	PASS	0.0%
Acenaphthylene	208968	5.00E-06	35	24 hr			2.50E-03	6.107	0.015268	PASS	0.0%
Acetaldehyde	75070	8.30E-04			0.5		4.15E-01	1.018	0.422470	PASS	84.5%
Acetaldehyde	75070	8.30E-04	9	24 hr			4.15E-01	6.107	2.534405	PASS	28.2%
Acetone	67641	1.90E-04	5900	8 hr			9.50E-02	9.16	0.870200	PASS	0.0%
Acetophenone	98862	3.20E-09	490	8 hr			1.60E-06	9.16	0.000015	PASS	0.0%
Acrolein	107028	4.00E-03	0.02	annual			2.00E+00	1.018	2.04	FAIL	10180.0%
Acrolein	107028	4.00E-03	5	1 hr			2.00E+00	10.18	20.36	FAIL	407.2%
Anthracene	120127	3.00E-06	1000	24 hr			1.50E-03	6.107	0.009161	PASS	0.0%
Antimony	7440360	7.90E-06	0.2	24 hr			3.95E-03	6.107	0.024123	PASS	12.1%
Arsenic	7440382	2.20E-05			2.0E-04		1.10E-02	1.018	0.011198	FAIL	5599.0%
Barium	7440393	1.70E-04	5	8 hr			8.50E-02	9.16	0.778600	PASS	15.6%
Benzaldehyde	100527	8.50E-07			0.4		4.25E-04	1.018	0.000433	PASS	0.1%

Table 9. Wood Processes: 500mmbtu, 80 foot stack

Chemical	CAS	Wood /Bark EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Dioxin Equiva-lent EF (TEQ)	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Benzene	71432	4.20E-03			0.10		2.10E+00	1.018	2.137800	FAIL	2137.8%
Benzene	71432	4.20E-03	30	24 hr			2.10E+00	6.107	12.824700	PASS	42.7%
Benzene	71432	4.20E-03	30	annual			2.10E+00	1.018	2.137800	PASS	7.1%
Benzo (a) anthracene	56553	6.50E-08			0.005		3.25E-05	1.018	0.000033	PASS	0.7%
Benzo (a) pyrene	50328	2.60E-06			0.0005		1.30E-03	1.018	0.001323	FAIL	264.7%
Benzo (b) fluoranthene	205992	1.00E-07			0.005		5.00E-05	1.018	0.000051	PASS	1.0%
Benzo (g,h,i) perylene	191242	9.30E-08			0.0556		4.65E-05	1.018	0.000047	PASS	0.1%
Benzo (g,h,i) perylene	191242	9.30E-08	12	24 hr			4.65E-05	6.107	0.000284	PASS	0.0%
Benzo (k) fluoranthene	207089	3.60E-08			0.05		1.80E-05	1.018	0.000018	PASS	0.0%
Benzoic acid	65850	4.70E-08	12	annual			2.35E-05	1.018	0.000024	PASS	0.0%
Beryllium	7440417	1.10E-06			0.0004		5.50E-04	1.018	0.000560	FAIL	140.0%
Beryllium	7440417	1.10E-06	0.02	24 hr			5.50E-04	6.107	0.003359	PASS	16.8%
Cadmium	7440439	4.10E-06			0.0006		2.05E-03	1.018	0.002087	FAIL	347.8%
Carbazole	86748	1.80E-06			0.4		9.00E-04	1.018	0.000916	PASS	0.2%
Carbon tetrachloride	56235	4.50E-05	100	24 hr	0.17		2.25E-02	6.107	0.137408	PASS	0.1%
Chlorine	7782505	7.90E-04	0.3	annual			3.95E-01	1.018	0.402110	FAIL	134.0%
Chlorine	7782505	7.90E-04	500	8 hr			3.95E-01	9.16	3.618200	PASS	0.7%
Chlorobenzene	108907	3.30E-05	70	24 hr			1.65E-02	6.107	0.100766	PASS	0.1%
Chloroform	67663	2.80E-05			0.4		1.40E-02	1.018	0.014252	PASS	3.6%
Chromium (VI)	18540299	3.50E-06			8.3E-05		1.75E-03	1.018	0.001782	FAIL	2146.4%
Chromium (VI)	18540299	3.50E-06	0.01	24 hr			1.75E-03	6.107	0.010687	FAIL	133.6%
Chrysene	218019	3.80E-08			0.5		1.90E-05	1.018	0.000019	PASS	0.0%
Cobalt	7440484	6.50E-06	0.2	8 hr			3.25E-03	9.16	0.029770	PASS	14.9%
Copper	7440508	4.90E-05	2	8 hr			2.45E-02	9.16	0.224420	PASS	11.2%
Crotonaldehyde	123739	9.90E-06	9	1 hr			4.95E-03	10.18	0.050391	PASS	0.6%
Decachlorobiphenyl	2051243	2.70E-10			0.002		1.35E-07	1.018	0.000000	PASS	0.0%
Dibenzo(a,h) anthracene	53703	9.10E-09			0.0005		4.55E-06	1.018	0.000005	PASS	0.9%
Dichlorobiphenyl	25512429	7.40E-10			0.002		3.70E-07	1.018	0.000000	PASS	0.0%
Dichloromethane	75092	2.90E-04			60		1.45E-01	1.018	0.147610	PASS	0.2%

Table 9. Wood Processes: 500mmbtu, 80 foot stack

Chemical	CAS	Wood /Bark EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Dioxin Equiva-lent EF (TEQ)	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Dichloromethane	75092	2.90E-04	2000	annual			1.45E-01	1.018	0.147610	PASS	0.0%
Dichloromethane	75092	2.90E-04	14000	1 hr			1.45E-01	10.18	1.476100	PASS	0.0%
Dioctyl phthalate	117817	4.70E-08			0.2		2.35E-05	1.018	0.000024	PASS	0.0%
Ethylbenzene	100414	3.10E-05			3		1.55E-02	1.018	0.015779	PASS	0.5%
Ethylbenzene	100414	3.10E-05	1000	24 hr			1.55E-02	6.107	0.094659	PASS	0.0%
Ethylene dichloride	107062	2.90E-05			0.04		1.45E-02	1.018	0.014761	PASS	36.9%
Fluoranthene	206440	1.60E-07			0.006		8.00E-05	1.018	0.000081	PASS	1.3%
Fluoranthene	206440	1.60E-07	140	24 hr			8.00E-05	6.107	0.000489	PASS	0.0%
Fluorene	86737	3.40E-06	140	24 hr			1.70E-03	6.107	0.010382	PASS	0.0%
Formaldehyde	50000	4.40E-03			0.08		2.20E+00	1.018	2.239600	FAIL	2799.5%
Formaldehyde	50000	4.40E-03	9	8 hr			2.20E+00	9.16	20.152000	FAIL	223.9%
Heptachlorobiphenyls, total	28655712	6.60E-11			0.002		3.30E-08	1.018	0.000000	PASS	0.0%
Hexachlorobiphenyls, total	26601649	5.50E-10			0.002		2.75E-07	1.018	0.000000	PASS	0.0%
Hexachlorodibenzo-p-dioxins, total	34465468	1.60E-07			2.3E-08	x	8.00E-05	1.018	0.000081	FAIL	354087%
Hexachlorodibenzo-p-dioxins, total	34465468	1.60E-07	2.0E-06	annual		x	7.27E-06	1.018	0.000007	FAIL	370.2%
Hexanal	66251	7.00E-06	2	annual			3.18E-04	1.018	0.000324	PASS	0.0%
Hydrogen chloride	7647010	1.90E-02	20	annual			9.50E+00	1.018	9.671000	PASS	48.4%
Hydrogen chloride	7647010	1.90E-02	2100	1 hr			9.50E+00	10.18	96.710000	PASS	4.6%
Indeno(1,2,3-cd)pyrene	193395	8.70E-08			0.005		4.35E-05	1.018	0.000044	PASS	0.9%
Isobutyraldehyde	78842	1.20E-05	160	24 hr			6.00E-03	6.107	0.036642	PASS	0.0%
Manganese	7439965	1.60E-03	0.05	annual			8.00E-01	1.018	0.814400	FAIL	1628.8%
Mercury	7439976	3.50E-06	0.3	24 hr			1.75E-03	6.107	0.010687	PASS	3.6%
Methyl bromide	74839	1.50E-05	5	24 hr			7.50E-03	6.107	0.045803	PASS	0.9%
Methyl chloride	74873	2.30E-05			1.6		1.15E-02	1.018	0.011707	PASS	0.7%
Methyl chloride	74873	2.30E-05	90	24 hr			1.15E-02	6.107	0.070231	PASS	0.1%
Methyl ethyl ketone	78933	5.40E-06	5000	24 hr			2.70E-03	6.107	0.016489	PASS	0.0%
Molybdenum	7439987	2.10E-06	30	8 hr			1.05E-03	9.16	0.009618	PASS	0.0%
Naphthalene	91203	9.70E-05			0.08		4.85E-02	1.018	0.049373	PASS	61.7%

Table 9. Wood Processes: 500mmbtu, 80 foot stack

Chemical	CAS	Wood /Bark EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Dioxin Equiva-lent EF (TEQ)	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Naphthalene	91203	9.70E-05	3	24 hr			4.85E-02	6.107	0.296190	PASS	9.9%
Nickel	7440020	3.30E-05			0.0042		1.65E-02	1.018	0.016797	FAIL	399.9%
Octachlorodibenzo-p-dioxins, total	3268879	6.60E-12			2.3E-08	x	3.30E-09	1.018	3.36E-09	PASS	14.6%
Octachlorodibenzo-p-dioxins, total	3268879	6.60E-12	2.0E-06	annual		x	3.30E-09	1.018	3.36E-09	PASS	0.2%
o-Tolualdehyde	529204	7.20E-06	440	24 hr			3.60E-03	6.107	0.021985	PASS	0.0%
o-Xylene	95476	2.50E-05	100	24 hr			1.25E-02	6.107	0.076338	PASS	0.1%
Pentachlorobiphenyls, total	25429292	1.20E-09			0.002		6.00E-07	1.018	0.000001	PASS	0.0%
Pentachlorodibenzofurans, total		2.10E-10			2.3E-08	x	1.05E-07	1.018	0.0000001	FAIL	464.7%
Pentachlorodibenzofurans, total		2.10E-10	2.0E-06	annual		x	1.05E-07	1.018	0.0000001	PASS	5.3%
Pentachlorodibenzo-p-dioxins, total		1.50E-09			2.3E-08	x	7.50E-07	1.018	0.000001	FAIL	3319.6%
Pentachlorodibenzo-p-dioxins, total		1.50E-09	2.0E-06	annual		x	7.50E-07	1.018	0.000001	PASS	38.2%
Pentachlorophenol (PCP)	87865	5.10E-08			0.009		2.55E-05	1.018	0.000026	PASS	0.3%
Pentachlorophenol (PCP)	87865	5.10E-08	20	24 hr			2.55E-05	6.107	0.000156	PASS	0.0%
Perchloroethylene	127184	3.80E-05			4		1.90E-02	1.018	0.019342	PASS	0.5%
Perchloroethylene	127184	3.80E-05	40	24 hr			1.90E-02	6.107	0.116033	PASS	0.3%
Phenanthrene	85018	7.00E-06	0.1	annual			3.50E-03	1.018	0.003563	PASS	3.6%
Phenol	108952	5.10E-05	190	8 hr			2.55E-02	9.16	0.233580	PASS	0.1%
Phosphorus (yellow or white)	7723140	2.70E-05	1	8 hr			1.35E-02	9.16	0.123660	PASS	12.4%
Propionaldehyde	123386	6.10E-05	8	24 hr			3.05E-02	6.107	0.186264	PASS	2.3%
Propylene dichloride	78875	3.30E-05	4	24 hr			1.65E-02	6.107	0.100766	PASS	2.5%
p-Tolualdehyde	104870	1.10E-05	440	24 hr			5.50E-03	6.107	0.033589	PASS	0.0%
Pyrene	129000	3.70E-06	100	24 hr			1.85E-03	6.107	0.011298	PASS	0.0%
Selenium	7782492	2.80E-06	2	8 hr			1.40E-03	9.16	0.012824	PASS	0.6%
Silver	7440224	1.70E-03	0.1	8 hr			8.50E-01	9.16	7.786000	FAIL	7786.0%
Strontium	7440246	1.00E-05	2000	24 hr			5.00E-03	6.107	0.030535	PASS	0.0%
Styrene	100425	1.90E-03			1.7		9.50E-01	1.018	0.967100	PASS	56.9%
Styrene	100425	1.90E-03	1000	24 hr			9.50E-01	6.107	5.801650	PASS	0.6%

Table 9. Wood Processes: 500mmbtu, 80 foot stack

Chemical	CAS	Wood /Bark EF* (lb/mmbtu)	ITSL (µg/m³)	Avg Time	IRSL (µg/m³)	Dioxin Equiva-lent EF (TEQ)	Emissions (lb/hr)	Generic 1- lb/hr Impacts AERSCREEN (µg/m^3/ lb/hr)	Predicted Ambient Impacts (µg/m^3)	PASS/ FAIL	% of screening
Tetrachlorobiphenyls, total	26914330	2.50E-09			0.002		1.25E-06	1.018	0.000001	PASS	0.1%
Tetrachlorodibenzofurans, total		7.50E-11			2.3E-08	x	3.75E-08	1.018	3.82E-08	FAIL	166.0%
Tetrachlorodibenzofurans, total		7.50E-11	2.0E-06	annual		x	3.75E-08	1.018	3.82E-08	PASS	1.9%
Tetrachlorodibenzo-p-dioxins, total		4.70E-10			2.3E-08	x	2.35E-07	1.018	0.0000002	FAIL	1040.1%
Tetrachlorodibenzo-p-dioxins, total		4.70E-10	2.0E-06	annual		x	2.35E-07	1.018	0.0000002	PASS	12.0%
Tin	7440315	2.30E-05	20	8 hr			1.15E-02	9.16	0.105340	PASS	0.5%
Toluene	108883	9.20E-04	5000	24 hr			4.60E-01	6.107	2.809220	PASS	0.1%
Trichloroethylene	79016	3.00E-05			0.2		1.50E-02	1.018	0.015270	PASS	7.6%
Trichloroethylene	79016	3.00E-05	2	annual			1.50E-02	1.018	0.015270	PASS	0.8%
Trichloroethylene	79016	3.00E-05	10000	24 hr			1.50E-02	6.107	0.091605	PASS	0.0%
Trichlorofluoromethane	75694	4.10E-05	56200	1 hr			2.05E-02	10.18	0.208690	PASS	0.0%
Vanadium	7440622	9.80E-07	0.5	1 hr			4.90E-04	10.18	0.004988	PASS	1.0%
Vinyl chloride	75014	1.80E-05			0.11		9.00E-03	1.018	0.009162	PASS	8.3%
Vinyl chloride	75014	1.80E-05	100	24 hr			9.00E-03	6.107	0.054963	PASS	0.1%
Yttrium	7440655	3.00E-07	10	8 hr			1.50E-04	9.16	0.001374	PASS	0.0%
Zinc	7440666	4.20E-04	50	8 hr			2.10E-01	9.16	1.923600	PASS	3.8%

* Based on worse-case Emission Factor from EPA's WebFIRE database

APPENDIX I:

TAC LIST DISCUSSION PAPER

Air Toxics Workgroup
"TAC List" Discussion Paper — DRAFT
August 20, 2013 UPDATE

ORR (2011) Report Recommendation A-1(6):

R 336.1225 should be amended and specifically include the following:
Limit the number of air toxics to the federal HAPs list.

ATW Initial Discussion

Discussion of the "TAC list" issue at the 3/5/13 ATW meeting indicated that the "status quo" is characterized by some ATW members as burdensome and more extensive than other Region 5 state's programs. However, there are also reservations about the sufficiency of the HAPs list. And if the DEQ were to adopt a defined list of TACs for R225 applicability, then staff asked about a mechanism to ensure public health protection if health concerns are posed by the proposed emission of an unlisted compound. ATW members voted, using the "gradient of agreement" tool, on three options: 1. HAPs only; 2. HAPs plus, including a caveat to add other compounds; and, 3. maintaining the status quo. Although there were varied levels of acceptability for each option, the voting was relatively polarized for options 1 and 3, and option 2 was relatively closer to consensus. While the discussion and the voting at that point should not be mistaken for a final recommendation or decision, the feedback was sufficient to prompt DEQ to explore further the potential ways that a regulatory system based on a defined TAC list could be developed.

Goal Statement and Guiding Concepts

The following **goal statement** was proposed, for purposes of consideration and discussion, and was accepted by the ATW:

The TAC list includes the federal HAPs list and other air toxics that may be reasonably anticipated to occur in NSR permitted air emissions, and which warrant the evaluation of ambient air impacts in PTI applications in order to help ensure public health and environmental protection while promoting regulatory certainty and efficiency.

The following set of **"guiding concepts"** for developing an "option 2" approach was provided for discussion purposes:

1. The TAC list should include the HAPs list, and should additionally include the air toxics that may be reasonably anticipated to occur in emissions from facilities requiring a Permit to Install (PTI), minus those substances that have relatively low toxicity. The regulated community would prefer an approach that is focused on the more relevant substances, that is less burdensome and provides greater certainty.

2. The DEQ would have the authority to add to the list or remove substances from the list through the rulemaking process.

3. Rule 203(1)(c) should continue to require PTI applicants to describe the "quantity of **all air contaminants** that are reasonably anticipated due to the operation of the proposed process equipment." However, for unlisted air toxics (i.e., non-TACs), the current language in Rule 203(1)(h) would not be interpreted to be applicable; i.e., the applicant would not be required to provide in the PTI application, "Data demonstrating that the emissions from the process will not have an unacceptable air quality impact in relation to all federal, state, and local air quality standards." So, for non-TACs, the permit applicant would need to identify the emission rates but would not be required to model the ambient air impacts or compare the impacts to screening levels or other health protective benchmarks.
4. The DEQ rules should provide the DEQ authority to evaluate the ambient air impacts and potential health concerns of non-TACs in a PTI application, and to impose restrictions on their emissions as necessary to ensure public health protection. Section 324.5512 of NREPA authorizes the department to promulgate rules for controlling or prohibiting air pollution, and to deny or revoke a permit to operate a source, process, or process equipment that **would adversely affect human health** or other conditions important to the life of the community. [The Natural Resources and Environmental Protection Act (NREPA) Act 451 of the Public Acts of 1994, Part 55 Air Pollution Control].
5. For non-TACs, a modeled maximum ambient air impact exceeding a health-protective benchmark, such as a screening level (SL) as currently derived by the DEQ, may or may not in itself provide sufficient weight of evidence to support DEQ action to ensure public health protection under #4 above. The DEQ may additionally consider relevant scientific and case-by-case information (as done currently under Rule 226(d) and Rule 228).

Potential Approaches to List Development

In 2010, AQD conducted a survey of State's air toxics programs to gather basic information on the scope of their programs, including the list of air toxics regulated. The survey found that 29 of the 50 states regulate air toxics in permit reviews, based on ambient air impact estimates and public health protective benchmarks. Of the 21 states that do not routinely perform air toxics risk assessment in NSR, many (if not all) have a "backstop" or "safety net" provision for case-specific risk assessment. Of the six states in EPA Region 5, four states routinely evaluate air toxics ambient air impacts for public health acceptability. Illinois generally does not (but could in exceptional cases). Indiana performs such evaluations only in a limited number of cases, not "routinely." Complete information was not collected on what list of air toxics are included for all states, but the gathered information did indicate that program scope varied widely. The state's approach for establishing the regulated air toxics may be generally grouped into five categories, as listed in **Table 1** below.

Table 1. State's approaches to the development of lists of regulated air toxics.

Air toxics included in NSR health risk assessment	Example states	# states
HAPs only	CT; HA; VA	3
HAPs plus additional air toxics of concern	KY (HAPs+112r list); LA; NM (HAPs+OELs); NY (HAPs+112r list); NC; ND; RI; VT; WV (HAPs+OELs)	10
All air toxics with OELs	AL	1
State-specific list	OH; WI; CA; ID; MA; NH; SC	7
No discrete list; virtually any may be included	MI; MN; DE; GA; MD; NJ; OK; TX	9

Conceptually, there are several potential approaches to constructing a R225 TAC list, including the following:

1. Adopt a list developed by another state / states.
2. Develop a "list of lists."
3. List those chemicals meeting listing criteria based on health hazards, potency, persistence and bioaccumulation.
4. Develop a list based on the HAPs and the current list of TACs with SLs, with exclusion criteria.

The tendency for air toxics to pose a public health concern is generally a function of the potency, the exposure potential (which depends on the quantity and duration of the emission, the dispersion, and background exposures), and the presence and susceptibility of the public to the exposure. A list of regulated air toxics that is *unlimited* may be a relatively more reliable approach to address all potential concerns; any approach to developing a defined list of regulated air toxics may potentially be less reliable. For example, a substance with relatively low toxicity may be unlisted, however, a combination of high emissions, poor dispersion, and the presence of an exposed public, can pose public health concerns even if the toxicity or potency is relatively low. A "backstop" plan for detecting and addressing such cases is important, and is discussed elsewhere in this paper. Having noted this general limitation of any defined list, the following is a brief description of the apparent strengths and weaknesses/limitations of the four general approaches listed above, for discussion purposes.

1. Adopt a list developed by another state / states.

The positives of this option include convenience, and consistency (with the chosen State(s), but not with others). The concern is that the available lists in Region 5 may not be regarded by the DEQ, ATW, and/or the public, as fully appropriate for Michigan. The Ohio EPA list (303 compounds or classes) is based on the HAPs list plus substances passing several inclusion and exclusion criteria. Their rationale for applying exclusion criteria contains a considerable number of professional judgments. Some of these criteria may be regarded by some as having a questionable basis; environmental groups have strongly objected and have brought a lawsuit against Ohio EPA over the list and the criteria used to develop the list. The Minnesota MPCA has an unlimited list of regulated air toxics. The Wisconsin DNR's list was derived in 2004 based on certain inclusion and exclusion criteria,

and consists of 535 substances (26 HAPs are not included). Of course, lists from states outside of EPA R5 may also be considered. There is no consistency in the state's lists or in the approaches used to derive the lists. It would be arguable to debate whose list is more appropriate for Michigan.

2. Develop a "list of lists."
This approach was recommended by the Michigan Air Toxics Policy Committee (1989) as a way to focus the required environmental acceptability assessments (with case-by-case assessment of other air toxics of concern at a specific site). They recommended a list of approximately 1200 substances, consisting of the substances with ACGIH or NIOSH OELs, the Michigan Critical Materials Register, the NTP and IARC lists of carcinogens, and the chemicals listed in the IJC's Great Lakes Water Quality Board 1987 Report on Great Lakes Water Quality. As noted in Table 1 above, some states have used the EPA's 112(r) chemical list for emergency preparedness (which consists of 77 acutely toxic chemicals, and 63 flammable gases and volatile flammable liquids). Another relevant list available today is the EPA's Toxics Release Inventory (TRI) list.

The strengths of this approach are the relative ease of compiling a list of lists, and, the contributing lists would presumably have some environmental relevance. The limitations of this approach are that many listed substances may be irrelevant to PTI air emissions in Michigan, and, many of the substances on lists such as the TRI may have inadequate data for SL development. Also, this approach can result in a very long list, which may be undesirable to the regulated community (guiding concept #1 above).

3. List those chemicals meeting listing criteria based on health hazards, potency, persistence and bioaccumulation.
The strength of this approach is that the scientific defensibility may be relatively strong. The limitations of this approach are that it is a relatively labor intensive and time consuming initiative, the appropriate criteria may be difficult to establish, and the resulting list may not be the most relevant to the PTI program. Also, this approach (a version of which was implemented by Ohio EPA) may rely on multiple judgments for inclusion or exclusion that may be contested. A key element would be to establish well-reasoned, non-arbitrary inclusion and exclusion criteria, preferably derived by a consensus approach among multiple stakeholders.

4. Develop a TAC list based on the HAPs and the current MDEQ list of TACs with SLs, with exclusion criteria.
The strengths of this approach are relative efficiency of list development, the focus on air toxics that are relevant to PTI applications in Michigan, and the inclusion of those substances that have already been found to have sufficient toxicity data for SL development. As with #3 above, a key element would be to derive well-reasoned, non-arbitrary criteria, but in this case, those would be more limited since they would only be exclusion criteria (i.e., criteria for not including certain substances that currently have SLs). The limitation of this approach is that the selection of the exclusion criteria may be debatable.

Further rationale for approach #4: The initial universe of substances for assessment is the current SL list of **1202 substances** (as of May, 2013). This list represents MDEQ's 21+ years of experience in evaluating air toxics in the New Source Review permitting program, under an open-ended TAC definition (excluding only a short list of exempted substances; currently 41). Over the last 21 years (since 1992), screening levels have been derived for TACs (under the open-ended definition) if they appeared in proposed emission characterizations for all categories of facilities (thermal, chemical, or general manufacturing). Data-poor chemicals were addressed relatively inclusively in the MDEQ program, i.e., SL derivation methods include the use of minimal data such as subchronic animal studies, LD50s, and LC50s. This list also includes 289 substances with inadequate toxicity data for SL derivation, which were assigned the default ITSL of 0.1 µg/m^3 (annual AT). Rather than propose the inclusion of all 1200+ substances on the future TAC list, some exclusion criteria may be reasonable in the interest of developing a shorter list that is more focused on the more relevant substances and is less burdensome on the regulated community (guiding concept #1).

Proposal for the TAC List

It was proposed that the MDEQ follow approach #4 above, to develop a defined TAC list including the following:

1. Most EPA HAPs should be included, including all individual chemicals that EPA includes as members of HAP listed groups (e.g., metal compounds). For clarity, the individual chemical members of the HAP groups of polycyclic organic matter (POM) and glycol ethers should be listed individually and only if they meet the other qualifying criteria (based on the ITSL or carcinogenicity). The HAPs list includes many air toxics with well documented toxicity and with the potential for public exposure, based on air emissions data and/or ambient air monitoring data. The HAPs list is the focus of EPA's air toxics data collection and regulatory actions under the Clean Air Act. Ohio EPA adopted all HAPs into their Toxic Air Pollutant list. However, it may be noted that some of the HAPs have relatively limited toxicity datasets, and some of the HAPs have not been identified and addressed in Permit to Install applications. For some HAPs, it may not be reasonable to anticipate that they would appear in future PTI applications. Reasons to include all HAPs in a TAC list are: for simplicity; for consistency with EPA; and, for better clarity in communicating the basis for the list with the regulated community and other groups. Reasons to not include some HAPs in the TAC list are: to better focus on the air toxics most relevant to PTI applications; and, many HAPs do not have SLs and therefore may never have been identified in a PTI application. In some cases, DEQ has evaluated air toxics in PTI applications and not established a SL, but rather notified permits staff that the predicted ambient air impact is acceptable, in cases where the impact was very low and the toxicologist did not feel it was appropriate to establish a data-derived or default SL. Therefore, for the **Table 2** list of HAPs without SLs, the Toxics Unit files were reviewed to determine if the substance had been evaluated for a PTI application (**Table 2** has a column for "File Review Comments"). It is tentatively proposed that the potential TAC list exclude HAPs that do not have a SL and have not been encountered in a PTI application.

2. All carcinogens would be included (i.e., all compounds with a current IRSL, or, meeting the current rules' definition of a carcinogen (e.g., asphalt fumes)). See also the discussion of the carcinogenic PAHs in **Table 5**.

3. All substances with ITSLs at or below a cutoff value would be included; substances with only ITSLs that are above the cutoff values would be excluded (see discussion below).

4. It may be considered to exclude all substances with an ITSL of 0.1 µg/m^3 (annual averaging time) based on the default value and a lack of chemical-specific data sufficient for SL development. That would include 287 chemicals currently on the SL list. This approach is consistent with Guiding Concepts #1 described earlier. This approach would also be consistent with the other EPA R5 State air toxics programs. It may be noted that Texas TCEQ utilizes a default effect screening level (ESL) of 2 µg/m^3 (1 hour averaging time) when data are lacking for ESL derivation. That default ESL is similar to the AQD default ITSL, using the EPA's Screen3 averaging time (AT) conversion factor of 0.08 for converting from 1 hour AT to annual AT (2 µg/m^3 (1 hr AT) X 0.08 = 0.16 µg/m^3 (annual AT)).

5. Consistent with the Guiding Concepts described earlier, substances not on the TAC list would be identified in PTI applications, including information on the quantity of emissions (R203(1)(c)), but the applicant would not be required to include further information demonstrating the acceptability of the air quality impacts. MDEQ may still address those substances, with justification, by way of emission limits to protect the public health and/or adding substances to the TAC list via rulemaking.

ITSL Cutoff Values

Criterion #3 above mentions ITSL cutoff values. While initially proposed cutoff values for consideration may be largely arbitrary (e.g., proposing a µg/m^3 value or a percentile of an ITSL distribution), the final selection of an appropriate and reasonable cutoff is not arbitrarily selected. Careful consideration by staff and the ATW Members of the reasonableness of the approach, the magnitude of the resulting ITSL cutoff values, the resulting chemicals that meet or fail to meet the cutoff values, and the overall adequacy of the TAC list to meet the goal and the guiding concepts, followed by an ATW recommendation, make the approach more reasoned and deliberate.

The selection of a cutoff may take into consideration available and appropriate criteria utilized in other air quality protection activities. For example, for substances that may be anticipated to exist as particulates in air emissions and in ambient air, consider the primary NAAQS for particulate matter (150 µg/m^3 (24 hour) for PM_{10}, and 12 µg/m^3 (annual) and 35 µg/m^3 (24 hour) for $PM_{2.5}$); also consider that the ACGIH (2012 handbook; Appendix B) recommends TLVs of 3 mg/m^3 (respirable particles) and 10 mg/m^3 (inhalable particles) for Particles Not Otherwise Specified (PNOS).

The Wisconsin air toxics regulatory list is based on several qualifying criteria, including exclusion criteria of having an OEL (TLV) of greater than or equal to 100 ppm or 10 mg/m^3.

A TLV of 10 mg/m^3 would be associated with an AQD ITSL of 100 µg/m^3 (8 hr AT) (utilizing an uncertainty factor of 100, as per the air toxics rules).

It may be considered that the EPA has de-listed some HAPs based upon a finding that there are adequate data on the health and environmental effects of these substances to determine that emissions may not reasonably be anticipated to cause adverse human health or environmental effects (**Table 3)**.

The establishment of a cutoff may also consider the range of ITSL values thus far derived by DEQ. An assessment of the current SL values, and the selection of a reasonable percentile of the distribution of the current ITSLs, may help distinguish the relatively more toxic substances (in the majority of the distribution) from the relatively lower toxicity substances (in the minority of the distribution). Setting that cutoff may be guided by consideration of the range of current ITSL values. Rather than setting an *a priori* percentile of the distribution as the cutoff point, it was considered informative to describe the distribution (e.g., the 50th, 75th, 90th, 95th and 99th percentiles). The distributions were determined after excluding from the dataset those substances with an ITSL of 0.1 µg/m^3 (annual AT) based on the default value. These percentiles were first determined for all current ITSLs, without distinction as to HAP or non-HAP status, and without regard to the various averaging times (ATs) associated with the screening levels. For substances with two ITSLs (acute and chronic), only the chronic (lower) ITSL was included in the assessment. The ITSL distributions were also determined for the following subsets: HAPs only; non-HAPs only; annual AT only; 24 AT only; 8 hr AT only; and, 1 hr AT only. The resulting summary statistics for the ITSL group datasets, as of May 2013, that were initially considered by the ATW are presented in **Table 4a**. It should be noted that an August update of the 75th percentile values is presented in **Table 4b**.

For discussion purposes, staff initially pursued the potential content of a TAC list that includes the current ITSLs except for those exceeding the 75th percentile cutoff point for each specific averaging time, in addition to the other listing criteria previously mentioned (in bold in **Table 4a**). This approach and proposed cutoff points were regarded by staff as reasonably inclusive, while providing a significant reduction in the current SL list (guiding concept #1). Following ATW consideration and discussion at several meetings through the 8th meeting on August 1st, 2013, the utilization of the 75th percentile of the distribution for each ITSL averaging time appeared to gain acceptance by many Members, pending a final Workgroup recommendation. It should be noted that the updated ITSL cutoff values appear in **Table 4b and Table 7** and in the document on the ATW website, “Proposed TAC List, August Update”.

Authority to Address Unlisted Air Toxics in PTI Applications

If the current TAC definition were to be changed to some defined list, then a key issue would be the DEQ’s authority to address air toxics concerns that may arise for unlisted air toxics that are proposed for emission in a PTI application. A review of the authority of other state’s air agencies, and of other MDEQ divisions, to address unlisted substances, is summarized in **Table 6**. It was proposed for discussion purposes that AQD adopt rule

language similar to that of MDEQ-WRD in **Table 6**. Following Workgroup discussion of issue A-1(9) regarding Rule 228, the Workgroup drafted a recommendation to retain Rule 228 with the addition of clarifying language, and a Member proposed that non-TACs could also be addressed by the AQD as appropriate under this authority.

ITSLs With 1 Hour Averaging Times

Upon review of the proposed TAC list and ITSL cutoffs (**Table 4a**), it was noted that the 75th %ile cutoff value for the 1 hr AT ITSLs (300 µg/m^3) was not as high as for the 8 hr or 24 hr ITSLs. Staff responded that this group presumably has a relatively lower ITSL distribution because it includes a relatively more acutely toxic subset of the substances that have TLV occupational exposure levels. A Member asked staff to evaluate the chemicals with 1 hr AT ITSLs that do not meet the criteria for TAC listing; if they raise concerns, then it may be an option to include them in the TAC list. Staff evaluated this list of 33 chemicals; eight have 1 hr AT ITSLs above the 75th %ile value of 300 µg/m^3. Of these eight, one (methylene chloride) is a carcinogen and therefore will be on the TAC list. Another (hydrogen chloride) will be on the TAC list because it also has an annual AT ITSL (20 µg/m^3) that is below the 75th %ile cutoff for the annual AT. Staff do not feel that the remaining six raise particular concerns for being unlisted, therefore, it is proposed to not make an exception to the 75th percentile cutoff for these chemicals:

Chemical	**CAS #**	**1 hr AT ITSL (µg/m^3)**	**Other ITSL**
Ethylene glycol	107-21-1	1000	
Hexylene glycol	107-41-5	1210	
Methanol	67-56-1	3250	
Isoamyl acetate	123-92-2	5300	2700 µg/m^3 (8 hr AT); this is above the 75th %ile.
Trichlorofluoromethane	75-69-4	56200	
Hfc-227ea	431-89-0	5560000	130000 (annual AT); this is above the 75th %ile cutoff.

Listing of Chemical Groups

The Workgroup discussed how the EPA HAPs list contains chemical groups for metals, and also for glycol ethers, cyanide compounds, POM (polycyclic organic matter), etc. The listing of chemical groups gives the impression of a smaller list size. There are 187 HAPs including the chemical groups, but the actual size of the list of specific HAP chemicals is much larger. The inclusion of chemical groups in a regulatory list can enable a regulatory agency to add chemicals to the list (as new members of a listed group) very efficiently, but

this diminishes the goal of a list to be clear and as specific as possible. The Workgroup favored the clarity of specific chemical listings rather than the use of some of the groups as in EPA's HAPs list, although it is recognized that this contributes to a longer list than if groups were listed. Therefore, the proposed list includes *specific* PAHs and glycol ether compounds, etc., if they meet the criteria for listing. Regarding metal compounds, staff feels that in some cases these compounds should be listed separately, because toxicity (and the magnitude of the health protective screening level) is dependent on the specific metal compound. However, in other cases, different compounds of the same metal have toxicity that is primarily determined by the metal alone. In these cases, it seems inappropriate to list the metal forms individually, and then apply a footnote directing that their emissions and impacts should be evaluated additively (with adjustment of the MW to the atomic weight of the metal) for comparison to the screening level. Therefore, staff anticipates that some metals may be appropriately listed as a TAC group. The current SL list, and draft proposed TAC list, include some specific metal compounds that may be grouped together in the future, pending further review. For example, an initial review has tentatively identified the following cases where further assessment is warranted:

"Antimony and antimony compounds" may consolidate 5 current listings.
"Cobalt and cobalt compounds" may consolidate 3 current listings.
"Copper and copper compounds" may consolidate 4 current listings.
"Magnesium and magnesium compounds" may consolidate 7 current listings.
"Manganese and manganese compounds" may consolidate 4 current listings.
"Molybdenum water soluble compounds" may consolidate 3 current listings.
"Molybdenum water insoluble compounds" may consolidate 3 current listings.

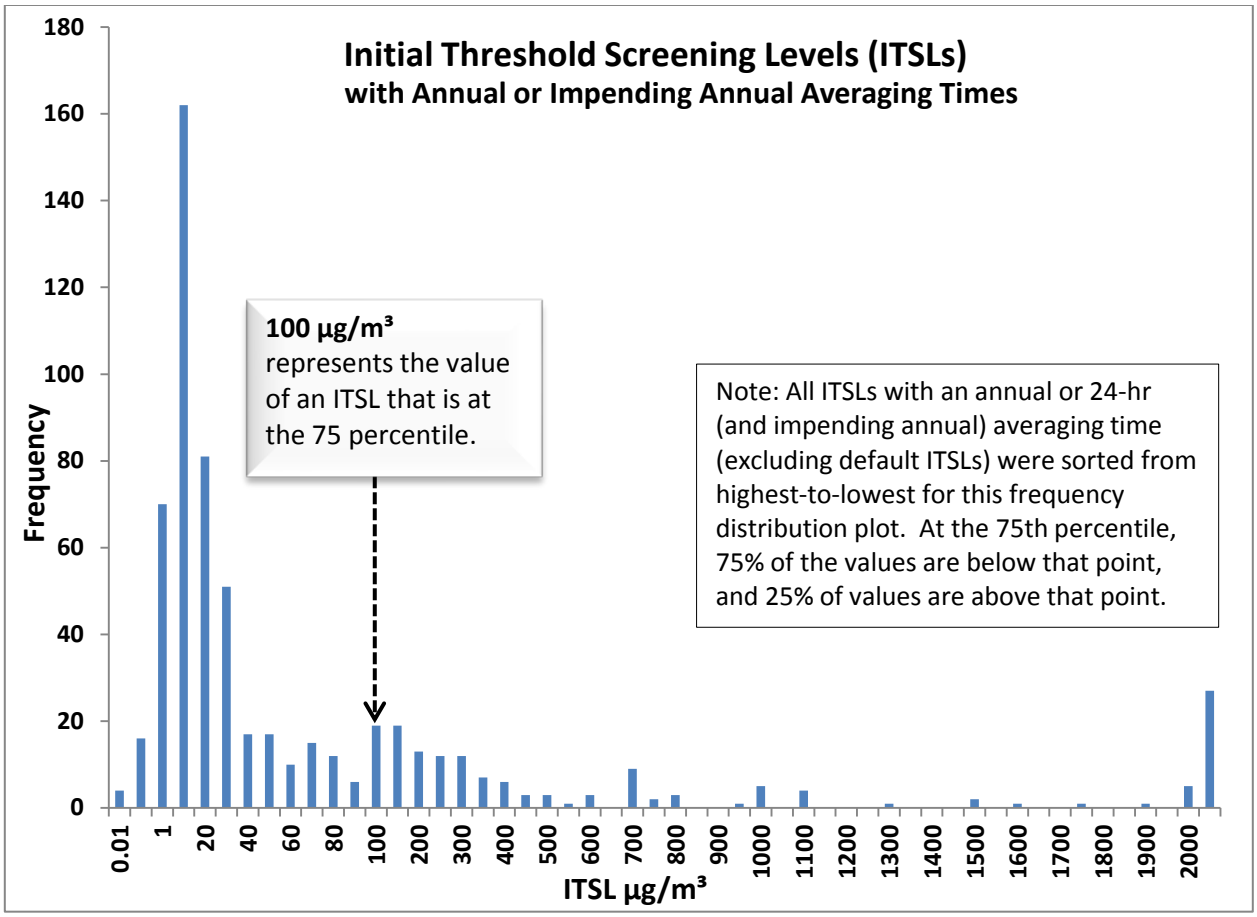
Merging of the Current Annual AT ITSLs With the Current RfC- and RfD-Based 24-Hour AT ITSLs That Are Anticipated To Change to Annual AT

Concurrent with addressing the TAC list issue, the Workgroup explored the ORR Report's Recommendation A-1(7): Make acceptable exposure limits consistent with other nearby states. As a result of that discussion, the Workgroup is recommending that AQD utilize a default annual averaging time (AT) rather than a 24 hour AT for ITSLs that are based on the EPA RfC and RfD methodologies. AQD is agreeable to making that change. Therefore, for those chemicals, the change in AT from 24 hours to annual may be regarded as "impending". However, this issue crosses over to the "TAC List" issue, because the proposed TAC list criteria include ITSL cutoff values set at the 75th percentile level for each AT. Those 75th percentile values are statistically determined based on the distribution of all of the non-default ITSLs for each AT. Previous estimates (e.g., the April 2013 statistics in **Table 4A**) of the 75th percentiles, TAC list size, and the TAC list of chemicals were based on the *current* ATs and 75th percentiles, and did not account for this

impending change in ATs. Further, the proposed draft rule language for the TAC list issue will include specific ITSL cutoff values. Therefore, it seems appropriate and necessary to address this impending change in the ATs so that the specific ITSL cutoff values in the draft proposed rules will reflect the AT change. In other words, the ITSL cutoff values for both annual and 24 hour ATs in the proposed draft rules should reflect that impending change. Also, there was a concern that making that change could significantly change the 75^{th} percentile cutoff values, and potentially cause a significant change in the number of chemicals proposed for the TAC list.

Staff recognized this issue and completed the evaluation of this AT change after the August 1, 2013 ATW meeting. After all ITSLs with a current 24 hour AT based on the EPA RfC or RfD methodologies are changed to annual AT, only eight chemicals will still have a 24 hour AT ITSL. The characteristics of that group are described in **Table 7**. The previous 75^{th} percentile cutoff values and the number of chemicals in the proposed draft TAC list are also presented for comparison in **Table 7**. Although the AT conversion results in a relatively small set of chemicals (n=8) that will have 24 hr AT ITSLs, the ITSLs in that group are well distributed (ranging from 2 $\mu g/m^3$ to 10000 $\mu g/m^3$), and the 75^{th} %ile cutoff did not change greatly (an increase from 420 to 522 $\mu g/m^3$).

Based on these findings, it is proposed that the draft TAC list rules utilize the cutoffs that result from the conversion of the ITSL ATs as described above. The effect of merging the two groups (those with current annual AT ITSLs, and those with an impending AT change from 24 hours to annual AT) is an increase in the cutoff from 43 $\mu g/m^3$ to 100 $\mu g/m^3$ for the annual AT. The effect of this change is the inclusion of chemicals that currently have annual AT ITSLs that are above the prior annual AT cutoff of 43 $\mu g/m^3$, but which are at or below the new cutoff of 100 $\mu g/m^3$. Another effect of this change is the exclusion of chemicals that have current 24 hr AT ITSLs below the prior 24 hr AT cutoff of 420 $\mu g/m^3$, but above the new annual AT cutoff of 100 $\mu g/m^3$. The overall net effect of these changes is a small increase in the total list of TACs (a change from 750 to 756 chemicals). This is further described in **Table 7**. The graph below helps to visualize the distribution of the merged annual AT ITSLs, and the 75^{th} percentile cutoff value.



Other Chemical Listing Discussions

In addition to the above criteria, procedures, and discussions, the ATW discussed the listing of two perfluorinated compounds (PFOS, CAS# 1763-23-1; and PFOA, CAS# 335-67-1), crystalline silica (from sources not meeting the current TAC list exemption; CAS# 14808-60-7), carcinogenic PAHs, and asphalt fumes (CAS# 8052-42-4) (see **Table 5**). Also, a Member requested that methyl isocyanate (CAS# 624-83-9) be added to the proposed TAC list due to high toxicity and the potential that it could occur in a future permit application. Although mercury (CAS# 7439-97-6) does not have a SL, the SL list has a footnote indicating that a benchmark for inhalation of elemental mercury (0.3 µg/m^3) would meet the cutoff criterion; mercury is included in the future TAC list.

Proposed TAC List and Procedure

The proposed TAC list, based on the above criteria, procedure, and discussions, is **756 chemicals**. This may be anticipated to change somewhat due to the routine updating of chemical risk assessments, the evaluation of "new" air toxics in permit applications, the potential consolidation of some metal compounds, etc. Further statistical information and a spreadsheet showing all *current* TACs, and the basis for chemicals meeting or not meeting the criteria for the *proposed future* TAC list, are available on the ATW website in an August 13, 2013 document, "Proposed TAC List, August 2013". The spreadsheet

includes a notation for the chemicals that currently have 24 hr AT ITSLs but with an impending change to an annual AT. The spreadsheet reflects the updated 75th %ile cutoff values as listed in **Table 4b** and **Table 7**.

Table 2. HAPs without SLs.

Chemical and CAS #	Toxics Unit File Review Comments
Acetamide 60-35-5	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
2-acetylaminofluorene 53-96-3	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
4-aminobiphenyl 92-67-1	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
o-anisidine 90-04-0	O-anisidine hydrochloride (134-29-2) has an IRSL. Therefore, include it in the TAC list.
Benzotrichloride (trichlorotoluene) 98-07-7	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Calcium cyanamide 156-62-7	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Captan 133-06-2	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Carbaryl 63-25-2	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Catechol 120-80-9	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Chloramben 133-90-4	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Chlordane 57-74-9	Chlordane (technical) (12789-03-6) has an ITSL and IRSL. Therefore, it is proposed to include it in the TAC list.
Chloroacetic acid 79-11-8	This was evaluated for at least one NSR permit. Therefore, it is proposed to list it as a TAC.
Chlorobenzilate 510-15-6	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Chloromethyl methyl ether 107-30-2	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
2,4-D, salts and esters 94-75-7	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
DDE 3547-04-4	DDD(TDE; 72-54-8), DDE(p,p'; 72-55-9) and DDT(50-29-3) have IRSLs. Therefore, it is proposed to include it in the TAC list.
Diazomethane 334-88-3	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
3,3-dimethoxybenzidine 119-90-4	This was evaluated for at least one NSR permit. Therefore, it is proposed to list it as a TAC.
Dimethyl aminoazobenzene 60-11-7	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
3,3'-dimethyl benzidine 119-93-7	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Dimethyl carbamoyl chloride	There is no indication of a review for NSR permitting,

79-44-7	therefore, it is proposed to not include it in the TAC list.
1,1-dimethyl hydrazine 57-14-7	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
1,2-diphenylhydrazine 122-66-7	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Ethyl carbamate (Urethane) 51-79-6	This was evaluated for at least one NSR permit. Therefore, it is proposed to list it as a TAC.
Ethylene imine (Aziridine) 151-56-4	This was evaluated for at least one NSR permit. Therefore, it is proposed to list it as a TAC.
Hexamethylphosphoramide 680-31-9	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Hydroquinone 123-31-9	This was evaluated for at least one NSR permit. Therefore, it is proposed to list it as a TAC.
Lindane (all isomers) 58-89-9	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Methoxychlor 72-43-5	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Methyl iodide (Iodomethane) 74-88-4	This was evaluated for at least one NSR permit. Therefore, it is proposed to list it as a TAC.
Methyl isocyanate 624-83-9	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
4,4-methylene bis(2-chloroaniline) 101-14-4	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
4,4'-methylenedianiline 101-77-9	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
4-nitrobiphenyl 92-93-3	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
N-Nitrosomorpholine 59-89-2	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Parathion 56-38-2	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
p-Phenylenediamine 106-50-3	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Phthalic anhydride 85-44-9	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
beta-Propiolactone 57-57-8	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Propoxur (Baygon) 114-26-1	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Quinone (p-benzoquinone) 106-51-4	This was evaluated for at least one NSR permit. Therefore, it is proposed to list it as a TAC.
Styrene oxide 96-09-3	Styrene (also a HAP) has an IRSL. Styrene is metabolized to styrene oxide. Both are reasonably anticipated to be human carcinogens (NTP Report on Carcinogens, 12th Ed.). Therefore, RETAIN on TAC list.

Titanium tetrachloride 7550-45-0	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
2,4-toluene diamine 95-80-7	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Trifluralin 1582-09-8	There is no indication of a review for NSR permitting, therefore, it is proposed to not include it in the TAC list.
Lead compounds	Lead is a criteria pollutant; exempted from TAC defn.
Radionuclides (including radon)	A 1994 DEQ policy determination was that there were sufficient regulations by NRC, EPA, and MDCH, such that additional AQD permitting requirements would be unnecessary and duplicative.
Polycyclic organic matter (POM)	The TAC list should include specific compounds, for clarity, if they meet criteria (ITSLs or carcinogenicity).
Glycol ethers	The TAC list should include specific compounds, for clarity, if they meet criteria (ITSLs).

Table 3. De-listed EPA HAPs.

Delisted HAP	**Date of delisting**	**AQD ITSL (µg/m^3; AT) or RfC**	**comments**
Caprolactam	6/18/96	10 µg/m^3 (8 hr AT)	
Surfactant alcohol ethoxylates and their derivatives (SAED) (in glycol ethers HAP category)	8/2/2000	Ethylene glycol ether 2-methoxy-1-propanol (a non-SAED) used as a conservative surrogate to derive an RfC-like benchmark of 200 to 2000 µg/m^3 for SAEDs.	A hypothetical facility emission rate of 105 lbs total SAEDs/year was used in the petition for de-listing, and was relied upon in EPA's review.
Ethylene glycol monobutyl ether (2-butoxyethanol) (in glycol ethers HAP category)	11/29/04	1600 µg/m^3 (24 hr AT)	
Methyl ethyl ketone	12/19/05	5000 µg/m^3 (24 hr AT)	

Table 4a. ITSL value distribution (as of April, 2013). All values are in units of µg/m^3. (These statistics are based on only the air toxics with data-derived final SLs, i.e., excluding chemicals with only default-based ITSLs).

ITSL group	Mean	50th %ile	75th %ile	90th %ile	95th %ile	99th %ile
All ITSLs	1375	24	140	1956	5000	23800
HAPs only	626	14.5	100	1000	3088	13572
Non-HAPs only	1547	28	140	2300	5450	42850
Annual AT only	482	14	**43**	140	300	1363
24 hr AT only	1789	60	**420**	2600	6000	46600
8 hr AT only	2760	86	**2850**	6020	16710	30482
1 hr AT only	2741	15	**290**	1168	3046	44551

Table 4b. Updated 75th percentile values (as of August, 2013) reflecting the change in averaging time from 24 hours to annual for ITSLs based on the RfC or RfD methodologies. All values are in units of µg/m^3. (These statistics are based on only the air toxics with data-derived final SLs, i.e., excluding chemicals with only default-based ITSLs).

Averaging Time	75th Percentile of Distribution (µg/m^3)
1 hr	**300**
8 hr	**2330**
24 hr	**522**
Annual	**100**

Table 5. Additional air toxics (n=23) that are not on the TAC SL list, which are proposed to be added to the future TAC list:

Substance	Comments on why there is no SL, but that listing as a TAC would be appropriate
Crystalline silica (14808-60-7)	Not a HAP. Some sources of crystalline silica are exempt from TAC definition. (AQD has recently set an ITSL at 3 µg/m^3 (annual AT)). Proposed to place it on the TAC list. The current TAC list exemption for certain sources would remain.
Asphalt fumes (8052-42-4)	Not a HAP as a mixture. The fumes contain carcinogens, but there is no IRSL for the mixture due to lack of a key study on the mixture. Based on a 1995 Scientific Advisory Panel recommendation, AQD has regulated the mixture utilizing the EPA RPFs for carcinogenic PAHs (see also below). Proposed to list this mixture as a TAC with an explanatory footnote (only) that would help clarify the regulatory approach.
Carcinogenic PAHs (n=19, in addition to those meeting other listing criteria)	The PAHs are HAPs as "POM." The EPA's risk assessment of the carcinogenic PAH group is currently in transition. The 1993 EPA guidance for the group is currently still in use by MDEQ (there are 7 carcinogenic PAHs, including B(a)P and 6 with Relative Potency Factors (RPFs) relative to B(a)P). CalOEHHA regulates 21 carcinogenic PAHs with RPFs. EPA has drafted a new scheme, with 25 carcinogenic PAHs with nonzero RPFs (including B(a)P); they are currently addressing the SAB review comments on that draft (http://yosemite.epa.gov/sab/sabproduct.nsf/0/E65D909C98520C1D85257501005E46AE?OpenDocument). Currently, 16 do **not** have SLs. **Three** additional PAHs have evidence of carcinogenicity, have CalOEHHA RPFs, and are not on the current SL list. Therefore, **19** additional substances for the TAC list are proposed, for this group. (In the 5/13/13 spreadsheet of potential TACs, the basis for listing = "Carc7" (n=7), "EPA Carc" (n=16), or "CAL Carc" (n=3).
Perfluorinated compounds (PFCs): PFOS and PFOA (n=2)	Perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) are persistent bioaccumulative toxics (PBTs) that have been identified by MDEQ as emerging contaminants of concern. (http://www.michigan.gov/deq/0,4561,7-135-3308-266777--,00.html). PFCs have recently been detected in Michigan groundwater and in several species of aquatic and terrestrial wildlife. Although the presence of PFCs in air emission sources subject to NSR permitting has not yet been characterized, it is proposed that these two PFCs be listed as TACs. (In the 8/13/13 spreadsheet of potential TACs, the basis for listing = "Emerging".

Table 6. Authority to address unlisted substances.

Agency	Description of authority
MDEQ-Water Resources Division (WRD)	NREPA Part 8 rules regulate surface water discharges of "toxic substances," which are defined as those included in three lists of substances (several hundred) and, **"Any other toxic substances that the department determines are of concern at a specific site."**
MDEQ-Remediation and Redevelopment Division (RRD)	NREPA Part 201 rules define "hazardous substance" as three lists of substances (several hundred), and, **"Any substance that the department demonstrates, on a case by case basis, poses an unacceptable risk to the public health, safety, or welfare, or the environment, considering the fate of the material, dose-response, toxicity, or adverse impact on natural resources."**
Ohio EPA - Air	Ohio EPA has a list of 303 chemicals/classes of regulated air toxics. Language in administrative code and in rules gives authority for their Director to evaluate unlisted air toxics (personal communication with Paul Koval, 2/21/13).
Wisconsin DNR - Air	There are 535 listed "hazardous air contaminants" substances/groups; this was established in 2004, based on criteria specified in their code. Authority to address unlisted substances: **"Code: NR 445.03 General limitations. No person may cause, allow or permit emissions into the ambient air of any hazardous substance in a quantity or concentration or for a duration that is injurious to human health, plant or animal life unless the purpose of that emission is for the control of plant or animal life. Hazardous substances include but are not limited to the hazardous air contaminants listed in Tables A to C of s. NR 445.07."**
Minnesota PCA - Air	MN does not have a defined list of regulated air toxics. Statute: **"The Pollution Control Agency may issue, continue in effect or deny permits, under such conditions as it may prescribe for the prevention of pollution, for the emission of air contaminants…"**

Table 7. The Effects of Converting the 24 Hour AT ITSLs Based on the RfD or RfC Methodologies to Annual AT ITSLs.

	May 13, 2013 Draft Discussion Paper	**Current Discussion Paper**	**Comments**
Number of chemicals with an annual AT ITSL	389	620	The current number reflects the conversion from 24 hr AT to annual AT for all RfC- and RfD-based ITSLs.
Number of chemicals with a 24 hr AT ITSL	239	8	Same as above.
75^{th} %ile cutoff for annual AT ($\mu g/m^3$)	43	100	The current cutoff is significantly higher than previous, due to the new, larger group of chemicals in the annual AT group.
75^{th} %ile cutoff for 24 hr AT ($\mu g/m^3$)	420	522	The AT conversion will result in 8 remaining chemicals with a 24 hr AT. Only two of these 8 chemicals (TCE and tetrachloroethylene) have 24 hr AT ITSLs that are above the cutoff of 522 $\mu g/m^3$; they would be listed as TACs based on carcinogenicity.
Total TACs	**750**	**756**	

APPENDIX J:

POTENTIAL DEFINED TAC LIST

APPENDIX J: Proposed TAC List – August Update

Table 1. Percentiles of Initial Threshold Screening Levels			
Initial Threshold Screening Levels (ITSLs) Grouped by Averaging Time	**75th Percentile of ITSL Group**	**Count of 1st ITSL <75th%**	**Count of 2nd ITSL <75th%**
1 hr	300 µg/m³	18	7
8 hr	2330 µg/m³	135	10
24 hr	522 µg/m³	2	4
Annual	100 µg/m³	479	0
Note: Some Toxic Air Contaminant (TACs) have 2 ITSLs each with different averaging times. One or both ITSLs may be less than 75th percentile cutoff.			

Table 2. Basis for TACs on the Future Screening Level List	
Count only if "1st ITSL"	578
Count only if "1st ITSL, 2nd ITSL"	18
Count only if "1st ITSL, 2nd ITSL, Carc*"	3
Count only if "1st ITSL, Carc"	40
Count only if "Carc"	81
**Count only if "Added"	36
Total Number of Future TACs	756
* "Carc" = carcinogenic compounds. All carcinogenic TACs have Initial Risk Screening Levels (IRSLs), except Asphalt Fumes.	
**Note: Asphalt fumes and crystalline silica were listed as "carc" and "1st ITSL", respectively, therefore, are counted in those groups above, despite being technically "Added".	

Table 3. Other Information	
Total number of compounds evaluated	1231
1st ITSL <75%	639
2nd ITSL <75%	21
*TACs removed from List	475
Default ITSLs	289
Added TACs	38
Number of TACs that had 24 hr averaging time, but were converted to annual averaging time	231
Number of TACs with annual averaging time that were previously 24 hr averaging time AND had values < 75th percentile, therefore are on the new TAC list	139
**IRSLs	123
IRSLs with no ITSLs <75th%	80
*TACs with ITSL values that were either: (1) greater than 75th percentile OR (2) default ITSL, AND there was no other reason for including in a new list of TACs.	
**All TACs with IRSLs are included in the new screening level list.	

Table 4. Current and Proposed MDEQ Air Quality Division Screening Level List of Toxic Air Contaminants

NEW AvgT "annual" Some ITSLs with 24-hr avg. time were converted to annual avg. because ITSL was derived to protect for chronic effects.

CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
--	100 sxl	NO		default	0.1	annual					
--	2-(1-ethoxyethoxy)-6-(trifluoromethyl)-benzenethiol	NO		default	0.1	annual					
--	2-mercapto-3-(trifluoromethyl)-phenol	NO		default	0.1	annual					
--	4-chloro-2-ethyoxy-6-fluoropyrimidine	NO		default	0.1	annual					
--	atlox 848	NO		default	0.1	annual					
--	cyclic (phme)2(me)2, d4	NO		default	0.1	annual					
--	cyclopentyldichlorosilane	NO		default	0.1	annual					
--	dicyclopentyldichlorosilane	NO		default	0.1	annual					
--	disiloxane	NO		default	0.1	annual					
--	ethomeen t/30	NO		default	0.1	annual					
--	heptamethyl-1-vinyl-1,7-dichlorotetrasilazane	NO		default	0.1	annual					
--	n-chloro-2,6-difluorobenzamide	NO		default	0.1	annual					
--	sponto 11	NO		default	0.1	annual					
--	sponto 723	NO		default	0.1	annual					
--	t-det c-40	NO		default	0.1	annual					
--	witconol al 69-66	NO		default	0.1	annual					
--	o-(1-ethoxyethyl)-2-(propylthio)-3-(trifluoromethyl)phenol	NO		default	0.1	annual					
--1	biosam tp-1.5	YES	1st ITSL		0.02	1 hr	YES				
--2	purafect 4000g	YES	1st ITSL		0.02	1 hr	YES				
--3	fyre-zyme	YES	1st ITSL		0.15	annual	YES				
--4	1,1,2,4-tetramethyl-1-1-1-sila-2-aza-cyclopentane	YES	1st ITSL		0.7	annual	YES				
--5	epoxy resin solution	YES	1st ITSL		6	annual	YES				
--6	n-butylglucamine	YES	1st ITSL		6.4	annual	YES				

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
--7	polyglycol 26-3	YES	1st ITSL		16	annual	YES				
--8	ad acid	YES	1st ITSL		17	annual	YES				
--9	triethylammonium suleptanate	YES	1st ITSL		17	annual	YES				
-1-0	amyl acetate (mixture)	NO		>75th%	1100	annual*					
50-00-0	formaldehyde	YES	1st ITSL, Carc		9	8 hr	YES				0.08
50-03-3	hydrocortisone acetate	YES	1st ITSL		15	annual	YES				
50-21-5	lactic acid	YES	1st ITSL		7	annual	YES				
50-28-2	estradiol	NO		default	0.1	annual					
50-29-3	ddt	YES	Carc								0.01
50-32-8	benzo(a)pyrene	YES	Carc								0.0005
51-28-5	2,4-dinitrophenol	YES	1st ITSL		7	annual*	YES				
51-79-6	Ethyl carbamate (Urethane)	YES	HAP Table 2								
53-36-1	methyl predisolone acetate	YES	1st ITSL		43	annual	YES				
53-70-3	Dibenz(a,h)anthracene	YES	Carc7								
56-23-5	carbon tetrachloride	YES	1st ITSL, Carc		100	annual*	YES				0.17
56-49-5	3-methyl cholanthrene	YES	Cal Carc								
56-55-3	benz(a)anthracene	YES	Carc7								
56-81-5	glycerol	YES	1st ITSL		100	8 hr	YES				
57-11-4	stearic acid	YES	1st ITSL		100	8 hr	YES				
57-12-5	cyanide	YES	1st ITSL		50	1 hr	YES				
57-15-8	chlorobutanol	NO		default	0.1	annual					
57-41-0	phenytoin	YES	Carc								0.07
57-55-6	propylene glycol	NO		>75th%	6000	annual					
57-83-0	progesterone	NO		default	0.1	annual					
57-97-9	7,12-dimethyl benzanthracene	YES	Cal Carc								
58-36-6	10,10'-oxybisphenoxarsine oxide	YES	1st ITSL		0.2	annual	YES				

Table 4. Current and Proposed MDEQ Air Quality Division Screening Level List of Toxic Air Contaminants

NEW AvgT "annual" Some ITSLs with 24-hr avg. time were converted to annual avg. because ITSL was derived to protect for chronic effects.

CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
60-29-7	ethyl ether	NO		>75th%	12000	8 hr					
60-34-4	methyl hydrazine	YES	1st ITSL, Carc		0.03	annual*	YES				0.0087
60-57-1	dieldrin	YES	Carc								0.0002
62-53-3	aniline	YES	1st ITSL, 2nd ITSL, Carc		1	annual	YES	76	8 hr	YES	0.6
62-73-7	dichlorvos	YES	1st ITSL		0.5	annual*	YES				
62-75-9	n-nitrosodimethylamine	YES	Carc								7E-05
63-05-8	androstenedione	YES	1st ITSL		17	annual	YES				
64-02-8	ethylenediamine tetra-acetic acid, tetrasodium salt	NO		default	0.1	annual					
64-04-0	beta phenylethylamine	NO		default	0.1	annual					
64-17-5	ethyl alcohol	NO		>75th%	19000	8 hr					
64-18-6	formic acid	YES	1st ITSL		2	annual*	YES				
64-19-7	acetic acid	YES	1st ITSL		250	8 hr	YES				
64-67-5	diethyl sulfate	YES	1st ITSL		1	annual	YES				
66-25-1	hexanaldehyde	YES	1st ITSL		2	annual	YES				
67-56-1	methanol	NO		>75th%	3250	1 hr					
67-63-0	isopropyl alcohol	NO		>75th%	220	annual*					
67-64-1	acetone	NO		>75th%	5900	8 hr					
67-66-3	chloroform	YES	Carc								0.4
67-68-5	dimethylsulfoxide	YES	1st ITSL		20	annual	YES				
67-72-1	hexachloroethane	YES	1st ITSL, 2nd ITSL, Carc		30	annual	YES	1600	8 hr	YES	0.1
68-12-2	N,N-dimethylformamide	YES	1st ITSL		30	annual*	YES				
71-23-8	n-propyl alcohol	NO		>75th%	730	annual					
71-36-3	n-butanol	NO		>75th%	350	annual*					

Table 4. Current and Proposed MDEQ Air Quality Division Screening Level List of Toxic Air Contaminants

NEW AvgT "annual" Some ITSLs with 24-hr avg. time were converted to annual avg. because ITSL was derived to protect for chronic effects.

CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
71-41-0	amyl alcohol	NO		>75th%	120	annual					
71-43-2	benzene	YES	1st ITSL, 2nd ITSL, Carc		30	annual	YES	**30**	**24 hr**	**YES**	0.1
71-55-6	methyl chloroform	NO		>75th%	6000	annual*					
72-54-8	DDD (TDE)	YES	Carc								0.01
72-55-9	DDE, p,p'-	YES	Carc								0.01
74-83-9	methyl bromide	YES	1st ITSL		5	annual*	YES				
74-85-1	ethylene	NO		>75th%	6240	annual*					
74-87-3	methyl chloride	YES	1st ITSL, Carc		90	annual*	YES				1.6
74-88-4	Methyl iodide (Iodomethane)	YES	HAP Table 2								
74-89-5	methylamine	YES	1st ITSL		64	8 hr	YES				
74-90-8	hydrogen cyanide	YES	1st ITSL, 2nd ITSL		0.8	annual	YES	50	1 hr	YES	
74-93-1	methyl mercaptan	YES	1st ITSL		10	1 hr	YES				
74-97-5	chlorobromomethane	NO		>75th%	10600	8 hr					
74-99-7	methyl acetylene	NO		>75th%	16500	8 hr					
75-00-3	ethyl chloride	NO		>75th%	10000	annual*					
75-01-4	vinyl chloride	YES	1st ITSL, Carc		100	annual*	YES				0.11
75-04-7	ethylamine	YES	1st ITSL		92	8 hr	YES				
75-05-8	acetonitrile	YES	1st ITSL		60	annual*	YES				
75-07-0	acetaldehyde	YES	1st ITSL, Carc		9	annual*	YES				0.5
75-09-2	methylene chloride	YES	Carc		2000	annual		14000	1 hr		60
75-12-7	formamide	YES	Carc		600	annual*					0.2
75-15-0	carbon disulfide	NO		>75th%	700	annual*					
75-18-3	dimethylsulfide	YES	1st ITSL		7	annual	YES				

Table 4. Current and Proposed MDEQ Air Quality Division Screening Level List of Toxic Air Contaminants

NEW AvgT "annual" Some ITSLs with 24-hr avg. time were converted to annual avg. because ITSL was derived to protect for chronic effects.

CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
75-21-8	ethylene oxide	YES	Carc								0.03
75-25-2	bromoform	YES	Carc								0.9
75-27-4	bromodichloromethane	YES	Carc								0.06
75-28-5	isobutane	NO		>75th%	23800	8 hr					
75-29-6	2-chloropropane	YES	1st ITSL		100	annual*	YES				
75-31-0	isopropylamine	YES	1st ITSL		120	8 hr	YES				
75-34-3	1,1-dichloroethane	NO		>75th%	500	annual*					
75-35-4	vinylidene chloride (1,1-dichloroethylene)	NO		>75th%	200	annual*					
75-36-5	acetyl chloride	NO		default	0.1	annual					
75-37-6	1,1-difluoroethane	NO		>75th%	40000	annual*					
75-38-7	vinylidene fluoride	YES	1st ITSL		30	annual*	YES				
75-44-5	phosgene	YES	1st ITSL		0.3	annual*	YES				
75-45-6	chlorodifluoromethane	NO		>75th%	50000	annual*					
75-50-3	trimethylamine	YES	1st ITSL		120	8 hr	YES				
75-52-5	nitromethane	YES	1st ITSL, Carc		70	annual*	YES				0.1
75-54-7	methyldichlorosilane	YES	1st ITSL		4	annual	YES				
75-55-8	1,2-propylenimine	YES	1st ITSL		5	8 hr	YES				
75-56-9	propylene oxide	YES	1st ITSL, Carc		30	annual*	YES				0.3
75-64-9	t-butylamine	YES	1st ITSL		60	annual	YES				
75-65-0	t-butanol	NO		>75th%	1890	annual*					
75-68-3	1-chloro-1,1-difluoroethane	NO		>75th%	50000	annual*					
75-69-4	trichlorofluoromethane	NO		>75th%	56200	1 hr					
75-71-8	dichlorodifluoromethane	NO		>75th%	49500	8 hr					
75-75-2	methane sulfonic acid	YES	1st ITSL		1.4	annual	YES				
75-76-3	tetramethylsilane	NO		>75th%	1300	annual					
75-77-4	trimethylchlorosilane	YES	1st ITSL		6	annual	YES				

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
75-78-5	dimethyldichlorosilane	YES	1st ITSL		6.2	annual	YES				
75-79-6	methyltrichlorosilane	NO		>75th%	109	annual					
75-94-5	vinyltrichlorosilane	YES	1st ITSL		7	annual	YES				
76-05-1	trifluoroacetic acid	YES	1st ITSL		8	annual	YES				
76-13-1	1,1,2-trichloro-1,2,2-trifluoroethane	NO		>75th%	19140	annual*					
76-14-2	dichlorotetrafluoroethan	NO		>75th%	69000	8 hr					
76-44-8	heptachlor	YES	Carc								0.0008
76-83-5	triphenyl methyl chloride	YES	1st ITSL		17	annual	YES				
77-47-4	hexachlorocyclopentadiene	YES	1st ITSL		0.2	annual*	YES				
77-48-5	1,3-dibromo-5,5-dimethylhydantoin	YES	1st ITSL		2	8 hr	YES				
77-58-7	dibutyl tin dilaurate	YES	1st ITSL		5	8 hr	YES				
77-73-6	dicyclopentadiene	YES	1st ITSL		1	annual*	YES				
77-76-9	2,2-dimethoxypropane	NO		default	0.1	annual					
77-78-1	dimethyl sulfate	YES	1st ITSL		0.5	8 hr	YES				
77-93-0	triethyl citrate	NO		>75th%	290	annual					
78-07-9	ethyltriethoxysilane	YES	1st ITSL		44	annual	YES				
78-10-4	ethyl silicate	YES	1st ITSL		850	8 hr	YES				
78-59-1	isophorone	YES	1st ITSL, Carc		280	1 hr	YES				3.7
78-78-4	2-methyl butane	NO		>75th%	17700	8 hr					
78-79-5	isoprene	YES	Carc								0.02
78-83-1	isobutyl alcohol	YES	1st ITSL		1500	8 hr	YES				
78-84-2	isobutyraldehyde	NO		>75th%	160	annual*					
78-87-5	propylene dichloride	YES	1st ITSL		4	annual*	YES				
78-92-2	sec-butanol	NO		>75th%	3000	8 hr					
78-93-3	methyl ethyl ketone	NO		>75th%	5000	annual*					
78-96-6	monoisopropanolamine	YES	1st ITSL		15	annual	YES				
79-00-5	1,1,2-trichloroethane	YES	Carc								0.06

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
79-01-6	trichloroethylene	YES	1st ITSL, Carc		2	annual	YES	10000	24 hr		0.2
79-06-1	acrylamide	YES	1st ITSL, Carc		6	annual*	YES				0.005
79-09-4	propionic acid	YES	1st ITSL		300	8 hr	YES				
79-10-7	acrylic acid	YES	1st ITSL		1	annual*	YES				
79-11-8	Chloroacetic acid	YES	HAP Table 2								
79-14-1	hydroxyacetic acid/ glycolic acid	YES	1st ITSL		4	annual	YES				
79-20-9	methyl acetate	NO		>75th%	6100	8 hr					
79-24-3	nitroethane	YES	1st ITSL		60	annual*	YES				
79-29-8	2,3-dimethylbutane	NO		>75th%	3500	8 hr					
79-31-2	isobutyric acid	YES	1st ITSL		0.9	annual	YES				
79-34-5	1,1,2,2-tetrachloroethane	YES	Carc								0.02
79-41-4	methacrylic acid	YES	1st ITSL		30	annual*	YES				
79-46-9	2-nitropropane	YES	1st ITSL, Carc		20	annual*	YES				0.0004
79-92-5	camphene	YES	1st ITSL		80	annual	YES				
80-15-9	cumene hydroperoxide	YES	1st ITSL		6	annual*	YES				
80-43-3	dicumyl peroxide	NO		default	0.1	annual					
80-56-8	pinene, alpha	YES	1st ITSL		1120	8 hr	YES				
80-62-6	methyl methacrylate	NO		>75th%	700	annual*					
80-73-9	n,n'-dimethylethyleneurea	NO		default	0.1	annual					
82-68-8	pentachloronitrobenzene	YES	1st ITSL		11	annual*	YES				
83-32-9	acenaphthene	NO		>75th%	210	annual*					
84-66-2	diethyl phthalate	YES	1st ITSL		50	8 hr	YES	2800	24 hr		
85-01-8	phenanthrene	NO		default	0.1	annual					
85-68-7	butyl benzyl phthalate	NO		>75th%	700	annual*					
86-73-7	fluorene	NO		>75th%	140	annual*					

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
86-74-8	carbazole	YES	Carc								0.4
87-61-6	1,2,3-trichlorobenzene	YES	1st ITSL		27	annual*	YES				
87-62-7	2,6-xylidine	YES	Carc								0.78
87-68-3	hexachlorobutadiene	YES	Carc								0.05
87-86-5	pentachlorophenol	YES	1st ITSL, Carc		20	annual*	YES				0.009
87-90-1	1,3,5-trichloroisocyanuric acid	YES	1st ITSL		2	annual	YES				
88-06-2	2,4,6-trichlorophenol	YES	Carc								0.3
88-12-0	n-vinylpyrrolidinone	YES	Carc								0.04
88-65-3	o-bromobenzoic acid	NO		default	0.1	annual					
88-73-3	1-chloro-2-nitrobenzene	YES	Carc								0.21
88-85-7	dinoseb	YES	1st ITSL		4	annual*	YES				
90-02-8	salicylaldehyde	YES	1st ITSL		30	annual	YES				
90-12-0	1-methyl naphthalene	YES	Carc		250	annual*					0.14
90-43-7	o-phenylphenol	YES	Carc								1.1
90-72-2	2,4,6-tri(dimethylaminomethyl)phenol	YES	1st ITSL		7	annual	YES				
91-01-0	benzhydrol	YES	1st ITSL		16	annual	YES				
91-17-8	decahydronaphthalene	YES	Carc								0.03
91-20-3	naphthalene	YES	1st ITSL, Carc		3	annual*	YES				0.08
91-22-5	quinoline	YES	Carc								0.001
91-44-1	7-diethylamino-4-methyl coumarin	YES	1st ITSL		16	annual	YES				
91-57-6	2-methylnaphthalene	YES	1st ITSL		10	annual	YES				
91-59-8	2-naphthylamine	YES	Carc								0.0001
91-94-1	dichlorobenzidine	YES	Carc								0.002
92-52-4	biphenyl	YES	1st ITSL		13	8 hr	YES				
92-87-5	benzidine	YES	Carc								2E-05
93-14-1	guaifenesin	YES	1st ITSL		5	annual	YES				

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
93-58-3	methyl benzoate	YES	1st ITSL		4	annual	YES				
93-59-4	peroxybenzoic acid	NO		default	0.1	annual					
93-83-4	oleoyl diethanolamine	YES	1st ITSL		3	annual	YES				
94-96-2	2-ethyl-1,3-hexanediol	YES	1st ITSL		30	annual	YES				
95-16-9	benzothiazole	YES	1st ITSL		1	annual	YES				
95-38-5	oyel hydroxyethylimidazoline	YES	1st ITSL		2	annual	YES				
95-47-6	o-xylene	YES	1st ITSL		100	annual*	YES				
95-48-7	o-cresol	YES	1st ITSL		100	8 hr	YES				
95-49-8	monochlorotoluene	YES	1st ITSL		70	annual*	YES				
95-50-1	1,2-dichlorobenzene	NO		>75th%	300	annual*					
95-51-2	2-chloroaniline	YES	1st ITSL		10	annual*	YES				
95-53-4	o-toluidine	YES	Carc								0.07
95-57-8	2-chlorophenol	YES	1st ITSL		18	annual*	YES				
95-63-6	1,2,4-trimethylbenzene	YES	1st ITSL, 2nd ITSL		50	annual	YES	1200	8 hr	YES	
95-65-8	3,4-dimethyl phenol	YES	1st ITSL		3.5	annual*	YES				
95-74-9	3-chloro-p-toluidine	YES	1st ITSL		2	annual	YES				
95-87-4	2,5-dimethylphenol	YES	1st ITSL		0.7	annual	YES				
95-93-2	1,2,4,5-tetramethyl benzene	YES	1st ITSL		20	annual	YES				
95-94-3	1,2,4,5-tetrachlorobenzene	YES	1st ITSL		1	annual*	YES				
95-95-4	2,4,5-trichlorophenol	NO		>75th%	350	annual*					
96-12-8	dibromochloropropane	YES	1st ITSL, Carc		0.2	annual*	YES				0.0001
96-14-0	3-methylpentane	NO		>75th%	3500	8 hr					
96-18-4	1,2,3-trichloropropane	YES	1st ITSL		0.3	annual*	YES				
96-23-1	1,3-dichloro-2-propanol	YES	1st ITSL, Carc		3	annual*	YES				0.07
96-29-7	methylethylketoxime	YES	Carc								2.5
96-33-3	methyl acrylate	YES	1st ITSL		70	annual*	YES				

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
96-37-7	methylcyclopentane	NO		>75th%	700	annual*					
96-45-7	ethylene thiourea	YES	1st ITSL, Carc		0.28	annual*	YES				0.01
96-48-0	gamma-butyrolactone	NO		>75th%	280	annual*					
96-49-1	ethylene carbonate	YES	1st ITSL		30	annual	YES				
96-80-0	diisopropylaminoethanol	YES	1st ITSL		4	annual	YES				
97-64-3	ethyl lactate	YES	1st ITSL		20	annual	YES				
97-85-8	isobutyl isobutyrate	NO		>75th%	300	annual					
97-86-9	isobutyl methacrylate	NO		>75th%	600	annual					
97-88-1	n-butyl methacrylate	NO		>75th%	569	annual					
97-95-0	2-ethyl butanol	YES	1st ITSL		40	annual	YES				
97-99-4	tetrahydrofuryl methanol	YES	1st ITSL		52	annual	YES				
98-00-0	furfuryl alcohol	YES	1st ITSL, Carc		1	annual*	YES				0.03
98-01-1	furfural	YES	Carc								0.06
98-06-6	tert-butylbenzene	YES	1st ITSL		10	annual	YES				
98-13-5	phenyltrichlorosilane	NO		default	0.1	annual					
98-17-9	m-trifluoromethylphenol	YES	1st ITSL		0.08	annual	YES				
98-29-3	t-butylcatechol	YES	1st ITSL		9	annual	YES				
98-56-6	p-chlorobenzotrifluoride	YES	1st ITSL		70	annual*	YES				
98-82-8	cumene	YES	Carc		400	annual*					0.1
98-83-9	alpha-methyl styrene	NO		>75th%	230	annual*					
98-84-0	dl-alpha phenylethylamine	YES	1st ITSL		3	annual	YES				
98-86-2	acetophenone	YES	1st ITSL		490	8 hr	YES				
98-95-3	nitrobenzene	YES	1st ITSL, Carc		9	annual*	YES				0.025
99-87-6	p-isopropyltoluene	YES	1st ITSL		10	annual	YES				
99-97-8	n,n-dimethyl-p-toluidine	YES	1st ITSL		28	annual	YES				
100-02-7	4-nitrophenol	YES	1st ITSL		0.7	annual	YES				

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100-06-1	4-methoxyacetophenone	NO		default	0.1	annual					
100-36-7	2-diethylaminoethylamine	YES	1st ITSL		9	annual	YES				
100-37-8	2-diethylaminoethanol (deae)	YES	1st ITSL		4	annual*	YES				
100-40-3	4-vinylcyclohexene	YES	1st ITSL		4	8 hr	YES				
100-41-4	ethylbenzene	YES	Carc		1000	annual*					3
100-42-5	styrene	YES	Carc		1000	annual*					1.7
100-44-7	benzyl chloride	YES	Carc								0.02
100-46-9	benzylamine	NO		default	0.1	annual					
100-51-6	benzyl alcohol	NO		>75th%	5000	annual*					
100-52-7	benzaldehyde	YES	Carc								0.4
100-85-6	benzyltrimethylammonium hydroxide	NO		default	0.1	annual					
100-97-0	hexamethylenetetramine	YES	1st ITSL		100	annual	YES				
101-68-8	methylene diphenyl diisocyanate	YES	1st ITSL		0.6	annual*	YES				
101-84-8	diphenyloxide	YES	1st ITSL		70	8 hr	YES				
102-69-2	tripropylamine	YES	1st ITSL		0.2	annual	YES				
102-71-6	triethanolamine	YES	1st ITSL		50	8 hr	YES				
102-76-1	triacetin	YES	1st ITSL		20	annual	YES				
102-79-4	butyldiethanolamine	YES	1st ITSL		14	annual	YES				
102-81-8	2-n-dibutylaminoethanol	YES	1st ITSL		28	annual*	YES				
102-82-9	tributylamine	YES	1st ITSL		7	annual	YES				
103-09-3	2-ethylhexyl acetate	YES	1st ITSL		15	annual	YES				
103-11-7	2-ethylhexyl acrylate	YES	1st ITSL		18	annual	YES				
103-23-1	di (2-ethylhexyl) adipate	YES	Carc								3
103-33-3	azobenzene	YES	Carc								0.03
103-63-9	2-bromoethyl benzene	YES	1st ITSL		3	annual	YES				
103-65-1	propylbenzene	YES	1st ITSL		20	annual	YES				
103-83-3	benzyl dimethylamine	YES	1st ITSL		30	annual	YES				
103-99-1	N-stearoyl-4-aminophenol	NO		default	0.1	annual					

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104-15-4	p-toluenesulfonic acid	NO		default	0.1	annual					
104-51-8	n-butylbenzene	YES	1st ITSL		30	annual	YES				
104-68-7	diethylene glycol monophenyl ether	YES	1st ITSL		7	annual	YES				
104-75-6	2-ethylhexylamine	NO		default	0.1	annual					
104-76-7	2-ethylhexanol	YES	1st ITSL		70	annual	YES				
104-78-9	n,n-diethyl-1,3-propanediamine	NO		>75th%	140	annual					
104-87-0	p-tolualdehyde	NO		>75th%	440	annual*					
105-39-5	ethyl chloroacetate	NO		default	0.1	annual					
105-53-3	diethylmalonate	YES	1st ITSL		50	annual	YES				
105-56-6	ethyl cyanoacetate	NO		default	0.1	annual					
105-58-8	diethyl carbonate	NO		>75th%	5000	annual*					
105-59-9	methyldiethanolamine	YES	1st ITSL		6	annual	YES				
105-60-2	caprolactam	YES	1st ITSL		10	8 hr	YES				
105-67-9	2,4-dimethylphenol	YES	1st ITSL		70	annual*	YES				
106-36-5	propyl propionate	YES	1st ITSL		84	annual	YES				
106-42-3	p-xylene	YES	1st ITSL		100	annual*	YES				
106-46-7	1,4-dichlorobenzene	YES	Carc		800	annual*					0.14
106-49-0	p-toluidine	YES	Carc								0.03
106-51-4	Quinone (p-benzoquinone)	YES	HAP Table 2								
106-79-6	dimethyl decanedioate	NO		default	0.1	annual					
106-88-7	1,2-butylene oxide	YES	1st ITSL, Carc		20	annual*	YES				1.2
106-89-8	epichlorohydrin	YES	1st ITSL, Carc		1	annual*	YES				0.8
106-91-2	glycidyl methacrylate	YES	1st ITSL, 2nd ITSL		0.8	annual	YES	**16**	**24 hr**	**YES**	
106-92-3	allyl glycidyl ether	YES	Carc								0.1
106-93-4	ethylene dibromide	YES	1st ITSL,		9	annual*	YES				0.002

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
			Carc								
106-94-5	propyl bromide	YES	1st ITSL		49	annual	YES				
106-97-8	butane	NO		>75th%	23800	8 hr					
106-99-0	1,3-butadiene	YES	1st ITSL, Carc		2	annual*	YES				0.03
107-00-6	ethylacetylene	NO		default	0.1	annual					
107-02-8	acrolein	YES	1st ITSL, 2nd ITSL		0.16	annual	YES	5	1 hr	YES	
107-03-9	1-propanethiol	YES	1st ITSL		16	1 hr	YES				
107-05-1	allyl chloride	YES	1st ITSL, 2nd ITSL		1	annual	YES	31	8 hr	YES	
107-06-2	1,2-dichloroethane	YES	Carc								0.04
107-10-8	propylamine	NO		>75th%	112	annual					
107-13-1	acrylonitrile	YES	1st ITSL, Carc		2	annual*	YES				0.01
107-15-3	ethylene diamine	YES	1st ITSL		0.03	annual	YES				
107-18-6	allyl alcohol	YES	1st ITSL		18	annual*	YES				
107-21-1	ethylene glycol	NO		>75th%	1000	1 hr					
107-31-3	methyl formate	YES	1st ITSL		1250	8 hr	YES				
107-39-1	diisobutylene	NO		default	0.1	annual					
107-41-5	hexylene glycol	NO		>75th%	1210	1 hr					
107-46-0	hexamethyldisiloxane	NO		>75th%	240	annual					
107-51-7	octamethyltrisiloxane	NO		default	0.1	annual					
107-54-0	3,5-dimethyl-1-hexyn-3-o	NO		default	0.1	annual					
107-66-4	dibutyl phosphate	YES	1st ITSL		50	8 hr	YES				
107-68-6	n-methyl taurine	YES	1st ITSL		17	annual	YES				
107-71-1	t-butyl peroxyacetate	YES	1st ITSL		0.06	annual	YES				
107-83-5	2-methylpentane	NO		>75th%	17600	8 hr					
107-87-9	methyl propyl ketone	NO		>75th%	5300	8 hr					

Table 4. Current and Proposed MDEQ Air Quality Division Screening Level List of Toxic Air Contaminants

NEW AvgT "annual" Some ITSLs with 24-hr avg. time were converted to annual avg. because ITSL was derived to protect for chronic effects.

CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
107-92-6	butyric acid	YES	1st ITSL		10	annual	YES				
107-98-2	propylene glycol monomethyl ether	NO		>75th%	2000	annual*					
108-01-0	dimethylethanolamine	YES	1st ITSL, 2nd ITSL		5.2	annual	YES	220	8 hr	YES	
108-03-2	1-nitropropane	YES	1st ITSL		900	8 hr	YES				
108-05-4	vinyl acetate	NO		>75th%	200	annual*					
108-08-7	2,4-dimethylpentane	NO		>75th%	3500	8 hr					
108-10-1	methyl isobutyl ketone	NO		>75th%	3000	annual*					
108-11-2	methyl amyl alcohol	YES	1st ITSL		1000	8 hr	YES				
108-16-7	dimethylamino-2-propanol	YES	1st ITSL		4	annual	YES				
108-18-9	diisopropylamine	YES	1st ITSL		200	8 hr	YES				
108-20-3	diisopropyl ether	NO		>75th%	358	annual*					
108-21-4	isopropyl acetate	NO		>75th%	4200	8 hr					
108-31-6	maleic anhydride	YES	1st ITSL		0.1	8 hr	YES				
108-32-7	propylene carbonate	NO		>75th%	700	annual*					
108-38-3	m-xylene	YES	1st ITSL		100	annual*	YES				
108-46-3	resorcinol	YES	1st ITSL		27	annual*	YES				
108-60-1	bis(2-chloroisopropyl)ether	NO		>75th%	140	annual*					
108-65-6	propylene glycol monomethyl ether acetate	NO		>75th%	3000	annual*					
108-67-8	1,3,5-trimethyl benzene	YES	1st ITSL, 2nd ITSL		50	annual	YES	1200	8 hr	YES	
108-68-9	3,5-dimethylphenol	YES	1st ITSL		0.8	annual	YES				
108-78-1	melamine	YES	Carc								1.5
108-82-7	2,6-dimethyl-4-heptanol	YES	1st ITSL		30	annual	YES				
108-83-8	diisobutyl ketone	YES	1st ITSL		1500	8 hr	YES				
108-86-1	bromobenzene	YES	1st ITSL		60	annual*	YES				
108-87-2	methylcyclohexane	NO		>75th%	16000	8 hr					

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NEW AvgT "annual" Some ITSLs with 24-hr avg. time were converted to annual avg. because ITSL was derived to protect for chronic effects.

CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
108-88-3	toluene	NO		>75th%	5000	annual*					
108-90-7	chlorobenzene	YES	1st ITSL		50	annual	YES	4400	8 hr		
108-94-1	cyclohexanone	YES	1st ITSL		800	8 hr	YES				
108-95-2	phenol	YES	1st ITSL		190	8 hr	YES				
108-99-6	3-picoline	YES	1st ITSL		80	annual	YES				
109-06-8	alpha-picoline	YES	1st ITSL		24	annual*	YES				
109-56-8	isopropylethanolamine	NO		default	0.1	annual					
109-60-4	n-propyl acetate	NO		>75th%	8350	8 hr					
109-65-9	1-bromobutane	YES	1st ITSL		9	annual	YES				
109-66-0	pentane	NO		>75th%	17700	8 hr					
109-69-3	n-butyl chloride	NO		>75th%	1500	annual*					
109-70-6	1-bromo-3-chloropropane	NO		default	0.1	annual					
109-83-1	2-methylaminoethanol	YES	1st ITSL		38	annual	YES				
109-86-4	2-methoxyethanol	YES	1st ITSL		20	annual*	YES				
109-89-7	diethylamine	YES	1st ITSL		150	8 hr	YES				
109-92-2	ethyl vinyl ether	YES	1st ITSL		20	annual	YES				
109-94-4	ethyl formate	NO		>75th%	3000	8 hr					
109-99-9	tetrahydrofuran	NO		>75th%	8000	annual					
110-00-9	furan	YES	1st ITSL, Carc		4	annual*	YES				0.0002
110-12-3	methyl isoamy ketone	YES	1st ITSL		2300	8 hr	YES				
110-16-7	maleic acid	NO		default	0.1	annual					
110-19-0	isobutyl acetate	YES	1st ITSL		480	8 hr	YES				
110-30-5	n,n'-ethylene bis-octadecanamide	NO		default	0.1	annual					
110-43-0	methyl n-amyl ketone	YES	1st ITSL		2330	8 hr	YES				
110-49-6	ethylene glycol monomethyl ether acetate	YES	1st ITSL		31	annual*	YES				
110-54-3	n-hexane	NO		>75th%	700	annual*					

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NEW AvgT "annual" Some ITSLs with 24-hr avg. time were converted to annual avg. because ITSL was derived to protect for chronic effects.

CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
110-58-7	amylamine	YES	1st ITSL		1	annual	YES				
110-61-2	succinonitrile	YES	1st ITSL		0.8	annual	YES				
110-62-3	valeraldehyde	YES	1st ITSL		1760	8 hr	YES				
110-63-4	1,4 butanediol	YES	1st ITSL		79	annual	YES				
110-71-4	ethylene glycol dimethyl ether	YES	1st ITSL		24	annual*	YES				
110-73-6	2-ethylaminoethanol	YES	1st ITSL		1	annual	YES				
110-80-5	2-ethoxyethanol	NO		>75th%	200	annual*					
110-82-7	cyclohexane	NO		>75th%	6000	annual*					
110-83-8	cyclohexene	NO		>75th%	10000	8 hr					
110-86-1	pyridine	YES	1st ITSL		3.5	annual*	YES				
110-89-4	piperidine	NO		>75th%	140	annual					
110-97-4	diisopropanolamine	YES	1st ITSL		4	annual	YES				
111-13-7	2-octanone	YES	1st ITSL		20	annual	YES				
111-15-9	ethylene glycol monoethyl ether acetate	NO		>75th%	293	annual*					
111-30-8	glutaraldehyde	YES	1st ITSL, 2nd ITSL		0.08	annual	YES	0.2	1 hr	YES	
111-42-2	diethanolamine	YES	1st ITSL		5	annual*	YES				
111-44-4	bis-2-chloroethylether	YES	Carc								0.003
111-46-6	diethylene glycol	NO		>75th%	21000	annual*					
111-75-1	2-butylaminoethanol	YES	1st ITSL		4	annual	YES				
111-76-2	2-butoxyethanol	NO		>75th%	1600	annual*					
111-77-3	diethylene glycol monomethyl ether	NO		>75th%	190	annual*					
111-84-2	n-nonane	NO		>75th%	550	annual*					
111-90-0	diethylene glycol monoethyl ether	NO		>75th%	1750	annual*					
111-92-2	dibutylamine	YES	1st ITSL		23	annual	YES				
112-06-1	n-heptyl acetate	YES	1st ITSL		16	annual	YES				
112-07-2	ethylene glycol monobutyl ether acetate	NO		>75th%	17600	annual*					

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NEW AvgT "annual" Some ITSLs with 24-hr avg. time were converted to annual avg. because ITSL was derived to protect for chronic effects.

CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
112-15-2	diethylene glycol monoethyl ether acetate	YES	1st ITSL		18	annual	YES				
112-24-3	triethylene tetramine	YES	1st ITSL		8	annual	YES				
112-25-4	ethylene glycol monohexyl ether	YES	1st ITSL		8	annual	YES				
112-34-5	butyl carbitol	YES	1st ITSL		20	annual*	YES				
112-48-1	ethylene glycol dibutyl ether	YES	1st ITSL		10	annual	YES				
112-50-5	triethylene glycol monoethyl ether	YES	1st ITSL		100	annual	YES				
112-55-0	n-dodecyl mercaptan	YES	1st ITSL		8	8 hr	YES				
112-80-1	oleic acid	NO		>75th%	242	annual					
115-07-1	propylene	NO		>75th%	1500	annual*					
115-10-6	dimethyl ether	YES	1st ITSL		66	annual	YES				
115-11-7	isobutylene	YES	1st ITSL		21	annual	YES				
115-19-5	methyl butynol	YES	1st ITSL		6.5	annual	YES				
116-11-0	2-methoxy-1-propene	YES	1st ITSL		6	annual	YES				
116-14-3	tetrafluoroethylene	YES	Carc								0.4
117-81-7	diethyl hexyl phthalate	YES	Carc								0.2
117-84-0	di-n-octyl phthalate	NO		>75th%	470	annual*					
118-52-5	1,3-dichloro-5,5-dimethylhydantoin	YES	1st ITSL		2	8 hr	YES				
118-74-1	hexachlorobenzene	YES	Carc								0.002
118-91-2	o-chlorobenzoic acid	NO		default	0.1	annual					
119-53-9	benzoin	YES	1st ITSL		32	annual*	YES				
119-90-4	3,3-dimethoxybenzidine	YES	HAP Table 2								
120-07-0	phenyldiethanolamine	YES	1st ITSL		3	annual	YES				
120-12-7	anthracene	NO		>75th%	1000	annual*					
120-82-1	1,2,4-trichlorobenzene	YES	1st ITSL		4	annual*	YES				
120-83-2	2,4-dichlorophenol	YES	1st ITSL		77	annual	YES				
121-14-2	2,4-dinitrotoluene	YES	1st ITSL, Carc		2	8 hr	YES				0.009

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
121-43-7	trimethoxyborine	YES	1st ITSL		18	annual	YES				
121-44-8	triethylamine	YES	1st ITSL		7	annual*	YES				
121-69-7	dimethylaniline	YES	Carc								0.085
121-93-7	isopropyldiethanolamine	NO		default	0.1	annual					
122-20-3	triisopropanolamine (tipa)	YES	1st ITSL		19	annual	YES				
122-60-1	phenyl glycidyl ether	YES	Carc								0.1
122-79-2	phenyl acetate	NO		default	0.1	annual					
122-99-6	ethylene glycol monophenyl ether	YES	1st ITSL		8	annual	YES				
123-03-5	cetylpyridinium chloride	YES	1st ITSL		1.8	annual	YES				
123-05-7	2-ethylhexanal	YES	1st ITSL		10	annual	YES				
123-19-3	dipropyl ketone	NO		>75th%	250	annual*					
123-31-9	Hydroquinone	YES	HAP Table 2								
123-38-6	propionaldehyde	YES	1st ITSL		8	annual*	YES				
123-42-2	diacetone alcohol	NO		>75th%	2375	8 hr					
123-51-3	isoamyl alcohol	YES	1st ITSL		360	8 hr	YES				
123-54-6	2,4-pentanedione	YES	1st ITSL		25	annual*	YES				
123-72-8	butyraldehyde	YES	1st ITSL		7	annual*	YES				
123-86-4	n-butyl acetate	NO		>75th%	7100	8 hr					
123-91-1	1,4-dioxane	YES	1st ITSL, Carc		100	annual*	YES				0.04
123-92-2	isoamyl acetate	NO		>75th%	2700	8 hr		5300	1 hr		
124-04-9	adipic acid	YES	1st ITSL		50	8 hr	YES				
124-07-2	octanoic acid	YES	1st ITSL		33	annual	YES				
124-17-4	diethylene glycol monobutyl ether acetate	YES	1st ITSL		25	annual*	YES				
124-26-5	octadecanamide	NO		default	0.1	annual					
124-28-7	N,N-dimethyl octadecylamine	NO		default	0.1	annual					
124-41-4	sodium methylate	NO		default	0.1	annual					

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
124-48-1	chlorodibromomethane	YES	Carc								0.04
124-63-0	methyl sulfonyl chloride	YES	1st ITSL		2	annual	YES				
124-68-5	2-amino-2-methyl-1-propanol	YES	1st ITSL		4	annual	YES				
124-70-9	methylvinyldichlorosilane	YES	1st ITSL		6	annual	YES				
126-06-7	3-bromo-1-chloro-5,5-dimethylhydantoin	YES	1st ITSL		2	8 hr	YES				
126-30-7	neopentyl glycol	NO		default	0.1	annual					
126-72-7	tris(2,3-dibromopropyl) phosphate	YES	Carc								0.002
126-73-8	tributyl phosphate	YES	1st ITSL		22	8 hr	YES				
126-86-3	actylenic diol	NO		default	0.1	annual					
126-99-8	beta-chloroprene	YES	1st ITSL, Carc		20	annual*	YES				0.002
127-18-4	tetrachloroethylene	YES	1st ITSL, Carc		40	annual	YES	1400	24 hr		4
127-91-3	pinene, beta	YES	1st ITSL		1120	8 hr	YES				
128-04-1	sodium dimethyl dithiocarbamate	NO		default	0.1	annual					
128-37-0	2,6-di-tert-butyl-p-cresol	YES	Carc								1
129-00-0	pyrene	YES	1st ITSL		100	annual*	YES				
131-11-3	dimethylphthalate	YES	1st ITSL		50	8 hr	YES				
131-17-9	diallyl phthalate	YES	Carc								0.1
132-64-9	dibenzofuran	YES	1st ITSL		4	annual*	YES				
134-29-2	o-ansidine hydrochloride	YES	Carc								0.04
135-98-8	sec-butylbenzene	YES	1st ITSL		6	annual	YES				
136-47-0	tetracaine hyrochloride	YES	1st ITSL		0.3	annual	YES				
136-52-7	cobalt 2-ethylhexanoate	NO		default	0.1	annual					
137-26-8	thiram	YES	1st ITSL		17.5	annual*	YES				
137-32-6	2-methyl-1-butanol	YES	1st ITSL		13	annual	YES				
140-31-8	aminoethylpiperazine	NO		default	0.1	annual					
140-88-5	ethyl acrylate	YES	1st ITSL		30	annual*	YES				

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
141-32-2	butyl acrylate	YES	1st ITSL		100	8 hr	YES				
141-43-5	ethanolamine	YES	1st ITSL		80	8 hr	YES				
141-62-8	decamethyltetrasiloxane	NO		default	0.1	annual					
141-63-9	linear dimethylsiloxanes,MD3M(&higher)	NO		default	0.1	annual					
141-78-6	ethyl acetate	NO		>75th%	3200	annual*					
141-79-7	mesityl oxide	YES	1st ITSL		400	8 hr	YES				
141-91-3	2,6-dimethyl morpholine	NO		>75th%	377	annual					
141-97-9	ethyl acetoacetate	YES	1st ITSL		46	annual	YES				
142-29-0	cyclopentene	YES	1st ITSL		5	annual	YES				
142-59-6	ethylene bisthiocarbamate disodium	YES	1st ITSL		1	annual	YES				
142-71-2	cupric acetate	YES	1st ITSL		2	8 hr	YES				
142-82-5	heptane	NO		>75th%	3500	8 hr					
142-84-7	di-n-propylamine	YES	1st ITSL		1.5	annual	YES				
142-96-1	dibutyl ether	YES	1st ITSL		33	annual	YES				
143-29-3	butylcarbitol formal	NO		default	0.1	annual					
144-62-7	oxalic acid	YES	1st ITSL		10	8 hr	YES				
144-79-6	diphenylmethylchlorosilane	NO		default	0.1	annual					
145-73-3	endothall	YES	1st ITSL		35	annual*	YES				
147-14-8	copper phthalocyanine	YES	1st ITSL		21	annual	YES				
147-24-0	benadryl hcl	YES	1st ITSL		50	annual	YES				
147-94-4	cytarabine	NO		default	0.1	annual					
149-57-5	2-ethylhexanoic acid	YES	1st ITSL		64	annual	YES				
149-73-5	trimethylorthoformate	NO		>75th%	800	annual					
151-56-4	Ethylene imine (Aziridine)	YES	HAP Table 2								
156-59-2	cis-1-2,dichloroethylene	YES	1st ITSL		7	annual*	YES				
156-60-5	trans-1-2-dichloroethylene	YES	1st ITSL		70	annual*	YES				

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
189-55-9	Dibenzo[a,i]pyrene	YES	EPA Carc								
189-64-0	Dibenzo[a,h]pyrene	YES	EPA Carc								
191-24-2	benzo(g,h,i)perylene	YES	1st ITSL		12	annual*	YES				
191-26-4	Anthanthrene	YES	EPA Carc								
191-30-0	Dibenzo[a,l]pyrene	YES	EPA Carc								
192-65-4	Dibenzo[a,e]pyrene	YES	EPA Carc								
193-09-9	Naphtho[2,3e]pyrene	YES	EPA Carc								
193-39-5	Indeno(1,2,3-cd)pyrene	YES	Carc7								
199-54-2	Benz[e]aceanthrylene	YES	EPA Carc								
202-33-5	Benz[j]aceanthrylene	YES	EPA Carc								
202-94-8	Benz[b,c]aceanthrylene, 11H	YES	EPA Carc								
202-98-2	Cyclopenta[d,e,f]chrysene, 4H	YES	EPA Carc								
205-12-9	Benzo[c]fluorene	YES	EPA Carc								
205-82-3	Benzo[j]fluoranthene	YES	EPA Carc								
205-99-2	Benzo(b)fluoranthene	YES	Carc7								
206-44-0	fluoranthene	NO		>75th%	140	annual*					
207-08-9	Benzo(k)fluoranthene	YES	Carc7								
208-96-8	acenaphthylene	YES	1st ITSL		35	annual*	YES				
211-91-6	Benz[l]aceanthrylene	YES	EPA Carc								
215-58-7	Dibenz[a,c]anthracene	YES	EPA Carc								
218-01-9	Chrysene	YES	Carc7								
280-57-9	triethylenediamine	YES	1st ITSL		6	annual	YES				
287-92-3	cyclopentane	NO		>75th%	17200	8 hr					
300-57-2	allyl benzene	YES	1st ITSL		5	annual	YES				
302-01-2	hydrazine	YES	Carc								0.0002
302-22-7	chlormadinone acetate	NO		default	0.1	annual					
303-81-1	novobiocin	YES	1st ITSL		40	annual*	YES				
309-00-2	aldrin	YES	Carc								0.0002

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
313-06-4	estradiol cypionate	NO		default	0.1	annual					
319-84-6	alpha-hexachlorocyclohexane	YES	Carc								0.0006
330-54-1	diuron	YES	1st ITSL		7	annual*	YES				
335-67-1	PFOA	YES	Emerging								
338-98-7	isoflupredone acetate	YES	1st ITSL		0.01	annual	YES				
353-50-4	carbonyl fluoride	YES	1st ITSL		54	8 hr	YES				
358-67-8	trifluoropropylmethyl dimethoxysilane	YES	1st ITSL		100	annual	YES				
359-07-9	2-bromo-1,1- difluoro ethane	NO		default	0.1	annual					
363-51-9	2-chloro-6-fluorobenzenamine	NO		default	0.1	annual					
363-72-4	pentafluorobenzene	YES	1st ITSL		10	annual	YES				
366-18-7	2,2'-bipyridyl	YES	1st ITSL		0.8	annual	YES				
382-21-8	perfluoroisobutylene	YES	1st ITSL		0.8	1 hr	YES				
385-00-2	2,6-difluorobenzoic acid	NO		default	0.1	annual					
431-89-0	hfc-227ea	NO		>75th%	130000	annual		5560000	1 hr		
460-73-1	1,1,1,3,3-pentafluoropropane	NO		>75th%	2000	annual*					
461-58-5	cyanoguanidine	NO		default	0.1	annual					
463-58-1	carbonyl sulfide	YES	1st ITSL		9	annual	YES				
505-48-6	suberic acid	YES	1st ITSL		17	annual	YES				
509-14-8	tetranitromethane	YES	1st ITSL, Carc		0.4	8 hr	YES				7E-05
513-35-9	amylene	NO		>75th%	106	annual					
513-37-1	dimethylvinyl chloride	YES	Carc								0.008
513-85-9	2,3-butanediol	YES	1st ITSL		15	annual	YES				
526-73-8	1,2,3-trimethylbenzene	YES	1st ITSL, 2nd ITSL		50	annual	YES	1200	8 hr	YES	
526-75-0	2,3-dimethyl phenol	YES	1st ITSL		2	annual	YES				
532-27-4	alpha chloroacetophenone	YES	1st ITSL		0.03	annual*	YES				
534-52-1	dinitro-o-cresol	YES	1st ITSL		2	8 hr	YES				

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
540-49-8	1,2-dibromoethylene	NO		default	0.1	annual					
540-59-0	1,2-dichloroethylene	YES	1st ITSL		35	annual*	YES				
540-84-1	2,2,4-Trimethyl Pentane	NO		>75th%	3500	8 hr					
540-88-5	tert-butyl acetate	NO		>75th%	9500	8 hr					
540-97-6	dodecamethylcyclohexasiloxane	NO		>75th%	400	annual					
541-02-6	decamethylcyclopentasiloxane	NO		>75th%	200	annual*					
541-05-9	hexamethylcyclotrisiloxane	YES	1st ITSL		50	annual	YES				
541-73-1	1,3-dichlorobenzene	YES	1st ITSL		3	annual	YES				
541-85-5	ethyl amyl ketone	NO		>75th%	220	annual*					
542-75-6	1,3-dichloropropene	YES	1st ITSL, Carc		20	annual*	YES				0.2
542-88-1	bis(chloromethyl)ether	YES	Carc								2E-05
546-93-0	magnesium carbonate	YES	1st ITSL		50	8 hr	YES				
552-45-4	alpha-chloro-ortho-xylene	NO		default	0.1	annual					
556-67-2	octamethylcyclotetrasilo	YES	1st ITSL		75	annual*	YES				
557-04-0	magnesium stearate	YES	1st ITSL		100	8 hr	YES				
557-05-1	zinc stearate	YES	1st ITSL		50	8 hr	YES				
563-47-3	3-chloro-2-methylpropene	YES	Carc								0.03
565-59-3	2,3-dimethylpentane	NO		>75th%	3500	8 hr					
576-26-1	2,6-dimethyl phenol	YES	1st ITSL		2	annual*	YES				
584-84-9	2,4-toluene diisocyanate	YES	1st ITSL, Carc		0.07	annual*	YES				0.03
589-34-4	3-methylhexane	NO		>75th%	3500	8 hr					
590-01-2	n-butyl propionate	NO		>75th%	102	annual					
590-86-3	isovaleraldehyde	NO		>75th%	800	annual					
591-22-0	3,5-lutidine	NO		default	0.1	annual					
591-27-5	m-aminophenol	NO		>75th%	390	annual					
591-76-4	2-methylhexane	NO		>75th%	3500	8 hr					

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591-78-6	methyl n-butyl ketone	YES	1st ITSL		30	annual*	YES				
592-09-6	trifluoropropyltrichlorosilane	NO		default	0.1	annual					
592-42-7	1,5-hexanediene	NO		>75th%	264	annual					
592-76-7	1-heptene	YES	1st ITSL		24	annual	YES				
592-84-7	butyl formate	NO		default	0.1	annual					
593-51-1	methylamine hydrochloride	YES	1st ITSL		64	8 hr	YES				
593-60-2	vinyl bromide	YES	1st ITSL		3	annual*	YES				
606-46-2	n,n-diethyl-o-toluine	NO		default	0.1	annual					
608-31-1	2,6-dichlorobenzenamine	NO		default	0.1	annual					
611-14-3	1-ethyl-2-methylbenzene	NO		default	0.1	annual					
612-00-0	1,1-diphenylethane	YES	1st ITSL		0.8	annual	YES				
613-48-9	n,n-diethyl-p-toludine	NO		default	0.1	annual					
616-38-6	dimethyl carbonate	NO		>75th%	300	annual					
617-94-7	phenyl isopropanol (2-phenyl-2-propanol)	YES	1st ITSL		4	annual	YES				
620-23-5	m-tolualdehyde	NO		>75th%	440	annual*					
621-64-7	n-nitroso-di-n-propylamine	YES	Carc								0.0005
621-77-2	triamylamine	NO		default	0.1	annual					
622-96-8	p-ethyl toluene	NO		>75th%	350	annual*					
622-97-9	4-methylstyrene	YES	1st ITSL		2	annual	YES				
624-41-9	2-methyl butyl acetate	NO		>75th%	1100	annual*					
624-54-4	n-pentyl proprionate	YES	1st ITSL		21	annual	YES				
624-83-9	Methyl isocyanate	YES	ATW								
624-92-0	dimethyl disulfide	YES	1st ITSL		28	annual	YES				
626-38-0	2-pentyl acetate	NO		>75th%	2600	8 hr					
626-67-5	n-methylpiperidine	YES	1st ITSL		8	annual	YES				
627-20-3	cis-2-pentene	NO		default	0.1	annual					
627-30-5	3-chloro-1-propanol	NO		default	0.1	annual					

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627-83-8	octadecanoic acid, 1,2-ethanediyl ester	NO		default	0.1	annual					
628-63-7	n-amyl acetate	NO		>75th%	1100	annual*					
629-11-8	1,6-hexanediol	YES	1st ITSL		14	annual	YES				
629-73-2	1-hexadecene	YES	1st ITSL		17	annual	YES				
630-20-6	1,1,1,2-tetrachloroethane	YES	Carc								0.1
630-93-3	sodium dilantin	YES	Carc								0.04
632-22-4	tetramethyl urea	YES	1st ITSL, 2nd ITSL		0.8	annual	YES	**230**	**24 hr**	**YES**	
634-66-2	1,2,3,4-tetrachlorobenzene	NO		>75th%	120	annual*					
634-90-2	1,2,3,5-tetrachlorobenzene	YES	1st ITSL		12	annual*	YES				
637-92-3	ethyl tertiary butyl ether	NO		>75th%	373	annual*					
644-62-2	meclofenamic acid	NO		default	0.1	annual					
646-06-0	1,3-dioxolane	YES	1st ITSL		10	annual	YES				
668-45-1	chlorofluorobenzonitrile	NO		default	0.1	annual					
677-21-4	3,3,3-trifluoropropene	NO		>75th%	280	annual					
684-93-5	n-nitroso-n-methylurea	YES	Carc								2E-06
694-87-1	benzocyclobutene	NO		>75th%	220	annual					
696-82-2	2,4,6-trifluoropyrimidine	NO		default	0.1	annual					
701-64-4	monophenyl phosphoric acid	YES	1st ITSL		3	annual	YES				
756-79-6	dimethyl methyl phosphonate	NO		>75th%	700	annual*					
763-69-9	ethyl-3-ethyloxypropionate	NO		>75th%	134	annual*					
770-35-4	propylene glycol phenyl ether	YES	1st ITSL		8	annual	YES				
778-25-6	diphenylmethylsilanol	YES	1st ITSL		6	annual	YES				
807-28-3	tetraphenyldimethyldisiloxane	NO		default	0.1	annual					
811-97-2	1,1,1,2-tetrafluoroethane	NO		>75th%	80000	annual*					
814-68-6	acryloyl chloride	YES	1st ITSL		0.3	annual	YES				
822-06-0	hexamethylene diisocyanate	YES	1st ITSL		0.01	annual*	YES				

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827-52-1	cyclohexylbenzene	NO		default	0.1	annual					
836-30-6	n-nitrodiphenylamine	YES	1st ITSL		1	annual	YES				
838-85-7	diphenyl phosphoric acid	NO		default	0.1	annual					
859-18-7	lincomycin hydrochloride	YES	1st ITSL		75	annual*	YES				
868-77-9	2-hydroxyethyl methacrylate	YES	1st ITSL		10	annual	YES				
872-36-6	vinylene carbonate	NO		default	0.1	annual					
872-50-4	N-methylpyrrolidone	NO		>75th%	700	annual*					
947-19-3	1-hydroxcyclohexyl phenyl ketone	NO		default	0.1	annual					
981-34-0	betamethasone 11	YES	1st ITSL		17	annual	YES				
992-94-9	methylsilane	YES	1st ITSL		30	annual*	YES				
993-07-7	trimethylsilane	NO		>75th%	340	annual					
994-05-8	tertiary amyl methyl ether	YES	1st ITSL		62	annual*	YES				
996-35-0	dimethylisopropylamine	NO		>75th%	200	annual					
999-97-3	hexamethyldisilazane	NO		>75th%	206	annual					
1009-93-4	hexamethylcyclotrisilazane	NO		default	0.1	annual					
1047-16-1	quinacridone pigment	NO		default	0.1	annual					
1066-35-9	dimethylchlorosilane	YES	1st ITSL		2	annual	YES				
1066-40-6	trimethylsilanol	YES	1st ITSL		65	annual	YES				
1067-25-0	propyltrimethoxysilane	NO		>75th%	1000	annual					
1070-10-6	2-ethylhexyltitanate	NO		default	0.1	annual					
1072-53-3	1,3,2-dioxathiolane,2,2-dioxide	NO		default	0.1	annual					
1072-63-5	1-vinylimidazol	YES	1st ITSL		9	annual	YES				
1074-40-4	4,6-dichloro-2-methoxypyrimidine	NO		default	0.1	annual					
1111-74-6	dimethylsilane	YES	1st ITSL		30	annual*	YES				
1112-39-6	dimethyldimethoxysilane	YES	1st ITSL		90	annual	YES				
1116-54-7	n-nitrosodiethanolamine	YES	Carc								0.0012
1120-71-4	1,3-propane sultone	YES	1st ITSL		2	annual	YES				
1122-82-3	cyclohexyl isothiocyanate	NO		default	0.1	annual					

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1156-19-0	tolazamide	YES	1st ITSL		17	annual	YES				
1163-19-5	decabromodiphenyl oxide	YES	1st ITSL, Carc		25	annual*	YES				5
1184-85-6	methyl methane sulfonamide	NO		default	0.1	annual					
1185-55-3	trimethoxymethylsilane	YES	1st ITSL		80	annual	YES				
1194-02-1	p-fluorobenzonitrile	YES	1st ITSL		0.5	annual	YES				
1300-72-7	sodium xylenesulfonate	NO		default	0.1	annual					
1306-38-3	cerium oxide	YES	1st ITSL		0.9	annual*	YES				
1308-14-1	chromium (+3) hydroxide	YES	1st ITSL		0.5	annual*	YES				
1308-38-9	chromium 3 oxide	YES	1st ITSL		0.5	annual*	YES				
1309-42-8	magnesium hydroxide	YES	1st ITSL		100	8 hr	YES				
1309-48-4	magnesium oxide	YES	1st ITSL		100	8 hr	YES				
1309-64-4	antimony trioxide	YES	1st ITSL		0.2	annual*	YES				
1310-53-8	germanium dioxide	YES	1st ITSL		7	annual	YES				
1310-58-3	potassium hydroxide	YES	1st ITSL		20	1 hr	YES				
1310-66-3	lithium hydroxide	YES	1st ITSL		0.25	8 hr	YES				
1310-73-2	sodium hydroxide	YES	1st ITSL		20	1 hr	YES				
1313-27-5	molybdenum trioxide	YES	1st ITSL, Carc		5	8 hr	YES				0.12
1313-96-8	niobium oxide	NO		default	0.1	annual					
1314-13-2	zinc oxide	YES	1st ITSL		50	8 hr	YES				
1314-28-9	rhenium oxide	NO		default	0.1	annual					
1314-32-5	thallic oxide	YES	1st ITSL		0.2	annual*	YES				
1314-62-1	vanadium pentoxide	YES	1st ITSL		0.5	1 hr	YES				
1317-33-5	molybdenum disulfide	YES	1st ITSL		30	8 hr	YES				
1319-77-3	cresol (mixed isomers)	YES	1st ITSL		100	8 hr	YES				
1320-67-8	propylene glycol monomethyl ether	NO		>75th%	2000	annual*					
1328-53-6	phthalocyanine pigment green	NO		default	0.1	annual					

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1330-20-7	mixed xylenes	YES	1st ITSL		100	annual*	YES				
1330-86-5	adipate plasticizer	NO		default	0.1	annual					
1332-21-4	asbestos	YES	Carc								2E-05
1332-58-7	kaolin	YES	1st ITSL		20	8 hr	YES				
1333-13-7	tert-butyl-m-cresol	NO		default	0.1	annual					
1333-86-4	carbon black	YES	1st ITSL		30	8 hr	YES				
1336-21-6	ammonium hydroxide	NO		>75th%	200	annual*					
1336-36-3	polychlorinated biphenyls	YES	Carc								0.002
1338-23-4	methyl ethyl ketone peroxide	YES	1st ITSL		15	1 hr	YES				
1345-04-6	antimony trisulfide	YES	1st ITSL		0.2	annual*	YES				
1345-05-7	lithopone	NO		default	0.1	annual					
1405-10-3	neomycin sulfate	NO		>75th%	280	annual					
1445-45-0	trimethyl-o-acetate	YES	1st ITSL		24	annual	YES				
1477-55-0	1,3-bis(aminomethyl)benzenen	YES	1st ITSL		1	1 hr	YES				
1559-35-9	ethylene glycol mono-2-ethylhexyl ether	YES	1st ITSL		37	annual	YES				
1559-36-0	diethylene glycol mono-2-ethylhexyl ether	YES	1st ITSL		22	annual	YES				
1559-37-1	triethylene glycol mono-2-ethyhexyl ether	NO		default	0.1	annual					
1569-01-3	1-propoxy-2-propanol	YES	1st ITSL		86	annual*	YES				
1569-02-4	propylene glycol monoethyl ether (beta)	NO		>75th%	240	annual					
1589-47-5	2-methoxy-1-propanol	NO		>75th%	660	annual*					
1590-87-0	disilane	NO		default	0.1	annual					
1623-15-0	monobutyl phosphoric acid	YES	1st ITSL		15	annual	YES				
1634-04-4	methyl t-butyl ether	NO		>75th%	3000	annual*					
1643-19-2	t-n-butyl ammonium bromide	NO		default	0.1	annual					
1702-17-6	clopyralid	YES	1st ITSL		15	annual	YES				

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1717-00-6	1,1-dichloro-1-fluoroethane	NO		>75th%	12800	annual*					
1719-58-0	dimethylvinylchlorosilane	NO		default	0.1	annual					
1746-01-6	2,3,7,8-tetrachlorodibenzo(p)dioxin	YES	1st ITSL, Carc		2E-06	annual	YES				2E-08
1758-88-9	2-ethyl-1,4-dimethyl benzene	NO		default	0.1	annual					
1760-24-3	n-(3-(trimethoxysilyl)propyl)-ethylenediamine	YES	1st ITSL		8	annual	YES				
1761-71-3	4,4'-diaminodicyclohexylmethane	YES	1st ITSL		6	annual	YES				
1763-23-1	PFOS	YES	Emerging								
1873-88-7	heptamethyltrisiloxane	NO		default	0.1	annual					
1897-52-5	2,6-difluorobenzonitrile	YES	1st ITSL		0.2	annual	YES				
1912-83-0	stannous octoate	YES	1st ITSL		1	8 hr	YES				
2031-67-6	methyltriethoxysilane	YES	1st ITSL		23	annual	YES				
2050-92-2	diamylamine	YES	1st ITSL		9	annual	YES				
2157-45-1	tetra-2-methoxyethoxy-silane	NO		default	0.1	annual					
2160-93-2	t-butyldiethanolamine	YES	1st ITSL		9	annual	YES				
2238-07-5	diglycidyl ether	YES	1st ITSL		0.5	8 hr	YES				
2370-88-9	cyclic methylhydrogensiloxane, d4	NO		default	0.1	annual					
2374-14-3	cyclic methyltrifluoropropylsiloxane, d3	YES	1st ITSL		0.6	annual	YES				
2403-89-6	1,2,2,6,6-pentamethyl-4-piperidinol	NO		default	0.1	annual					
2426-08-6	n-butyl glycidyl ether	YES	1st ITSL, 2nd ITSL		300	1 hr	YES	160	8 hr	YES	
2467-02-9	bisphenol f	NO		default	0.1	annual					
2476-74-6	flumethasone 6	NO		default	0.1	annual					
2530-85-0	organofunctional silane	NO		default	0.1	annual					
2627-86-3	L-alpha-phenylethylamine	NO		default	0.1	annual					
2627-95-4	tetramethyldivinyldisiloxane	YES	1st ITSL		16	annual	YES				
2627-97-6	dimethyldiphenydivinylsiloxane	NO		default	0.1	annual					

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2682-20-4	2-methyl-4-isothiazolin-3-one	NO		default	0.1	annual					
2687-91-4	1-ethyl-2-pyrrolidone	YES	1st ITSL		4.9	annual	YES				
2768-02-7	vinyltrimethoxysilane	YES	1st ITSL		10	annual	YES				
2807-30-9	ethylene glycol monopropyl ether	YES	1st ITSL		30	annual	YES				
2837-89-0	2-chloro-1,1,1,2-tetrafluoroethane	NO		>75th%	5000	annual*					
2919-66-6	melengesterol acetate	YES	1st ITSL		**2**	annual*	YES				
2981-10-4	piperdinocyclohexene	YES	1st ITSL		2	annual	YES				
2996-92-1	phenyltrimethoxysilane	YES	1st ITSL		60	annual	YES				
3006-82-4	t-butylperoxy-2-ethylhexanoate	NO		default	0.1	annual					
3006-86-8	1,1-di-(tert-buytlperoxy)cyclohexane	NO		default	0.1	annual					
3020-12-0	o-(1-ethoxyethyl)-3-(trifluoromethyl)phenol	NO		default	0.1	annual					
3033-62-3	bis (2-dimethylaminoethyl) ether	YES	1st ITSL		0.05	annual*	YES				
3052-70-8	(1-methylethylidene)bis(1,1-dimethylpropyl)peroxide	NO		default	0.1	annual					
3081-01-4	santoflex 14	NO		default	0.1	annual					
3144-09-0	methanesulfonamide	YES	1st ITSL		44	annual	YES				
3153-26-2	vanadium oxide bis (2,4-pentanedionate)	NO		default	0.1	annual					
3236-53-1	trimethyl hexamethylenediamine	NO		default	0.1	annual					
3277-26-7	tetramethyldihydrogendisiloxane	NO		>75th%	120	annual					
3290-92-4	trimethylolpropane trimethacrylate	YES	1st ITSL		20	annual	YES				
3390-61-2	tetraphenyldimethyl-2-phenylmethyltrisiloxane	NO		default	0.1	annual					
3399-73-3	cyclohexenylethylamine	NO		default	0.1	annual					
3697-24-3	5-methylchrysene	YES	Cal Carc								
3731-51-9	2-(aminomethyl)pyridine	NO		default	0.1	annual					
3764-01-0	2,4,6-trichloropyrimidine	NO		default	0.1	annual					
3779-63-3	aliphatic polyisocyanate-1	NO		default	0.1	annual					

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
3814-34-4	2-ethylbutyl bromide	NO		default	0.1	annual					
3843-16-1	distearyldimethylammonium methosulfate	NO		default	0.1	annual					
3982-82-9	tetraphenyldimethyl-2-dimethyltrisiloxane	NO		default	0.1	annual					
3986-89-8	progesterone 4	NO		default	0.1	annual					
4098-71-9	isophorone diisocyanate	YES	1st ITSL		0.45	8 hr	YES				
4109-96-0	dichlorosilane	NO		default	0.1	annual					
4170-30-3	crotonaldehyde	YES	1st ITSL		9	1 hr	YES				
4221-98-1	p-mentha-1,5-diene	NO		default	0.1	annual					
4253-34-3	methyltriacetoxysilane	NO		default	0.1	annual					
4420-74-0	3-mercaptopropyltrimethoxysilane	YES	1st ITSL		2.4	annual	YES				
4435-53-4	butoxyl	YES	1st ITSL		14	annual	YES				
4444-67-1	di-sec-butylamine	NO		>75th%	417	annual					
4620-70-6	t-butylaminoethanol	YES	1st ITSL		5	annual	YES				
4652-27-1	4-methoxy-3-buten-2-one	NO		default	0.1	annual					
4994-16-5	4-phenylcyclohexene	YES	1st ITSL		33	annual	YES				
5131-66-8	propylene glycol n-butyl ether (alpha isomer)	YES	1st ITSL		77	annual	YES				
5314-55-6	ethyltrimethoxysilane	YES	1st ITSL		3	annual	YES				
5329-14-6	sulfamic acid	YES	1st ITSL		4	annual	YES				
5385-75-1	Dibenzo[a,e]fluoranthene	YES	EPA Carc								
5436-21-5	4,4-dimethoxy-2-butanone	YES	1st ITSL		20	annual	YES				
5507-44-8	vinylmethyldiethoxysilane	NO		default	0.1	annual					
5509-65-9	2,6-difluoroaniline	YES	1st ITSL		2	annual	YES				
5779-94-2	2,5-dimethylbenzaldehyde	NO		default	0.1	annual					
5888-33-5	iso-bornyl acrylate	YES	1st ITSL		14	annual	YES				
5906-75-2	vinyl dimethylsilanol	NO		default	0.1	annual					
5989-27-5	d-limonene	NO		>75th%	6250	annual*					

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6004-24-6	cetylpyridinium chloride monohydrate	YES	1st ITSL		1.8	annual	YES				
6166-86-5	cyclic methylhydrogensiloxane, d5	NO		default	0.1	annual					
6192-52-5	p-toluenesulfonic acid monohydrate	NO		default	0.1	annual					
6408-78-2	C.I. acid blue 25	NO		default	0.1	annual					
6419-19-8	aminotrimethylene phosphonic acid	NO		default	0.1	annual					
6574-99-8	3,4-dichlorobenzonitrile	YES	1st ITSL		2	annual	YES				
6674-22-2	1,8-diazabicyclo[5.4.0]undec-7-ene	NO		default	0.1	annual					
6700-34-1	dextromethorphan hydrochloride	YES	1st ITSL		0.4	annual	YES				
6713-03-7	1-(2-hydroxyethylthio)propane	NO		default	0.1	annual					
6846-50-0	2,2,4-trimethylpentanediol-1,3-diisobutyrate	NO		>75th%	106	annual					
6904-66-1	tetraphenylhexamethyltetrasiloxane	NO		default	0.1	annual					
6915-15-7	malic acid	YES	1st ITSL		5	annual	YES				
6975-71-9	cyclohexenylacetonitrile	YES	1st ITSL		3.5	annual	YES				
7085-85-0	ethyl 2-cyanoacrylate	YES	1st ITSL		10	8 hr	YES				
7439-93-2	lithium	YES	1st ITSL		35	annual*	YES				
7439-95-4	magnesium	YES	1st ITSL		100	8 hr	YES				
7439-96-5	manganese and compounds	YES	1st ITSL		0.05	annual	YES				
7439-97-6	Mercury	YES	<75%								
7439-98-7	molybdenum	YES	1st ITSL		30	8 hr	YES				
7440-02-0	nickel	YES	Carc								0.0042
7440-05-3	palladium	NO		default	0.1	annual					
7440-06-4	platinum soluble salt	YES	1st ITSL		0.02	8 hr	YES				
7440-22-4	silver - soluble	YES	1st ITSL		0.1	8 hr	YES				
7440-24-6	strontium	NO		>75th%	2000	annual*					
7440-28-0	thallium	YES	1st ITSL		0.2	annual*	YES				
7440-31-5	tin	YES	1st ITSL		20	8 hr	YES				
7440-36-0	antimony	YES	1st ITSL		0.2	annual*	YES				

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7440-38-2	arsenic	YES	Carc								0.0002
7440-39-3	barium	YES	1st ITSL		5	8 hr	YES				
7440-41-7	beryllium	YES	1st ITSL, Carc		0.02	annual*	YES				0.0004
7440-43-9	cadmium	YES	Carc								0.0006
7440-45-1	cerium	YES	1st ITSL		6	annual	YES				
7440-48-4	cobalt	YES	1st ITSL		0.2	8 hr	YES				
7440-50-8	copper	YES	1st ITSL		2	8 hr	YES				
7440-65-5	yttrium	YES	1st ITSL		10	8 hr	YES				
7446-11-9	sulfur trioxide	YES	1st ITSL, 2nd ITSL		1	annual	YES	120	1 hr	YES	
7446-70-0	aluminum chloride	YES	1st ITSL		20	8 hr	YES				
7473-98-5	2-hydroxy-2-methyl-1-phenyl-1-propanone	NO		default	0.1	annual					
7525-62-4	ethylvinyl benzene	NO		default	0.1	annual					
7553-56-2	iodine	YES	1st ITSL		1	8 hr	YES				
7558-79-4	disodium hydrogen phosphate	YES	1st ITSL		10	annual*	YES				
7580-85-0	2-tert-butoxyethanol	YES	1st ITSL		7	annual	YES				
7631-90-5	sodium bisulfite	YES	1st ITSL		50	8 hr	YES				
7631-95-0	sodium molybdate	YES	1st ITSL		5	8 hr	YES				
7632-00-0	sodium nitrite	YES	1st ITSL		10	annual	YES				
7632-04-4	sodium perborate	YES	1st ITSL		8	annual	YES				
7637-07-2	boron trifluoride	YES	1st ITSL		0.7	annual*	YES				
7647-01-0	hydrogen chloride	YES	1st ITSL		20	annual	YES	2100	1 hr		
7647-15-6	sodium bromide	NO		>75th%	140	annual*					
7664-38-2	phosphoric acid	YES	1st ITSL		10	annual*	YES				
7664-39-3	hydrogen fluoride	YES	1st ITSL, 2nd ITSL		14	annual	YES	240	1 hr	YES	

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7664-41-7	ammonia	YES	1st ITSL		100	annual*	YES				
7664-93-9	sulfuric acid	YES	1st ITSL, 2nd ITSL		1	annual	YES	120	1 hr	YES	
7681-49-4	sodium fluoride	YES	1st ITSL		60	8 hr	YES				
7681-52-9	sodium hypochlorite	YES	1st ITSL		16	8 hr	YES				
7681-82-5	sodium iodide	NO		default	0.1	annual					
7691-02-3	tetramethyldivinyldisila	YES	1st ITSL		30	annual	YES				
7697-37-2	nitric acid	YES	1st ITSL		50	8 hr	YES				
7704-34-9	sulfur (elemental)	YES	1st ITSL		30	8 hr	YES				
7722-64-7	potassium permanganate	YES	1st ITSL		0.1	annual*	YES				
7722-76-1	ammonium dihydrogen phosphate	NO		default	0.1	annual					
7722-84-1	hydrogen peroxide	YES	1st ITSL		14	8 hr	YES				
7723-14-0	phosphorus (total)	YES	1st ITSL		1	8 hr	YES				
7726-95-6	bromine	YES	1st ITSL		7	8 hr	YES				
7727-43-7	barium sulfate	YES	1st ITSL		50	8 hr	YES				
7757-83-7	sodium sulfite	YES	1st ITSL		0.028	annual	YES				
7758-05-6	potassium iodate	YES	1st ITSL		1	annual	YES				
7758-98-7	copper sulfate, anhydrous	YES	1st ITSL		2	8 hr	YES				
7758-99-8	copper sulfate pentahydrate	YES	1st ITSL		10	8 hr	YES				
7782-49-2	selenium	YES	1st ITSL		2	8 hr	YES				
7782-50-5	chlorine	YES	1st ITSL, 2nd ITSL		0.3	annual	YES	500	8 hr	YES	
7782-65-2	germanium tetrahydride	YES	1st ITSL		6	8 hr	YES				
7783-06-4	hydrogen sulfide	YES	1st ITSL, 2nd ITSL		2	annual	YES	**100**	**24 hr**	**YES**	
7783-28-0	diammonium hydrogen phosphate	NO		default	0.1	annual					
7783-54-2	nitrogen trifluoride	YES	1st ITSL		290	8 hr	YES				
7783-61-1	silicon tetrafluoride	YES	1st ITSL		0.2	annual	YES				

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7784-42-1	arsine	YES	1st ITSL		0.05	annual*	YES				
7786-30-3	magnesium chloride	YES	1st ITSL		5	annual	YES				
7789-23-3	potassium fluoride	YES	1st ITSL		76	8 hr	YES				
7789-82-4	calcium molybdate	YES	1st ITSL		5	8 hr	YES				
7803-51-2	phosphine	YES	1st ITSL		0.3	annual*	YES				
7803-52-3	stibine	YES	1st ITSL		5	8 hr	YES				
7803-62-5	silicon tetrahydride	YES	1st ITSL		30	annual*	YES				
8001-35-2	toxaphene	YES	Carc								0.003
8001-79-4	castor oil	YES	1st ITSL		50	8 hr	YES				
8002-09-3	yarmor pine oil	YES	1st ITSL		10	annual	YES				
8002-74-2	paraffin wax fume	YES	1st ITSL		20	8 hr	YES				
8005-02-5	solvent black	NO		default	0.1	annual					
8006-61-9	gasoline	YES	Carc								2
8006-64-2	turpentine	YES	1st ITSL		1120	8 hr	YES				
8007-45-2	coke oven emissions	YES	Carc								0.0016
8012-95-1	mineral oil	YES	1st ITSL		50	8 hr	YES				
8014-95-7	oleum	YES	1st ITSL, 2nd ITSL		1	annual	YES	120	1 hr	YES	
8020-83-5	deodorized kerosene	YES	1st ITSL		24	annual	YES				
8030-30-6	naphtha	NO		>75th%	3500	8 hr					
8032-32-4	VM & P naphtha	NO		>75th%	3500	8 hr					
8042-47-5	white mineral oil	YES	1st ITSL		50	8 hr	YES				
8050-09-7	colophony	YES	1st ITSL		1	1 hr	YES				
8052-41-3	stoddard solvent	NO		>75th%	3500	8 hr					
8052-42-4	Asphalt fumes	YES	Carc								
9000-90-2	alpha-amylase	YES	1st ITSL		0.02	1 hr	YES				
9001-92-7	bacillus subtilis neutral protease	YES	1st ITSL		0.02	1 hr	YES				
9002-86-2	polyvinyl chloride	YES	1st ITSL		5	annual	YES				

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9002-92-0	polyoxyethylene lauryl ether	YES	1st ITSL		12	annual	YES				
9002-93-1	triton x100	YES	1st ITSL		0.15	annual	YES				
9003-11-6	methyl oxirane (pluronic p103)	NO		default	0.1	annual					
9003-13-8	polyalkylene glycol monobutyl ether/ butoxypolypropylene glycol	NO		>75th%	160	annual					
9003-22-9	polyvinylchloride/polyvinylacetate	YES	1st ITSL		50	annual	YES				
9003-39-8	polyvinyl pyrrolidone	YES	1st ITSL		4	annual	YES				
9003-55-8	styrene-butadiene polymer	NO		default	0.1	annual					
9004-32-4	carboxymethyl cellulose	NO		>75th%	300	annual					
9004-58-4	ethylhydroxyethyl cellulose	YES	1st ITSL		50	8 hr	YES				
9004-74-4	polyethylene glycol methyl ether	YES	1st ITSL		13	annual	YES				
9011-17-0	polyvinylidine fluoride	NO		default	0.1	annual					
9014-85-1	tetramethyl decyndiol	NO		default	0.1	annual					
9014-92-0	t-det dd-14	NO		default	0.1	annual					
9016-45-9	igepal co-630	YES	1st ITSL		18	annual	YES				
9016-87-9	polmeric methylene diphenyl diisocyanate	YES	1st ITSL		0.6	annual*	YES				
9036-19-5	t-det c08	NO		default	0.1	annual					
9063-06-3	oxirane, methyl-, polymer with oxirane, monomethyl ether	NO		default	0.1	annual					
10025-78-2	trichlorosilane	YES	1st ITSL		8	annual	YES				
10025-91-9	antimony trichloride	YES	1st ITSL		5	8 hr	YES				
10026-04-7	silicon tetrachloride	NO		>75th%	1100	annual					
10034-93-2	hydrazine sulfate	YES	Carc								0.0008
10034-96-5	manganese sulfate monohydrate	YES	1st ITSL		0.15	annual*	YES				
10035-10-6	hydrogen bromide	YES	1st ITSL		70	1 hr	YES				
10039-56-2	sodium hypophosphite monohydrate	NO		default	0.1	annual					
10049-04-4	chlorine dioxide	YES	1st ITSL		0.2	annual*	YES				

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10096-91-0	hydroxyphenylbenzotriazole	NO		default	0.1	annual					
10097-09-3	bis-urea accelerator	NO		default	0.1	annual					
10190-55-3	lead molybdate	YES	1st ITSL		30	8 hr	YES				
10215-30-2	2-propoxy-1-propanol	NO		default	0.1	annual					
10377-60-3	magnesium nitrate	YES	1st ITSL		100	8 hr	YES				
10431-98-8	2-ethyl-2-oxazoline	YES	1st ITSL		53	annual	YES				
10469-09-7	tetrachloropicolinic acid	YES	1st ITSL		21	annual	YES				
10482-56-1	alpha-terpineol	NO		default	0.1	annual					
10551-21-0	phenethyl alpha picolinium bromide	NO		default	0.1	annual					
12021-95-3	hexafluorozirconium acid	NO		default	0.1	annual					
12035-72-2	nickel subsulfide	YES	Carc								0.0021
12037-29-5	praseodymium oxide	NO		default	0.1	annual					
12054-85-2	ammonium molybdate	YES	1st ITSL		5	8 hr	YES				
12070-12-1	tungsten carbide	YES	1st ITSL		50	8 hr	YES				
12136-45-7	potassium oxide	NO		default	0.1	annual					
12262-58-7	cyclohexanone peroxide	NO		default	0.1	annual					
12401-86-4	sodium monoxide	NO		default	0.1	annual					
12789-03-6	chlordane (technical)	YES	1st ITSL, Carc		0.7	annual*	YES				0.01
13007-85-7	sodium glucoheptonate	NO		default	0.1	annual					
13209-41-1	17,21-dihydroxy-16 alpha-methylpregna-1,4,9(11)-triene-3,20-dione	NO		default	0.1	annual					
13465-77-5	hexachlorodisilane	NO		default	0.1	annual					
13466-78-9	carene, delta	YES	1st ITSL		1120	8 hr	YES				
13528-93-3	bis(me2clsilyl)ethane	NO		default	0.1	annual					
13701-59-2	barium metaborate monohydrate	NO		default	0.1	annual					
13879-32-8	1,1'[methylenebis(oxyethane-1,2-diloxy)]bisbenzene	YES	1st ITSL		0.7	annual	YES				

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13952-84-6	sec-butylamine	YES	1st ITSL		5	annual	YES				
14579-03-4	cyclopentyltrichlorosilane	NO		default	0.1	annual					
14807-96-6	talc	YES	Carc								0.8
14808-60-7	Crystalline silica	YES	1st ITSL		3	annual	YES				
14960-06-6	sodium lauriminodipropionate	NO		default	0.1	annual					
15096-52-3	sodium aluminum fluoride	YES	1st ITSL		270	8 hr	YES				
15245-12-2	nitric acid, ammonium calcium salt	NO		default	0.1	annual					
15321-61-6	iron oxalate	NO		default	0.1	annual					
15821-83-7	propylene glycol n-butyl ether (beta isomer)	YES	1st ITSL		77	annual	YES				
15956-58-8	manganese 2-ethylhexanoate	YES	1st ITSL		0.3	annual*	YES				
16065-83-1	Chromium, trivalent	YES	1st ITSL		5	8 hr	YES				
16079-88-2	1-bromo-3-chloro-5,5-dimethylhydantoin	YES	1st ITSL		2	8 hr	YES				
16369-21-4	n-propylethanolamine	YES	1st ITSL		28	annual	YES				
16691-43-3	3-amino-5-mercapto-1,2,4-triazole	YES	1st ITSL		7	annual	YES				
16753-62-1	methylvinyldimethoxysilane	YES	1st ITSL		100	annual	YES				
16881-77-9	methyldimethoxysilane	YES	1st ITSL		92	annual	YES				
16883-83-3	1,3-pentanediol-2,2,4-trimethyl-3-(benzyl phthalate)-isobutyrate	NO		default	0.1	annual					
16893-85-9	sodium silicofluoride	YES	1st ITSL		250	8 hr	YES				
16919-31-6	ammonium hexafluorozirconate	NO		default	0.1	annual					
17557-23-2	neopentyl glycol diglycidyl ether	NO		default	0.1	annual					
17639-93-9	methyl chloroproprionate	YES	1st ITSL		6	annual	YES				
18063-03-1	2,6-difluorobenzamide	YES	1st ITSL		11	annual	YES				
18300-89-5	cinnamate	NO		default	0.1	annual					
18395-30-7	isobutyltrimethoxysilane	NO		>75th%	200	annual					
18540-29-9	chromium, hexavalent - mist	YES	1st ITSL, Carc		0.008	annual*	YES				8E-05

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18540-29-9	chromium, hexavalent - particulate	YES	1st ITSL, Carc		0.1	annual*	YES				8E-05
18868-43-4	molybdenum dioxide	YES	1st ITSL		30	8 hr	YES				
19089-47-5	propylene glycol monoethyl ether (alpha)	YES	1st ITSL		23	annual	YES				
19430-93-4	perfluorobutylethylene	NO		>75th%	340	annual					
19549-80-5	4,6-dimethyl-2-heptanone	NO		default	0.1	annual					
19666-30-9	oxadiazon	YES	Carc								0.05
20324-33-8	tripropylene glycol methyl ether, dowanol 62b	YES	1st ITSL		10	annual	YES				
20536-16-7	tetrachlorodisilane	NO		default	0.1	annual					
21324-40-3	lithium hexafluorophosphate	NO		default	0.1	annual					
21348-59-4	niobium oxalate	NO		default	0.1	annual					
22407-51-8	tetramethylchlorovinyldisiloxane	NO		default	0.1	annual					
22431-89-6	3,3,6,6-tetramethyl-1,2-dioxane	NO		default	0.1	annual					
23410-40-4	1,2-ethanediamine, n-(3-(dimethoxymethylsilyl)-2-methylpropyl)	NO		default	0.1	annual					
24304-00-5	aluminum nitride	YES	1st ITSL		0.03	annual	YES				
24510-87-0	flumethasone 5	NO		default	0.1	annual					
24729-96-2	clindamycin phosphate	YES	1st ITSL		6	annual	YES				
24937-79-9	polyvinylidene fluoride	NO		default	0.1	annual					
24938-91-8	polyglycol 59-13	YES	1st ITSL		7	annual	YES				
25013-15-4	vinyl toluene	YES	1st ITSL		6	annual*	YES				
25036-25-3	diglycidyl ether of bisphenol a	NO		default	0.1	annual					
25068-38-6	bisphenol a/epichlorohydrin resin	NO		>75th%	160	annual					
25085-99-8	bisphenol epoxy resin	NO		default	0.1	annual					
25154-52-3	nonyl phenol (mixed isomers)	YES	1st ITSL		30	annual*	YES				
25168-26-7	2,4-D, isooctyl ester	YES	1st ITSL		3	annual	YES				

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NEW AvgT "annual" Some ITSLs with 24-hr avg. time were converted to annual avg. because ITSL was derived to protect for chronic effects.

CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
25265-71-8	dipropylene glycol	NO		>75th%	242	annual					
25265-77-4	texanol	YES	1st ITSL		55	annual	YES				
25322-68-3	polyethylene glycol	YES	1st ITSL		8	annual	YES				
25322-69-4	polypropylene glycol	YES	1st ITSL		49	annual	YES				
25340-17-4	diethylbenzene mixture	YES	1st ITSL		6	annual	YES				
25498-49-1	tripropylene glycol methyl ether	YES	1st ITSL		11	annual	YES				
25550-14-5	ethyl toluene -mixture	NO		default	0.1	annual					
25551-13-7	trimethylbenzenes (mixed isomers)	YES	1st ITSL, 2nd ITSL		50	annual	YES	1200	8 hr	YES	
25973-55-1	benzotriazol dimethylpropyl phenol	NO		default	0.1	annual					
25988-97-0	dimethylamine-epichlorohydrin polymer	NO		default	0.1	annual					
26062-79-3	polydimethyl diallyl ammonium chloride	NO		>75th%	1000	annual*					
26142-30-3	diglycidyl ether of polyglycol	NO		default	0.1	annual					
26172-55-4	5-chloro-2-methyl-4-isothiazolin-3-one	NO		default	0.1	annual					
26447-40-5	1,1'-methylene bisisocyanatobenzene	YES	1st ITSL		0.6	annual*	YES				
26471-62-5	toluene diisocyanate	YES	1st ITSL, Carc		0.07	annual*	YES				0.03
26530-20-1	octylisothiazolone	YES	1st ITSL		2	annual	YES				
26544-20-7	mcpa 2-ehe (2-methyl-4-chlorophenoxyacetic acid 2-ethylhexyl ester)	YES	1st ITSL		90	annual	YES				
26761-40-0	diisodecyl ester phthalate	YES	1st ITSL		30	annual	YES				
26780-96-1	poly(1,2-dihydro-2,2,4-trimethylquinoline)	YES	1st ITSL		35	annual*	YES				
26952-20-5	picloram, isooctyl ester	NO		default	0.1	annual					
26952-21-6	isooctanol	NO		>75th%	2700	8 hr					
27078-75-7	4,6-difluoro-2-methoxypyrimidine	NO		default	0.1	annual					
27208-37-3	Cyclopenta[c,d]pyrene	YES	EPA Carc								

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27253-31-2	cobalt neodecanoate	YES	1st ITSL		1.4	8 hr	YES				
27253-32-3	manganese neodecanoate	YES	1st ITSL		0.3	annual*	YES				
27274-31-3	polyethylene glycol monoallyl ether	YES	1st ITSL		6	annual	YES				
27646-80-6	2-methylamino-2-methyl-1-propanol	NO		default	0.1	annual					
27668-52-6	octadecyldimethyl (3-(trimethoxysilyl)propyl) ammonium chloride	NO		>75th%	170	annual					
28300-74-5	antimony potassium tartrate	YES	1st ITSL		5	8 hr	YES				
28476-83-7	2-butenedioic acid (z)-dibutyl ester, polymer with chloroethene	NO		default	0.1	annual					
28553-12-0	diisononyl phthalate	YES	1st ITSL		75	annual	YES				
28729-52-4	dimethylcyclopentane	NO		default	0.1	annual					
28729-54-6	m-propyl toluene	NO		default	0.1	annual					
28961-43-5	triacrylate ester	NO		default	0.1	annual					
28984-69-2	4,4-(5h)-oxazoledimethanol, 2-(hepadecanyl)	NO		default	0.1	annual					
29387-86-8	propylene glycol, n-butyl ether (mixed isomers)	YES	1st ITSL		77	annual	YES				
29733-18-4	diisodecyl glutarate	NO		default	0.1	annual					
29911-27-1	dipropylene glycol monopropyl ether	YES	1st ITSL		5	annual	YES				
29911-28-2	dipropylene glycol monobutyl ether	YES	1st ITSL		11	annual	YES				
30030-25-2	vinylbenzylchloride	YES	1st ITSL		2	annual	YES				
30705-14-7	SR 1153	NO		default	0.1	annual					
31138-65-5	sodium glucoheptonate	NO		default	0.1	annual					
31726-34-8	poly(oxy-1,2-ethanediyl),alpha-hexyl-omega-hydroxy	NO		default	0.1	annual					
34375-28-5	hydroxymethylamino ethanol	NO		default	0.1	annual					
34590-94-8	dipropylene glycol methyl ether	NO		>75th%	720	annual*					

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
35176-78-4	polyethylene terephthalate (uncoated)	NO		default	0.1	annual					
35794-11-7	3,5-dimethylpiperidine	NO		default	0.1	annual					
35884-42-5	dowanol dpnb	NO		default	0.1	annual					
37251-67-5	polyethylene polypropylene glycol	NO		default	0.1	annual					
38436-16-7	perfluorobutylethylmethyldichlorosilane	NO		default	0.1	annual					
39464-66-9	lauryl alcohol, phosphated	YES	1st ITSL		20	annual	YES				
40758-65-4	4,6-dichloro-2-ethoxypyrimidine	NO		default	0.1	annual					
41556-26-7	bis(pentamethylpiperdinyl)sebacate	NO		default	0.1	annual					
41593-38-8	propylene glycol monophenyl ether	NO		default	0.1	annual					
42978-66-5	tripropylene glycol diacrylate	YES	1st ITSL		22	annual	YES				
44992-01-0	acryloyloxyethyltrimethyl ammonium chloride	NO		default	0.1	annual					
46438-39-5	monobutyl monophenyl phosphoric acid	NO		default	0.1	annual					
50791-87-2	methylvinylbis(N-methylace	YES	1st ITSL		4	annual	YES				
51200-87-4	dimethyloxazolidine	YES	1st ITSL		1	annual	YES				
51730-94-0	dipropylene glycol phenyl ether	NO		default	0.1	annual					
51811-38-2	tryfac 5556	NO		default	0.1	annual					
52125-53-8	propylene glycol monoethyl ether (mixture)	YES	1st ITSL		23	annual	YES				
53880-05-0	isophorone diisocyanate polymer	NO		default	0.1	annual					
55818-57-0	phenol, 4,4-(1-methylethylidene)bis, polymer with (chloromethyl)oxiran	NO		default	0.1	annual					
55934-93-5	tripropylene glycol n-butyl ether	NO		>75th%	116	annual*					
56539-66-3	3-methoxy-3methyl-1butanol	YES	1st ITSL		13	annual	YES				
56741-95-8	bropirimine	YES	1st ITSL		15	annual	YES				
56780-58-6	2-hydroxy-3-trimethylammoniopropyl ether starch	NO		default	0.1	annual					

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
57018-52-7	propylene glycol tert-butyl ether	NO		>75th%	329	annual					
60304-36-1	aluminum potassium fluoride	YES	1st ITSL		0.2	annual	YES				
60676-86-0	amorphous silica - fused silica	YES	1st ITSL		60	8 hr	YES				
60966-36-1	bisnoralcohol	YES	1st ITSL		17	annual	YES				
61477-94-9	pirmenol hydrochloride	YES	1st ITSL		3	annual	YES				
61788-93-0	coco alkyldimethyl amines	NO		default	0.1	annual					
61790-33-8	tallow alkylamines	NO		default	0.1	annual					
61790-53-2	amorphous silica - diatomaceous earth	YES	1st ITSL		60	8 hr	YES				
61791-28-4	ethoxy, tallow alcohol	NO		default	0.1	annual					
63148-57-2	Dow Corning Fluid 1107	YES	1st ITSL		30	annual	YES				
63148-62-9	high molecular wt. silicon	YES	1st ITSL		2	annual	YES				
63148-65-2	polyvinyl butyral	NO		default	0.1	annual					
63449-39-8	chlorinated paraffins	YES	Carc								0.03
63716-40-5	n-butoxy propanol (mixed isomers)	YES	1st ITSL		77	annual	YES				
63937-30-4	anhydro-dimethylamino hexose reductone	YES	1st ITSL		0.6	annual	YES				
64248-62-0	3,4-difluorobenzonitrile	YES	1st ITSL		0.6	annual	YES				
64265-57-2	crosslinker cx100	YES	1st ITSL		10	annual	YES				
64475-85-0	mineral spirits	NO		>75th%	3500	8 hr					
64485-82-1	thiazole ester	YES	1st ITSL		17	annual	YES				
64741-41-9	naphtha heavy straight run	NO		>75th%	3500	8 hr					
64741-42-0	naphtha, full range straight run	YES	1st ITSL		18	annual	YES				
64741-44-2	straight run middle distillate	YES	1st ITSL		36	annual	YES				
64741-54-4	naphtha, heavy catalytic cracked	NO		>75th%	115	annual					
64741-55-5	naphtha (petroleum), light catalytic cracked	NO		>75th%	5600	annual*					
64741-56-6	residues, (petroleum), vacuum	YES	1st ITSL		16	annual	YES				

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
64741-59-9	distillates, (petroleum), light catalytic cracked	YES	1st ITSL		93	annual	YES				
64741-62-4	clarified oils (petroleum), catalytic cracked	YES	1st ITSL		12	annual	YES				
64741-63-5	naphtha, light catalytic reformed	YES	1st ITSL		100	annual	YES				
64741-64-6	naphtha, full range alkylate	NO		>75th%	3500	8 hr					
64741-65-7	heavy alkylate naphtha	NO		>75th%	3500	8 hr					
64741-66-8	light alkylate naphtha	NO		>75th%	138	annual					
64741-68-0	heavy catalytic reformed naphtha	YES	1st ITSL		70	annual	YES				
64741-81-7	distillates (petroleum), heavy thermal cracked	YES	1st ITSL		15	annual	YES				
64741-82-8	distillates (petroleum), light thermal cracked	YES	1st ITSL		93	annual	YES				
64741-83-9	naphtha, heavy thermal cracked	NO		>75th%	5600	annual*					
64741-86-2	sweetened middle distillate	YES	1st ITSL		2	annual	YES				
64741-88-4	solvent refined heavy paraffnic distillate	YES	1st ITSL		50	8 hr	YES				
64741-89-5	distillates (petroleum) solvent-refined light paraffinic	YES	1st ITSL		50	8 hr	YES				
64742-06-9	extracts (petroleum), middle distillate solvent	YES	1st ITSL		2	annual	YES				
64742-14-9	petroleum distillates, acid treated	YES	1st ITSL		24	annual	YES				
64742-30-9	distillates (petroleum), chemically neutralized middle	YES	1st ITSL		2	annual	YES				
64742-46-7	hydrotreated middle distillate	YES	1st ITSL		50	8 hr	YES				
64742-47-8	hydrotreated light distillate	YES	1st ITSL		24	annual	YES				
64742-48-9	hydrotreated heavy napht	NO		>75th%	3500	8 hr					
64742-49-0	hydrotreated light naphtha	NO		>75th%	3500	8 hr					
64742-52-5	hydrotreated heavy naphthenic	YES	1st ITSL		50	8 hr	YES				

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
	distillate										
64742-53-6	hydrotreated light naphthenic distillate	YES	1st ITSL		50	8 hr	YES				
64742-54-7	hydrotreated heavy paraffinic mineral oil	YES	1st ITSL		50	8 hr	YES				
64742-55-8	hydrotreated light paraffinic distillate	YES	1st ITSL		50	8 hr	YES				
64742-62-7	residual oils (petroleum) solvent-dewaxed	YES	1st ITSL		50	8 hr	YES				
64742-65-0	dewaxed heavy paraffinic mineral oil	YES	1st ITSL		50	8 hr	YES				
64742-80-9	hydrodesulfurized middle distillate	YES	1st ITSL		2	annual	YES				
64742-81-0	hydrodesulfurized kerosene	YES	1st ITSL		2	annual	YES				
64742-82-1	naphtha (petroleum) hydrodesulfurized heavy	YES	1st ITSL		14	annual	YES				
64742-88-7	solvent naphtha medium aliphatic	NO		>75th%	3500	8 hr					
64742-89-8	solvent naphtha light aliphatic	NO		>75th%	3500	8 hr					
64742-94-5	heavy aromatic solvent naphtha	YES	1st ITSL		70	annual*	YES				
64742-95-6	light aromatic solvent naphtha (petroleum)	YES	1st ITSL		61	annual	YES				
64742-96-7	solvent naphtha (petroleum) heavy aliphatic	YES	1st ITSL		24	annual	YES				
64771-72-8	norpar 12	NO		default	0.1	annual					
65402-65-5	4-hydroxytetramethyl piperadine free radical (4-oh-tempo)	YES	1st ITSL		4	annual	YES				
66071-86-1	LV 837/821	NO		default	0.1	annual					
67701-10-4	sodium soap 903923	YES	1st ITSL		6	annual	YES				
67701-11-5	sodium soap 900602	YES	1st ITSL		6	annual	YES				
67762-41-8	linear primary alcohol	NO		default	0.1	annual					
67762-90-7	siloxanes and silicones(silica filled polydimethylsiloxane)	NO		default	0.1	annual					
67784-80-9	soybean oil, methyl esters	YES	1st ITSL		15	annual	YES				

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67812-17-3	3-trimethoxysilyl propylmethyl methylphosphonate	NO		default	0.1	annual					
68002-20-0	1,2,3-triazine-2,4,6-triamine polymer with methylated formaldehyde	NO		default	0.1	annual					
68003-28-1	polyamide	NO		default	0.1	annual					
68037-58-1	high molecular wt. silicon	NO		default	0.1	annual					
68037-76-3	alphamethylstyrene(dodecyl)polysiloxane	NO		default	0.1	annual					
68037-77-4	ethylmethylsiloxane, 2-phenylpropylmethylsiloxane copolymer	NO		default	0.1	annual					
68037-88-7	high molecular weight sili	NO		default	0.1	annual					
68071-85-2	Spenkel F34	NO		default	0.1	annual					
68083-19-2	high molecular wt. silicon	NO		default	0.1	annual					
68083-20-5	linear methylvinylsiloxane ppolymer hydroxl endblock	NO		default	0.1	annual					
68083-40-9	2-hydroxy-4(2'-hydroxy-3'octoxypropoxy)-benzophenone	NO		default	0.1	annual					
68092-49-9	2-hydroxy-4(2'-hydroxy-3'dacyloxypropoxy)-benzophenone	NO		default	0.1	annual					
68131-40-8	tergitol 15-s-3	NO		>75th%	290	annual*					
68132-02-5	coumarone indene resin	NO		default	0.1	annual					
68309-52-4	Nylen 5	NO		default	0.1	annual					
68334-30-5	diesel fuel	YES	1st ITSL		70	annual	YES				
68390-56-7	diketene hydrogenated fatty acids	NO		default	0.1	annual					
68410-00-4	distillates (petroleum), crude oil	YES	1st ITSL		19	annual	YES				
68410-23-1	polyethylenepolyamine reaction products with c18-unsat. fatty acids	NO		default	0.1	annual					
68439-49-6	ethoxylated c16-18 alcohols	YES	1st ITSL		4	annual	YES				
68458-91-3	Solvar & LV 820	NO		default	0.1	annual					

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL (µg/m^3)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL (µg/m^3)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
68459-31-4	fatty acids c9-11 branched glycidyl esters polymer	NO		default	0.1	annual					
68476-86-8	petroleum gases, liquefied, sweetened	NO		default	0.1	annual					
68477-31-6	aromatic petroleum derivative solvent	YES	1st ITSL		13	annual	YES				
68515-40-2	alkyl benzyl phthalate	NO		default	0.1	annual					
68515-44-6	branched and linear diheptyl phthalate ester	NO		default	0.1	annual					
68516-16-5	sulfuric acid c6-10 alkyl esters	NO		default	0.1	annual					
68526-86-3	tridecanol	YES	1st ITSL		2	annual	YES				
68551-17-7	heavy naphtha	NO		>75th%	3500	8 hr					
68575-36-0	3,5-dichloro-a-methyl st	YES	1st ITSL		16	annual	YES				
68608-26-4	sodium petroleum sulfonate	NO		default	0.1	annual					
68610-11-7	diethylenetriamine reaction product with bisphenol a	NO		default	0.1	annual					
68783-24-4	di-tallow alkylamines	NO		default	0.1	annual					
68918-22-9	high molecular wt. silicon	NO		default	0.1	annual					
68955-35-1	naphtha, catalytic reformed	NO		>75th%	350	annual*					
68956-56-9	hydrocarbons, terpene processing by-products	NO		default	0.1	annual					
68987-42-8	ethylenated benzene residues	YES	1st ITSL		6	annual	YES				
68990-79-4	oils, vegetable, mixed with animal oil methylesters, polymerized, oxidixed	NO		default	0.1	annual					
69012-64-2	amorphous silica - silica fume	YES	1st ITSL		60	8 hr	YES				
69013-18-9	alcohols c8-18 ethoxylated propoxylated	NO		default	0.1	annual					
69029-39-6	polyglycol 26-2	NO		default	0.1	annual					
69102-90-5	butadiene homopolymer	NO		default	0.1	annual					
69430-24-6	high molecular wt. silicon	YES	1st ITSL		30	annual	YES				

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CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
69696-98-6	hexane 1,6-bis(tributyl ammonium bromi	NO		default	0.1	annual					
69991-67-9	fomblin perfluorpolyether	NO		default	0.1	annual					
70131-67-8	high molecular wt. silicon	NO		default	0.1	annual					
70657-70-4	2-methoxy-1-propanol acetate	NO		>75th%	500	annual*					
70914-20-4	c6-8 branched alcohols	YES	1st ITSL		13	annual	YES				
71888-89-6	diisoheptyl phthalate	YES	1st ITSL		100	annual*	YES				
71945-54-5	3-(1,1-dimethylethoxy)-heptane	YES	1st ITSL		6	annual	YES				
75782-86-4	alcohols c12-13	YES	1st ITSL		31	annual	YES				
77820-58-7	2-amino-3-chlorobenzoic acid methyl ester	YES	1st ITSL		7	annual	YES				
78330-21-9	c11-c14 isoalcohols, c14 rich, ethoxylated alcohol	YES	1st ITSL		8	annual	YES				
82586-54-7	quinapril step 8	YES	1st ITSL		2	annual	YES				
82919-37-7	methyl pentamethyl-4-piperidinyl ester of decanedioic acid	NO		default	0.1	annual					
84632-65-5	pyrrolo[3,4-c]pyrrole-1,4-dione,3,6-bis(4-chlorophenyl)-2,5-dihydro	NO		default	0.1	annual					
86753-78-8	Solsperse 5000	NO		default	0.1	annual					
88230-35-7	oxo-hexyl acetate	YES	1st ITSL		81	annual	YES				
88851-61-0	trospectomycin sulfate	NO		default	0.1	annual					
88917-22-0	dipropylene glycol methyl ether acetate	NO		>75th%	930	annual*					
90438-79-2	oxo-heptyl acetate	YES	1st ITSL		41	annual	YES				
90622-57-4	isopar h	NO		>75th%	128	annual					
95481-62-2	dibasic ester	YES	1st ITSL		1	annual	YES				
97658-80-5	5-bp-bisenamine	YES	1st ITSL		10	annual	YES				
98516-30-4	propanol, 1(or 2) ethoxy, acetate isoparaffinic petroleum hydrocarbon	NO		default	0.1	annual					

Table 4. Current and Proposed MDEQ Air Quality Division Screening Level List of Toxic Air Contaminants

NEW AvgT "annual" Some ITSLs with 24-hr avg. time were converted to annual avg. because ITSL was derived to protect for chronic effects.

CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL (µg/m^3)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL (µg/m^3)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
98967-40-9	flumetsulam	YES	1st ITSL		26	annual	YES				
98967-55-6	n-(2,6-difluorophenyl)-7-methyl-1h-1,2,4-triazolo(1,5a)pyrimidine-2-su	NO		default	0.1	annual					
102054-10-4	bis(2-methoxy-1-methylethy	YES	1st ITSL		6	annual	YES				
103335-54-2	4-aza acid	YES	1st ITSL		17	annual	YES				
103429-90-9	3-methoxy-3methyl-1butyl acetate	NO		default	0.1	annual					
103980-44-5	ceftiofur hydrochloride	NO		>75th%	166	annual					
106917-31-1	sanduvor 3068 liquid	YES	1st ITSL		52	annual	YES				
108419-32-5	exxate 800 - octyl acetate	NO		>75th%	110	annual*					
108419-33-6	exxate 900	YES	1st ITSL		17	annual	YES				
108419-34-7	exxate 1000	YES	1st ITSL		17	annual	YES				
108419-35-8	c11-14 branched alkyl acetates	NO		>75th%	300	annual*					
109265-71-6	Solsperse 12000	NO		default	0.1	annual					
110839-13-9	1,3-benzenedimethanamine polymer with 2,2'-((1-methylethylidene) bis(4	NO		default	0.1	annual					
110888-15-8	4-chloro-3-fluorobenzonitrile	NO		default	0.1	annual					
111109-77-4	dipropylene glycol dimethyl ether	YES	1st ITSL		59	annual*	YES				
111381-89-6	branched and linear heptyl nonyl phthalate ester	NO		default	0.1	annual					
112926-00-8	amorphous silica - precipitated silica and silica gel	YES	1st ITSL		60	8 hr	YES				
112945-52-5	amorphous silica - pyrogenic or fumed silica	YES	1st ITSL		60	8 hr	YES				
113171-12-3	n-(2,6-difluorophenyl)-5-amino-1h-1,2,4-triazole-3-sulfonamide	NO		default	0.1	annual					
117482-84-5	3-chloro-4-fluorobenzonitrile	YES	1st ITSL		2	annual	YES				
123312-54-9	distearyldimethylammonium bisulfate	NO		default	0.1	annual					
123333-53-9	1-hydroxy benzotriazole	NO		default	0.1	annual					

Table 4. Current and Proposed MDEQ Air Quality Division Screening Level List of Toxic Air Contaminants

NEW AvgT "annual" Some ITSLs with 24-hr avg. time were converted to annual avg. because ITSL was derived to protect for chronic effects.

CAS Number	Chemical Name	Future TAC?	Basis for Yes	Reason for No, etc.	1st ITSL ($\mu g/m^3$)	*NEW AvgT	1st ITSL <=75th%	2nd ITSL ($\mu g/m^3$)	2nd ITSL AvgT	2nd ITSL <=75th%	IRSL
126803-73-4	n-(2,6-dichloro-3-methylphenyl)-5,7-dimethyoxy(1,2,4)triazo...[de-511]	NO		default	0.1	annual					
129879-84-1	5-amino-1,2,4-triazole-3-sulfonyl chloride	YES	1st ITSL		7	annual	YES				
130014-38-9	trifluoropropylsilsesquioxane, dimethylhydrogensilyoxy-terminated	NO		default	0.1	annual					
136797-56-3	FC-247	YES	1st ITSL		24	annual	YES				
136816-75-6	atevirdane mesylate	YES	1st ITSL		16	annual	YES				
144669-03-4	hexenylsiloxane	YES	1st ITSL		16	annual	YES				
144669-04-5	hexenylsiloxanes	YES	1st ITSL		16	annual	YES				
166524-65-8	2-ethoxy-4,6-difluoropyrimidine	YES	1st ITSL		20	annual	YES				
166524-75-0	2,2'-dithiobis(5-ethoxy-7-fluoro[1,2,4]triazolo(1,5-c)pyrimidine	YES	1st ITSL		0.8	annual	YES				
170557-43-4	dowanol tmh-deg borate ester	YES	1st ITSL		32	annual	YES				

APPENDIX K:

COMPARISON OF HAP AND TAC SCREENING LEVEL LISTS

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE-AQD Toxic Air Contaminants List Compared to the EPA Hazardous Air Pollutants List
February 16, 2010
Robert Sills, Toxics Unit Supervisor, MDNRE-Air Quality Division

Michigan's Air Pollution Control Rules (under Part 55 of NREPA) to regulate the emission of toxic air contaminants (TACs) have been in place since 1992. TACs are defined (Rule 336. l120(f)) as any air contaminants for which there are no national - ambient air quality standard and which are or may become harmful to the environment when present in the outdoor atmosphere in sufficient quantities and duration. The TAC definition lists 41 substances which are not TACs. This list includes the six pollutants that have national ambient air quality standards and 35 other substances.

The original air toxics rules (1992) included the current definition of TACs based on the Michigan Air Toxics Policy Committee (1989) recommendation that the AQD should address a large list of TACs plus any other substances which the AQD determines to be of concern at a specific site. The TAC definition was re-visited again in 1997 by the AQD Air Toxics Subcommittee. Based on the Subcommittee's discussion and recommendations, the AQD made revisions to the air toxics rules in 1998, retaining the open-ended TAC definition but providing greater flexibility in the rules and adopting a small quantity exemption.

The regulatory programs of the AQD and the EPA are intended to provide a level of protection against the potential risks of air toxics and therefore ensure the public that facility emissions are safe. However, the federal regulations for air toxics have significant limitations. These limitations include the specific air toxics that are regulated, types of facilities that are regulated, the quantity of emissions that are subject to regulation, and the risk assessment requirements.

EPA lists 187 substances as hazardous air pollutants (HAPs) that are subject to federal regulation. Major sources are any facility that emits 10 tons per year of any HAP or 25 tons per year of any combination of HAPs. EPA has made progress in developing pollution control technology requirements for categories of major sources. EPA is also required to assess the need for standards to protect public health and the environment. However, EPA has completed very few of these residual risk assessments on their listed HAPs. In those instances where a technology standard is established and a residual risk assessment has been completed, the source category is exempted from the AQD air toxics regulations so there is no regulatory redundancy.

Michigan's program is broader than the federal program to better ensure public health protection from air toxics emissions from proposed new or modified sources, while also including a number of exemptions for sources and air toxics emission levels which have been specifically determined to pose no unacceptable risks to the public health. Michigan's program is designed to supplement and complement (without redundancy) the federal air toxics regulations.

Although the EPA HAP list captures many substances recognized as high-concern air contaminants, there are many non-HAP air toxics which can potentially pose health risks to the public who are exposed to them. These substances include pharmaceuticals, pesticides,

metals, inorganic compounds, and organic compounds. In Michigan, approximately 1200 TACs listed in the attached table were identified in Permit to Install applications for proposed facilities. As part of the permit application review, the TACs were evaluated by AQD toxicologist staff and health-based screening levels were developed, which provide a level of protection from adverse health effects. The AQD frequently provides assurances to the concerned public about the safety of existing or proposed facility air emissions, and is able to do so because of the health-based screening levels and the open-ended TAG definition.

As indicated in the 3rd and 4th columns of Table 2, there are many TACs which are not HAPs but which are carcinogenic. TACs also pose concerns for potential acute toxicity, developmental effects, sensitization, respiratory effects such as asthma, liver or kidney effects, neurological effects, etc. Table 1 shows some specific examples of non-HAP TACs and their primary public health concerns.

Table 1. Example non-HAP TACs and their primary public health concerns.

Toxic Air Contaminants (TACs)	Primary Public Health Concern
Aldrin, benzaldehyde, bromodichloromethane, dimethylvinyl chloride, hydrazine sulfate, molybdenum trioxide, nitromethane, tetrahydrofuran, etc.	Carcinogens
Ammonia, Glutaraldehyde, Hydrogen sulfide	Irritation of the eyes and respiratory tract
2,4,6-trinitrotoluene	Liver toxicity, anemia
Barium	Muscle toxicity; environmental persistence
Bromine	Respiratory irritation, headache
Chlorine dioxide	Lung toxicity
Chlormadinone acetate	Reproductive effects
Chlorpyrifos	Nervous system toxicity
Colophony, Isophorone diisocyanate	Asthma exacerbation, sensitizer
Dibutyltin oxide	Immune function and central nervous system toxicity
Methylene diphenyl isocyanate	Respiratory tract toxicity
Melengesterol acetate	Reproductive toxicity; menstruation blockage
Osmium tetroxide	Irritant to the eyes, nose and throat; pulmonary edema and bronchitis
Sulfuric acid	Eye and respiratory irritancy and corrosiveness, shortness of breath
Tetrachlorobenzene	Liver and kidney toxicity; environmental persistence
Thallium	Developmental, respiratory, and gastrointestinal effects; environmental persistence
Vanadium pentaoxide	Bronchitis, emphysema, respiratory tract irritation

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
3052-70-8	(1-methylethylidene)bis(1,1-dimethylpropyl)peroxide	no	no
6713-03-7	1-(2-hydroxyethylthio)propane	no	no
630-20-6	1,1,1,2-tetrachloroethane	no	yes
811-97-2	1,1,1,2-tetrafluoroethane	no	no
460-73-1	1,1,1,3,3-pentafluoropropane	no	no
79-34-5	**1,1,2,2-tetrachloroethane**	**yes**	yes
--0	1,1,2,4-tetramethyl-1-1-1-sila-2-aza-cyclopentane	no	no
76-13-1	1,1,2-trichloro-1,2,2-trifluoroethane	no	no
79-00-5	**1,1,2-trichloroethane**	**yes**	yes
3006-86-8	1,1-di-(tert-buytlperoxy)cyclohexane	no	no
1717-00-6	1,1-dichloro-1-fluoroethane	no	no
75-34-3	**1,1-dichloroethane**	**yes**	no
75-37-6	1,1-difluoroethane	no	no
612-00-0	1,1-diphenylethane	no	no
26447-40-5	1,1'-methylene bisisocyanatobenzene	no	no
2403-89-6	1,2,2,6,6-pentamethyl-4-piperidinol	no	no
634-66-2	1,2,3,4-tetrachlorobenzene	no	no
634-90-2	1,2,3,5-tetrachlorobenzene	no	no
68002-20-0	1,2,3-triazine-2,4,6-triamine polymer with methylated formaldehyde	no	no
87-61-6	1,2,3-trichlorobenzene	no	no
96-18-4	1,2,3-trichloropropane	no	no
526-73-8	1,2,3-trimethylbenzene	no	no
95-94-3	1,2,4,5-tetrachlorobenzene	no	no
95-93-2	1,2,4,5-tetramethylbenzene	no	no
120-82-1	**1,2,4-trichlorobenzene**	**yes**	no
95-63-6	1,2,4-trimethylbenzene	no	no
106-88-7	**1,2-butylene oxide**	**yes**	yes
95-50-1	1,2-dichlorobenzene	no	no
107-06-2	**1,2-dichloroethane**	**yes**	yes
540-59-0	1,2-dichloroethylene	no	no
23410-40-4	1,2-ethanediamine, n-(3-(dimethoxymethylsilyl)-2-methylpropyl)	no	no
87-90-1	1,3,5-trichloroisocyanuric acid	no	no
108-67-8	1,3,5-trimethylbenzene	no	no
110839-13-9	1,3-benzenedimethanamine polymer with 2,2'-((1-methylethylidene) bis(4	no	no
1477-55-0	1,3-bis(aminomethyl)benzenen	no	no
106-99-0	**1,3-butadiene**	**yes**	yes
77-48-5	1,3-dibromo-5,5-dimethylhydantoin	no	no
118-52-5	1,3-dichloro-5,5-dimethylhydantoin	no	no
541-73-1	1,3-dichlorobenzene	no	no
542-75-6	**1,3-dichloropropene**	**yes**	yes
646-06-0	1,3-dioxolane	no	no
16883-83-3	1,3-pentanediol-2,2,4-trimethyl-3-(benzyl phthalate)-isobutyrate	no	no
110-63-4	1,4 butanediol	no	no
106-46-7	**1,4-dichlorobenzene**	**yes**	yes
123-91-1	**1,4-dioxane**	**yes**	yes
592-42-7	1,5-hexanediene	no	no
629-11-8	1,6-hexanediol	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
6674-22-2	1,8-diazabicyclo[5.4.0]undec-7-ene	no	no
58-36-6	10,10'-oxybisphenoxarsine oxide	no	no
--0	100 sxl	unknown	no
13209-41-1	17,21-dihydroxy-16 alpha-methylpregna-1,4,9(11)-triene-3,20-dione	no	no
16079-88-2	1-bromo-3-chloro-5,5-dimethylhydantoin	no	no
109-70-6	1-bromo-3-chloropropane	no	no
109-65-9	1-bromobutane	no	no
75-68-3	1-chloro-1,1-difluoroethane	no	no
88-73-3	1-chloro-2-nitrobenzene	no	yes
611-14-3	1-ethyl-2-methylbenzene	no	no
592-76-7	1-heptene	no	no
629-73-2	1-hexadecene	no	no
947-19-3	1-hydroxcyclohexyl phenyl ketone	no	no
123333-53-9	1-hydroxy benzotriazole	no	no
90-12-0	**1-methyl naphthalene**	**yes** (POM)	yes
108-03-2	1-nitropropane	no	no
1569-01-3	1-propoxy-2-propanol	no	no
1072-63-5	1-vinylimidazol	no	no
--0	2-(1-ethoxyethoxy)-6-(trifluroromethyl)-benzenethiol	no	no
3731-51-9	2-(aminomethyl)pyridine	no	no
540-84-1	**2,2,4-trimethyl pentane**	**yes**	no
6846-50-0	2,2,4-trimethylpentanediol-1,3-diisobutyrate	no	no
366-18-7	2,2'-bipyridyl	no	no
77-76-9	2,2-dimethoxypropane	no	no
166524-75-0	2,2'-dithiobis(5-ethoxy-7-fluoro[1,2,4]triazolo(1,5-c)pyrimidine	no	no
1746-01-6	**2,3,7,8-tetrachlorodibenzo(p)dioxin**	**yes**	yes
513-85-9	2,3-butanediol	no	no
526-75-0	2,3-dimethyl phenol	no	no
79-29-8	2,3-dimethylbutane	no	no
565-59-3	2,3-dimethylpentane	no	no
95-95-4	**2,4,5-trichlorophenol**	**yes**	no
90-72-2	2,4,6-tri(dimethylaminomethyl)phenol	no	no
88-06-2	**2,4,6-trichlorophenol**	**yes**	yes
3764-01-1	2,4,6-trichloropyrimidine	no	no
696-82-2	2,4,6-trifluoropyrimidine	no	no
118-96-7	2,4,6-trinitrotoluene	no	no
94-75-7	**2,4-Dichlorophenoxyacetic Acid (2,4-d)**	**yes**	no
25168-26-7	**2,4- Dichlorophenoxyacetic Acid (2,4-d) isooctyl ester**	**yes**	no
120-83-2	2,4-dichlorophenol	no	no
108-08-7	2,4-dimethylpentane	no	no
105-67-9	2,4-dimethylphenol	no	no
51-28-5	**2,4-dinitrophenol**	**yes**	no
121-14-2	**2,4-dinitrotoluene**	**yes**	yes
123-54-6	2,4-pentanedione	no	no
548-84-9	**2,4-toluene diisocyanate**	**yes**	yes
5779-94-2	2,5-dimethylbenzaldehyde	no	no
95-87-4	2,5-dimethylphenol	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
608-31-1	2,6-dichlorobenzenamine	no	no
5509-65-9	2,6-difluoroaniline	no	no
18063-03-1	2,6-difluorobenzamide	no	no
385-00-2	2,6-difluorobenzoic acid	no	no
1897-52-5	2,6-difluorobenzonitrile	no	no
141-91-3	2,6-dimethyl morpholine	no	no
576-26-1	2,6-dimethyl phenol	no	no
606-20-2	2,6-dinitrotoluene	no	yes
128-37-0	2,6-di-tert-butyl-p-cresol	no	yes
87-62-7	2,6-xylidine	no	yes
124-68-5	2-amino-2-methyl-1-propanol	no	no
77820-58-7	2-amino-3-chlorobenzoic acid methyl ester	no	no
359-07-9	2-bromo-1,1-difluoroethane	no	no
103-63-9	2-bromoethylbenzene	no	no
28476-83-7	2-butenedioic acid (z)-dibutyl ester, polymer with chloroethene	no	no
111-76-2	**2-butoxyethanol**	**yes**	no
111-75-1	2-butylaminoethanol	no	no
2837-89-0	2-chloro-1,1,1,2-tetrafluoroethane	no	no
363-51-9	2-chloro-6-fluorobenzenamine	no	no
95-51-2	2-chloroaniline	no	no
95-57-8	2-chlorophenol	no	no
75-29-6	2-chloropropane	no	no
100-37-8	2-diethylaminoethanol	no	no
100-36-7	2-diethylaminoethylamine	no	no
166524-65-8	2-ethoxy-4,6-difluoropyrimidine	no	no
110-80-5	**2-ethoxyethanol**	**yes**	no
97-95-0	2-ethyl butanol	no	no
94-96-2	2-ethyl-1,3-hexanediol	no	no
1758-88-9	2-ethyl-1,4-dimethyl benzene	no	no
10431-98-8	2-ethyl-2-oxazoline	no	no
110-73-6	2-ethylaminoethanol	no	no
3814-34-4	2-ethylbutyl bromide	no	no
123-05-7	2-ethylhexanal	no	no
149-57-5	2-ethylhexanoic acid	no	no
104-76-7	2-ethylhexanol	no	no
103-09-3	2-ethylhexyl acetate	no	no
103-11-7	2-ethylhexyl acrylate	no	no
104-75-6	2-ethylhexylamine	no	no
1070-10-6	2-ethylhexyltitanate	no	no
7473-98-5	2-hydroxy-2-methyl-1-phenyl-1-propanone	no	no
56780-58-6	2-hydroxy-3-trimethylammoniopropyl ether starch	no	no
68092-49-9	2-hydroxy-4(2'-hydroxy-3'dacyloxypropoxy)-benzophenone	unknown	no
68083-40-9	2-hydroxy-4(2'-hydroxy-3'octoxypropoxy)-benzophenone	unknown	no
868-77-9	2-hydroxyethyl methacrylate	no	no
--0	2-mercapto-3-(trifluoromethyl)-phenol	no	no
1589-47-5	2-methoxy-1-propanol	no	no
70657-70-4	2-methoxy-1-propanol acetate	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
116-11-0	2-methoxy-1-propene	no	no
109-86-4	**2-methoxyethanol**	**yes**	no
78-78-4	2-methyl butane	no	no
624-41-9	2-methyl butyl acetate	no	no
137-32-6	2-methyl-1-butanol	no	no
2682-20-4	2-methyl-4-isothiazolin-3-one	no	no
27646-80-6	2-methylamino-2-methyl-1-propanol	no	no
109-83-1	2-methylaminoethanol	no	no
591-76-4	2-methylhexane	no	no
91-57-6	**2-methylnaphthalene**	**yes** (POM)	no
107-83-5	2-methylpentane	no	no
91-59-8	**2-naphthylamine**	**yes** (POM)	yes
102-81-8	2-n-dibutylaminoethanol	no	no
79-46-9	**2-nitropropane**	**yes**	yes
111-13-7	2-octanone	no	no
10215-30-2	2-propoxy-1-propanol	no	no
7580-85-0	**2-tert-butoxyethanol**	**yes**	no
71945-54-5	3-(1,1-dimethylethoxy)-heptane	no	no
677-21-4	3,3,3-trifluoropropene	no	no
22431-89-6	3,3,6,6-tetramethyl-1,2-dioxane	no	no
6574-99-8	3,4-dichlorobenzonitrile	no	no
64248-62-0	3,4-difluorobenzonitrile	no	no
95-65-8	3,4-dimethyl phenol	no	no
68575-36-0	3,5-dichloro-a-methyl st	no	no
107-54-0	3,5-dimethyl-1-hexyn-3-ol	no	no
108-68-9	3,5-dimethylphenol	no	no
35794-11-7	3,5-dimethylpiperidine	no	no
591-22-0	3,5-lutidine	no	no
16691-43-3	3-amino-5-mercapto-1,2,4-triazole	no	no
126-06-7	3-bromo-1-chloro-5,5-dimethylhydantoin	no	no
627-30-5	3-chloro-1-propanol	no	no
563-47-3	3-chloro-2-methylpropene	no	yes
117482-84-5	3-chloro-4-fluorobenzonitrile	no	no
95-74-9	3-chloro-p-toluidine	no	no
4420-74-0	3-mercaptopropyltrimethoxysilane	no	no
56539-66-3	3-methoxy-3methyl-1butanol	no	no
103429-90-9	3-methoxy-3methyl-1butyl acetate	no	no
589-34-4	3-methylhexane	no	no
96-14-0	3-methylpentane	no	no
108-99-6	3-picoline	no	no
67812-17-3	3-trimethoxysilyl propylmethyl methylphosphonate	no	no
28984-69-2	4,4-(5h)-oxazoledimethanol, 2-(hepadecanyl)	no	no
5436-21-5	4,4-dimethoxy-2-butanone	no	no
101-14-4	**4,4-methylenebis(2-chloroaniline)**	**yes**	yes
40758-65-4	4,6-dichloro-2-ethoxypyrimidine	no	no
1074-40-4	4,6-dichloro-2-methoxypyrimidine	no	no
27078-75-7	4,6-difluoro-2-methoxypyrimidine	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
19549-80-5	4,6-dimethyl-2-heptanone	no	no
103335-54-2	4-aza acid	no	no
--0	4-chloro-2-ethoxy-6-fluoropyrimidine	no	no
110888-15-8	4-chloro-3-fluorobenzonitrile	no	no
65402-65-5	4-hydroxytetramethyl piperadine free radical(4-oh-tempo)	no	no
4652-27-1	4-methoxy-3-buten-2-one	no	no
100-06-1	4-methoxyacetophenone	no	no
622-97-9	4-methylstyrene	no	no
100-02-7	**4-nitrophenol**	**yes**	no
4994-16-5	4-phenylcyclohexene	no	no
100-40-3	4-vinylcyclohexene	no	no
129879-84-1	5-amino-1,2,4-triazole-3-sulfonyl chloride	no	no
97658-80-5	5-bp-bisenamine	no	no
26172-55-4	5-chloro-2-methyl-4-isothiazolin-3-one	no	no
91-44-1	7-diethylamino-4-methyl coumarin	no	no
83-32-9	**acenaphthene**	**yes** (POM)	no
208-96-8	**acenaphthylene**	**yes** (POM)	no
75-07-0	**acetaldehyde**	**yes**	yes
64-19-7	acetic acid	no	no
108-24-7	acetic anhydride	no	no
67-64-1	acetone	no	no
75-05-8	**acetonitrile**	**yes**	no
98-86-2	**acetophenone**	**yes**	no
75-36-5	acetyl chloride	no	no
50-78-2	acetylsalicylic acid	no	no
107-02-8	**acrolein**	**yes**	no
79-06-1	**acrylamide**	**yes**	yes
79-10-7	**acrylic acid**	**yes**	no
107-13-1	**acrylonitrile**	**yes**	yes
814-68-6	acryloyl chloride	no	no
44992-01-0	acryloyloxyethyltrimethyl ammonium chloride	no	no
126-86-3	actylenic diol	no	no
--0	ad acid	no	no
1330-86-5	adipate plasticizer	no	no
75782-86-4	alcohols c12-13	no	no
69013-18-9	alcohols c8-18 ethoxylated propoxylated	no	no
309-00-2	aldrin	no	yes
3779-63-3	aliphatic polyisocyanate-1	no	no
68515-40-2	alkyl benzyl phthalate	no	no
107-18-6	allyl alcohol	no	no
300-57-2	allyl benzene	no	no
107-05-1	**allyl chloride**	**yes**	no
106-92-3	allyl glycidyl ether	no	yes
532-27-4	**alpha chloroacetophenone**	**yes**	no
9000-90-2	alpha-amylase	no	no
552-45-4	alpha-chloro-ortho-xylene	no	no
319-84-6	**alpha-hexachlorocyclohexane**	**yes**	yes

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
98-83-9	alpha-methyl styrene	no	no
68037-76-3	alphamethylstyrene(dodecyl)polysiloxane	no	no
109-06-8	alpha-picoline	no	no
7446-70-0	aluminum chloride	no	no
24304-00-5	aluminum nitride	no	no
60304-36-1	aluminum potassium fluoride	no	no
6419-19-8	aminotrimethylene phosphonic acid	no	no
7664-41-7	ammonia	no	no
12125-02-9	ammonium chloride	no	no
16919-31-6	ammonium hexafluorozirconate	no	no
1336-21-6	ammonium hydroxide	no	no
12054-85-2	ammonium molybdate	no	no
60676-86-0	amorphous fused silica	no	no
--0	amyl acetate (mixture)	no	no
71-41-0	amyl alcohol	no	no
110-58-7	amylamine	no	no
513-35-9	amylene	no	no
63-05-8	androstenedione	no	no
63937-30-4	anhydro-dimethylamino hexose reductone	no	no
62-53-3	**aniline**	**yes**	no
120-12-7	**anthracene**	**yes** (POM)	no
7440-36-0	**antimony**	**yes** (Sb comps.)	no
28300-74-5	**antimony potassium tartrate**	**yes** (Sb comps.)	no
10025-91-9	**antimony trichloride**	**yes** (Sb comps.)	no
1309-64-4	**antimony trioxide**	**yes** (Sb comps.)	no
1345-04-6	**antimony trisulfide**	**yes** (Sb comps.)	no
68477-31-6	aromatic petroleum derivative solvent	unknown	no
7440-38-2	**arsenic**	**yes** (As comps)	yes
7784-42-1	**arsine**	**yes**	no
1332-21-4	**asbestos**	**yes**	yes
136816-75-6	atevirdane mesylate	no	no
--0	atlox 848	no	no
103-33-3	azobenzene	no	yes
9001-92-7	bacillus subtilis neutral protease	no	no
7440-39-3	barium	no	no
13701-59-2	barium metaborate monohydrate	no	no
7727-43-7	barium sulfate	no	no
147-24-0	benadryl hcl	unknown	no
56-55-3	**benz(a)anthracene**	**yes** (POM)	no
100-52-7	benzaldehyde	no	yes
71-43-2	**benzene**	**yes**	yes
91-01-0	benzhydrol	no	no
92-87-5	**benzidine**	**yes**	yes
50-32-8	**benzo(a)pyrene**	**yes** (POM)	yes
205-99-2	**benzo(b)fluoranthene**	**yes** (POM)	no
191-24-2	**benzo(g,h,i)perylene**	**yes** (POM)	no
207-08-9	**benzo(k)fluoranthene**	**yes** (POM)	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
694-87-1	benzocyclobutene	no	no
119-53-9	benzoin	no	no
95-16-9	benzothiazole	no	no
25973-55-1	benzotriazol dimethylpropyl phenol	unknown	no
100-51-6	benzyl alcohol	no	no
100-44-7	**benzyl chloride**	**yes**	yes
103-83-3	benzyl dimethylamine	no	no
100-46-9	benzylamine	no	no
100-85-6	benzyltrimethylammonium hydroxide	no	no
7440-41-7	**beryllium**	**yes** (Be comps)	yes
64-04-0	beta phenylethylamine	no	no
126-99-8	**beta-chloroprene**	**yes**	yes
981-34-0	betamethasone 11	no	no
--0	biosam tp-1.5	no	no
92-52-4	**biphenyl**	**yes**	no
3033-62-3	bis (2-dimethylaminoethyl) ether	no	no
108-60-1	bis(2-chloroisopropyl)ether	no	no
102054-10-4	bis(2-methoxy-1-methylethy	no	no
542-88-1	**bis(chloromethyl)ether**	**yes**	yes
13528-93-3	bis(me2clsilyl)ethane	no	no
41556-26-7	bis(pentamethylpiperdinyl)sebacate	no	no
111-44-4	**bis-2-chloroethylether**	**yes**	yes
60966-36-1	bisnoralcohol	no	no
25068-38-6	bisphenol a/epichlorohydrin resin	no	no
25085-99-8	bisphenol epoxy resin	no	no
2467-02-9	bisphenol f	no	no
10097-09-3	bis-urea accelerator	no	no
7637-07-2	boron trifluoride	no	no
68515-44-6	branched and linear diheptyl phthalate ester	no	no
111381-89-6	branched and linear heptyl nonyl phthalate ester	no	no
7726-95-6	bromine	no	no
108-86-1	bromobenzene	no	no
75-27-4	bromodichloromethane	no	yes
75-25-2	**bromoform**	**yes**	yes
56741-95-8	bropirimine	no	no
69102-90-5	butadiene homopolymer	no	no
106-97-8	butane	no	no
4435-53-4	butoxyl	no	no
141-32-2	butyl acrylate	no	no
85-68-7	butyl benzyl phthalate	no	no
112-34-5	**butyl carbitol**	**yes**	no
592-84-7	butyl formate	no	no
138-22-7	butyl lactate	no	no
143-29-3	butylcarbitol formal	no	no
102-79-4	butyldiethanolamine	no	no
123-72-8	butyraldehyde	no	no
107-92-6	butyric acid	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
6408-78-2	c.i. acid blue 25	no	no
108419-35-8	c11-14 branched alkyl acetates	no	no
78330-21-9	c11-c14 isoalcohols, c14 rich, ethoxylated alcohol	no	no
70914-20-4	c6-8 branched alcohols	no	no
7440-43-9	**cadmium**	**yes** (Cd comps.)	yes
7789-82-4	calcium molybdate	no	no
1592-23-0	calcium stearate	no	no
79-92-5	camphene	no	no
105-60-2	caprolactam	no	no
86-74-8	**carbazole**	**yes** (POM)	yes
1333-86-4	carbon black	no	no
75-15-0	**carbon disulfide**	**yes**	no
56-23-5	**carbon tetrachloride**	**yes**	yes
353-50-4	carbonyl fluoride	no	no
463-58-1	**carbonyl sulfide**	**yes**	no
9004-32-4	carboxymethyl cellulose	no	no
13466-78-9	carene, delta	no	no
8001-79-4	castor oil	no	no
120-80-9	**catechol**	**yes**	no
103980-44-5	ceftiofur hydrochloride	no	no
7440-45-1	cerium	no	no
1306-38-3	cerium oxide	no	no
123-03-5	cetylpyridinium chloride	no	no
6004-24-6	cetylpyridinium chloride monohydrate	no	no
12789-03-6	chlordane (technical)	unknown	yes
63449-39-8	chlorinated paraffins	no	yes
7782-50-5	**chlorine**	**yes**	no
10049-04-4	chlorine dioxide	no	no
302-22-7	chlormadinone acetate	no	no
108-90-7	**chlorobenzene**	**yes**	no
74-97-5	chlorobromomethane	no	no
57-15-8	chlorobutanol	no	no
124-48-1	chlorodibromomethane	no	yes
75-45-6	chlorodifluoromethane	no	no
668-45-1	chlorofluorobenzonitrile	no	no
67-66-3	**chloroform**	**yes**	yes
2921-88-2	chlorpyrifos	no	no
1308-14-1	chromium (+3) hydroxide	no	no
1308-38-9	chromium 3 oxide	no	no
218-01-9	**chrysene**	**yes** (POM)	no
18300-89-5	cinnamate	no	no
156-59-2	cis-1-2,dichloroethylene	no	no
627-20-3	cis-2-pentene	no	no
64741-62-4	clarified oils (petroleum), catalytic cracked	no	no
24729-96-2	clindamycin phosphate	no	no
1702-17-6	clopyralid	no	no
7440-48-4	**cobalt**	**yes** (Co comps.)	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
136-52-7	cobalt 2-ethylhexanoate	no	no
27253-31-2	**cobalt neodecanoate**	**yes** (Co comps.)	no
61788-93-0	coco alkyldimethyl amines	no	no
8007-45-2	**coke oven emissions**	**yes**	yes
8050-09-7	colophony	no	no
7440-50-8	copper	no	no
3251-23-8	copper nitrate	no	no
147-14-8	copper phthalocyanine	no	no
7758-99-8	copper sulfate pentahydrate	no	no
7758-98-7	copper sulfate, anhydrous	no	no
68132-02-5	coumarone indene resin	no	no
7440-47-3	**Cr**	**yes** (Cr comps.)	no
18540-29-9	**Cr, hexavalent - mist**	**yes** (Cr comps.)	yes
18540-29-9	**Cr, hexavalent - particulate**	**yes** (Cr comps.)	yes
16065-83-1	**Cr, trivalent**	**yes** (Cr comps.)	no
1319-77-3	**cresol (mixed isomers)**	**yes**	no
64265-57-2	crosslinker cx100	no	no
4170-30-3	crotonaldehyde	no	no
98-82-8	**cumene**	**yes**	yes
80-15-9	cumene hydroperoxide	no	no
142-71-2	cupric acetate	no	no
1317-38-0	cupric oxide (dust)	no	no
57-12-5	**cyanide**	**yes** as cyanides	no
461-58-5	cyanoguanidine	no	no
--0	cyclic (phme)2(me)2, d4	no	no
2370-88-9	cyclic methylhydrogensiloxane, d4	no	no
6166-86-5	cyclic methylhydrogensiloxane, d5	no	no
2374-14-3	cyclic methyltrifluoropropylsiloxane, d3	no	no
110-82-7	cyclohexane	no	no
108-94-1	cyclohexanone	no	no
12262-58-7	cyclohexanone peroxide	no	no
110-83-8	cyclohexene	no	no
6975-71-9	cyclohexenylacetonitrile	no	no
3399-73-3	cyclohexenylethylamine	no	no
1122-82-3	cyclohexyl isothiocyanate	no	no
287-92-3	cyclopentane	no	no
142-29-0	cyclopentene	no	no
--0	cyclopentyldichlorosilane	no	no
14579-03-4	cyclopentyltrichlorosilane	no	no
147-94-4	cytarabine	no	no
72-54-8	DDD (p,p'-dichlorodiphenyl dichloroethane)	no	yes
72-55-9	DDE (p,p'-dichlorodiphenyl dichloroethylene)	no	yes
50-29-3	DDT (p,p'-dichlorodiphenyl trichloroethane)	no	yes
1163-19-5	decabromodiphenyl oxide	unknown	yes
91-17-8	decahydronaphthalene	no	yes
541-02-6	decamethylcyclopentasiloxane	no	no
141-62-8	decamethyltetrasiloxane	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
8020-83-5	deodorized kerosene	no	no
64742-65-0	dewaxed heavy paraffinic mineral oil	no	no
6700-34-1	dextromethorphan hydrochloride	no	no
103-23-1	di (2-ethylhexyl) adipate	no	yes
6422-86-2	di(ethylhexyl)terephthalate	no	no
123-42-2	diacetone alcohol	no	no
131-17-9	diallyl phthalate	no	yes
2050-92-2	diamylamine	no	no
95481-62-2	dibasic ester	no	no
53-70-3	**dibenz(a,h)anthracene**	**yes** (POM)	no
132-64-9	**dibenzofuran**	**yes**	no
96-12-8	**dibromochloropropane**	**yes**	no
107-66-4	dibutyl phosphate	no	no
107-66-4	dibutyl phosphate	no	no
84-74-2	**dibutyl phthalate**	**yes**	no
77-58-7	dibutyl tin dilaurate	no	no
111-92-2	dibutylamine	no	no
818-08-6	dibutyltin oxide	no	no
91-94-1	**dichlorobenzidine**	**yes**	yes
75-71-8	dichlorodifluoromethane	no	no
75-43-4	dichlorofluoromethane	no	no
4109-96-0	dichlorosilane	no	no
76-14-2	dichlorotetrafluoroethan	no	no
62-73-7	**dichlorvos**	**yes**	no
80-43-3	dicumyl peroxide	no	no
5124-30-1	dicyclohexylmethane-4,4'-diisocyanate	no	no
--0	dicyclopentyldichlorosilane	no	no
60-57-1	dieldrin	no	yes
68334-30-5	diesel fuel	no	no
111-42-2	**diethanolamine**	**yes**	no
117-81-7	**diethyl hexyl phthalate**	**yes**	yes
84-66-2	diethyl phthalate	no	no
64-67-5	**diethyl sulfate**	**yes**	no
109-89-7	diethylamine	no	no
25340-17-4	diethylbenzene mixture	no	no
111-46-6	**diethylene glycol**	**yes**	no
1559-36-0	diethylene glycol mono-2-ethylhexyl ether	no	no
124-17-4	**diethylene glycol monobutyl ether acetate**	**yes**	no
111-90-0	**diethylene glycol monoethyl ether**	**yes**	no
112-15-2	**diethylene glycol monoethyl ether acetate**	**yes**	no
111-77-3	**diethylene glycol monomethyl ether**	**yes**	no
104-68-7	**diethylene glycol monophenyl ether**	**yes**	no
111-40-0	diethylene triamine	no	no
68610-11-7	diethylenetriamine reaction product with bisphenol a	no	no
105-53-3	diethylmalonate	no	no
2238-07-5	diglycidyl ether	no	no
25036-25-3	diglycidyl ether of bisphenol a	unknown	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
26142-30-3	diglycidyl ether of polyglycol	no	no
108-83-8	diisobutyl ketone	no	no
107-39-1	diisobutylene	no	no
26761-40-0	diisodecyl ester phthalate	no	no
29733-18-4	diisodecyl glutarate	no	no
71888-89-6	diisoheptyl phthalate	no	no
28553-12-0	diisononyl phthalate	no	no
110-97-4	diisopropanolamine	no	no
108-20-3	diisopropyl ether	no	no
108-18-9	diisopropylamine	no	no
96-80-0	diisopropylaminoethanol	no	no
68390-56-7	diketene hydrogenated fatty acids	no	no
57-41-0	dilantin	unknown	yes
624-92-0	dimethyldisulfide	no	no
627-93-0	dimethyl adipate	no	no
106-79-6	dimethyl decanedioate	no	no
115-10-6	dimethyl ether	no	no
1119-40-0	dimethyl glutarate	no	no
756-79-6	dimethyl methyl phosphonate	no	no
106-65-0	dimethyl succinate	no	no
77-78-1	**dimethyl sulfate**	**yes**	no
124-40-3	dimethylamine	no	no
25988-97-0	dimethylamine-epichlorohydrin polymer	no	no
108-16-7	dimethylamino-2-propanol	no	no
121-69-7	**dimethylaniline**	**yes**	yes
1066-35-9	dimethylchlorosilane	no	no
28729-52-4	dimethylcyclopentane	no	no
75-78-5	dimethyldichlorosilane	no	no
1112-39-6	dimethyldimethoxysilane	no	no
2627-97-6	dimethyldiphenydivinylsiloxane	no	no
108-01-0	dimethylethanolamine	no	no
996-35-0	dimethylisopropylamine	no	no
51200-87-4	dimethyloxazolidine	no	no
131-11-3	**dimethylphthalate**	**yes**	no
1111-74-6	dimethylsilane	no	no
75-18-3	dimethylsulfide	no	no
67-68-5	dimethylsulfoxide	no	no
513-37-1	dimethylvinyl chloride	no	yes
1719-58-0	dimethylvinylchlorosilane	no	no
117-84-0	di-n-octyl phthalate	no	no
88-85-7	dinoseb	no	no
142-84-7	di-n-propylamine	no	no
838-85-7	diphenyl phosphoric acid	no	no
122-39-4	diphenylamine	unknown	no
144-79-6	diphenylmethylchlorosilane	unknown	no
778-25-6	diphenylmethylsilanol	unknown	no
101-84-8	diphenyloxide	unknown	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
1231-93-0	dipropyl ketone	no	no
25265-71-8	dipropylene glycol	no	no
111109-77-4	dipropylene glycol dimethyl ether	no	no
34590-94-8	dipropylene glycol methyl ether	no	no
88917-22-0	dipropylene glycol methyl ether acetate	no	no
29911-28-2	dipropylene glycol monobutyl ether	no	no
29911-27-1	dipropylene glycol monopropyl ether	no	no
51730-94-0	**dipropylene glycol phenyl ether**	**yes**	no
4444-67-1	di-sec-butylamine	no	no
1590-87-0	disilane	no	no
--0	disiloxane	no	no
123312-54-9	distearyldimethylammonium bisulfate	no	no
3843-16-1	distearyldimethylammonium methosulfate	no	no
64741-89-5	distillates (petroleum) solvent-refined light paraffinic	no	no
64742-30-9	distillates (petroleum), chemically neutralized middle	no	no
68410-00-4	distillates (petroleum), crude oil	no	no
64741-81-7	distillates (petroleum), heavy thermal cracked	no	no
64741-82-8	distillates (petroleum), light thermal cracked	no	no
64741-59-9	distillates, (petroleum), light catalytic cracked	no	no
68783-24-4	di-tallow alkylamines	no	no
330-54-1	diuron	no	no
1321-74-0	divinyl benzene	no	no
98-84-0	dl-alpha phenylethylamine	no	no
5989-27-5	d-limonene	no	no
540-97-6	dodecamethylcyclohexasiloxane	no	no
63148-57-2	dow corning fluid 1107	no	no
35884-42-5	dowanol dpnb	no	no
170557-43-4	dowanol tmh-deg borate ester	no	no
145-73-3	endothall	no	no
106-89-8	**epichlorohydrin**	**yes**	yes
--0	epoxy resin solution	no	no
50-28-2	estradiol	no	no
313-06-4	estradiol cypionate	no	no
141-43-5	ethanolamine	no	no
--0	ethomeen t/30	no	no
61791-12-6	ethoxylated castor oil	no	no
7085-85-0	ethyl 2-cyanoacrylate	no	no
141-78-6	ethyl acetate	no	no
141-97-9	ethyl acetoacetate	no	no
140-88-5	**ethyl acrylate**	**yes**	no
64-17-5	ethyl alcohol	no	no
541-85-5	ethyl amyl ketone	no	no
75-00-3	**ethyl chloride**	**yes**	no
105-39-5	ethyl chloroacetate	no	no
105-56-6	ethyl cyanoacetate	no	no
60-29-7	ethyl ether	no	no
109-94-4	ethyl formate	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
97-64-3	ethyl lactate	no	no
106-68-3	ethyl sec-amyl ketone	no	no
78-10-4	ethyl silicate	no	no
637-92-3	ethyl tertiary butyl ether	no	no
25550-14-5	ethyl toluene -mixture	no	no
109-92-2	ethyl vinyl ether	no	no
763-69-9	ethyl-3-ethyloxypropionate	no	no
107-00-6	ethylacetylene	no	no
75-04-7	ethylamine	no	no
100-41-4	**ethylbenzene**	**yes**	yes
68987-42-8	ethylenated benzene residues	no	no
74-85-1	ethylene	no	no
142-59-6	ethylene bisthiocarbamate disodium	no	no
107-15-3	ethylene diamine	no	no
106-93-4	**ethylene dibromide**	**yes**	yes
107-21-1	**ethylene glycol**	**yes**	no
112-48-1	**ethylene glycol dibutyl ether**	**yes**	no
110-71-4	ethylene glycol dimethyl ether	no	no
1559-35-9	ethylene glycol mono-2-ethylhexyl ether	no	no
112-07-2	**ethylene glycol monobutyl ether acetate**	**yes**	no
111-15-9	**ethylene glycol monoethyl ether acetate**	**yes**	no
112-25-4	**ethylene glycol monohexyl ether**	**yes**	no
110-49-6	**ethylene glycol monomethyl ether acetate**	**yes**	no
122-99-6	**ethylene glycol monophenyl ether**	**yes**	no
2807-30-9	**ethylene glycol monopropyl ether**	**yes**	no
75-21-8	**ethylene oxide**	**yes**	yes
96-45-7	**ethylene thiourea**	**yes**	yes
64-02-8	ethylenediamine tetra-acetic acid, tetrasodium salt	no	no
9004-58-4	ethylhydroxyethyl cellulose	no	no
78-07-9	ethyltriethoxysilane	no	no
5314-55-6	ethyltrimethoxysilane	no	no
7525-62-4	ethylvinyl benzene	no	no
64742-06-9	extracts (petroleum), middle distillate solvent	no	no
108419-34-7	exxate 1000	no	no
108419-32-5	exxate 800 - octyl acetate	no	no
108419-33-6	exxate 900	no	no
68459-31-4	fatty acids c9-11 branched glycidyl esters polymer	no	no
136797-56-3	fluorochemical-247	unknown	no
7705-08-0	ferric chloride	no	no
24510-87-0	flumethasone 5	no	no
2476-74-6	flumethasone 6	no	no
98967-40-9	flumetsulam	no	no
16872-11-0	fluoboric acid	no	no
206-44-0	**fluoranthene**	**yes** (POM)	no
86-73-7	**fluorene**	**yes** (POM)	no
69991-67-9	fomblin perfluorpolyether	no	no
50-00-0	**formaldehyde**	**yes**	yes

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
75-12-7	formamide	no	no
64-18-6	formic acid	no	no
110-00-9	furan	no	yes
98-01-1	furfural	no	yes
98-00-0	furfuryl alcohol	no	yes
--0	fyre-zyme	no	no
96-48-0	gamma-butyrolactone	no	no
8006-61-9	**gasoline**	**yes** some comps	yes
1310-53-8	germanium dioxide	no	no
7782-65-2	germanium tetrahydride	no	no
111-30-8	glutaraldehyde	no	no
56-81-5	glycerol	no	no
106-91-2	glycidyl methacrylate	no	no
93-14-1	guaifenesin	no	no
64741-65-7	heavy alkylate naphtha	unknown	no
64742-94-5	heavy aromatic solvent naphtha	unknown	no
64741-68-0	heavy catalytic reformed naphtha	no	no
68551-17-7	heavy naphtha	no	no
76-44-8	**heptachlor**	**yes**	yes
--0	heptamethyl-1-vinyl-1,7-dichlorotetrasilazane	no	no
1873-88-7	heptamethyltrisiloxane	no	no
142-82-5	heptane	no	no
118-74-1	**hexachlorobenzene**	**yes**	yes
87-68-3	**hexachlorobutadiene**	**yes**	yes
77-47-4	**hexachlorocyclopentadiene**	**yes**	no
13465-77-5	hexachlorodisilane	no	no
67-72-1	**hexachloroethane**	**yes**	yes
12021-95-3	hexafluorozirconium acid	no	no
1009-93-4	hexamethylcyclotrisilazane	no	no
541-05-9	hexamethylcyclotrisiloxane	no	no
107-46-0	hexamethyldisiloxane	no	no
822-06-0	**hexamethylene diisocyanate**	**yes**	no
100-97-0	hexamethylenetetramine	no	no
66-25-1	hexanaldehyde	no	no
69696-98-6	hexane 1,6-bis(tributyl ammonium bromi	no	no
144669-03-4	hexenylsiloxane	no	no
144669-04-5	hexenylsiloxanes	no	no
107-41-5	hexylene glycol	no	no
431-89-0	hfc-227ea	no	no
68037-88-7	high molecular weight sili	no	no
63148-62-9	high molecular wt. silicon	no	no
68037-58-1	high molecular wt. silicon	no	no
68083-19-2	high molecular wt. silicon	no	no
68918-22-9	high molecular wt. silicon	no	no
69430-24-6	high molecular wt. silicon	no	no
70131-67-8	high molecular wt. silicon	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
302-01-2	**hydrazine**	**yes**	yes
10034-93-2	hydrazine sulfate	no	yes
68956-56-9	hydrocarbons, terpene processing by-products	no	no
50-03-3	hydrocortisone acetate	no	no
64742-81-0	hydrodesulfurized kerosene	no	no
64742-80-9	hydrodesulfurized middle distillate	unknown	no
10035-10-6	hydrogen bromide	no	no
7647-01-0	**hydrogen chloride**	**yes**	no
74-90-8	**hydrogen cyanide**	**yes**	no
7664-39-3	**hydrogen fluoride**	**yes**	no
7722-84-1	hydrogen peroxide	no	no
7783-06-4	hydrogen sulfide	no	no
64742-48-9	hydrotreated heavy napht	unknown	no
64742-52-5	hydrotreated heavy naphthenic distillate	unknown	no
64742-54-7	hydrotreated heavy paraffinic mineral oil	unknown	no
64742-47-8	hydrotreated light distillate	unknown	no
64742-49-0	hydrotreated light naphtha	no	no
64742-53-6	hydrotreated light naphthenic distillate	no	no
64742-55-8	hydrotreated light paraffinic distillate	unknown	no
64742-46-7	hydrotreated middle distillate	unknown	no
79-14-1	hydroxyacetic acid/ glycolic acid	no	no
34375-28-5	hydroxymethylamino ethanol	no	no
10096-91-0	hydroxyphenylbenzotriazole	no	no
999-61-1	hydroxypropyl acrylate	no	no
9016-45-9	igepal co-630	no	no
193-39-5	**indeno(1,2,3-cd)pyrene**	**yes** (POM)	no
7553-56-2	iodine	no	no
123-92-2	isoamyl acetate	no	no
123-51-3	isoamyl alcohol	no	no
5888-33-5	iso-bornyl acrylate	no	no
75-28-5	isobutane	no	no
110-19-0	isobutyl acetate	no	no
78-83-1	isobutyl alcohol	no	no
97-85-8	isobutyl isobutyrate	no	no
97-86-9	isobutyl methacrylate	no	no
115-11-7	isobutylene	no	no
18395-30-7	isobutyltrimethoxysilane	no	no
78-84-2	isobutyraldehyde	no	no
79-31-2	isobutyric acid	no	no
338-98-7	isoflupredone acetate	no	no
26952-21-6	isooctanol	no	no
90622-57-4	isopar h	no	no
78-59-1	**isophorone**	**yes**	yes
4098-71-9	isophorone diisocyanate	no	no
53880-05-0	isophorone diisocyanate polymer	no	no
78-79-5	isoprene	no	yes
108-21-4	isopropyl acetate	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
67-63-0	isopropyl alcohol	no	no
75-31-0	isopropylamine	no	no
121-93-7	isopropyldiethanolamine	no	no
109-56-8	isopropylethanolamine	no	no
590-86-3	isovaleraldehyde	no	no
1332-58-7	kaolin	no	no
50-21-5	lactic acid	no	no
2627-86-3	l-alpha-phenylethylamine	no	no
39464-66-9	lauryl alcohol, phosphated	no	no
10190-55-3	lead molybdate	no	no
64741-66-8	light alkylate naphtha	no	no
64742-95-6	light aromatic solvent naphtha (petroleum)	unknown	no
859-18-7	lincomycin hydrochloride	no	no
141-63-9	linear dimethylsiloxanes,md3m(&higher)	no	no
68083-20-5	linear methylvinylsiloxane ppolymer hydroxl endblock	no	no
67762-41-8	linear primary alcohol	no	no
1345-05-7	lithopone	no	no
66071-86-1	lv 837/821	no	no
7439-95-4	magnesium	no	no
546-93-0	magnesium carbonate	no	no
7786-30-3	magnesium chloride	no	no
1309-42-8	magnesium hydroxide	no	no
10377-60-3	magnesium nitrate	no	no
1309-48-4	magnesium oxide	no	no
557-04-0	magnesium stearate	no	no
108-31-6	**maleic anhydride**	**yes**	no
6915-15-7	malic acid	no	no
591-27-5	m-aminophenol	no	no
7439-96-5	**manganese**	**yes** (Mn comps.)	no
15956-58-8	**manganese 2-ethylhexanoate**	**yes** (Mn comps.)	no
27253-32-3	**manganese neodecanoate**	**yes** (Mn comps.)	no
1317-35-7	**manganese oxide**	**yes** (Mn comps.)	no
10034-96-5	**manganese sulfate monohydrate**	**yes** (Mn comps.)	no
26544-20-7	mcpa 2-ehe (2-methyl-4-chlorophenoxyacetic acid 2-ethylhexyl ester)	no	no
644-62-2	meclofenamic acid	unknown	no
108-78-1	melamine	no	yes
2919-66-6	melengesterol acetate	no	no
7439-97-6	**mercury**	**yes** (Hg comps.)	no
141-79-7	mesityl oxide	no	no
79-41-4	methacrylic acid	no	no
75-75-2	methane sulfonic acid	no	no
3144-09-0	methanesulfonamide	no	no
67-56-1	**methanol**	**yes**	no
79-20-9	methyl acetate	no	no
74-99-7	methyl acetylene	no	no
96-33-3	methyl acrylate	no	no
108-11-2	methyl amyl alcohol	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
93-58-3	methyl benzoate	no	no
74-83-9	**methyl bromide**	**yes**	no
115-19-5	methyl butynol	no	no
74-87-3	**methyl chloride**	**yes**	yes
71-55-6	**methyl chloroform**	**yes**	no
17639-93-9	methyl chloroproprionate	no	no
78-93-3	**methyl ethyl ketone**	**yes**	no
1338-23-4	methyl ethyl ketone peroxide	no	no
107-31-3	methyl formate	no	no
60-34-4	**methyl hydrazine**	**yes**	yes
110-12-3	methyl isoamyl ketone	no	no
108-10-1	**methyl isobutyl ketone**	**yes**	no
624-83-9	**methyl isocyanate**	**yes**	no
74-93-1	methyl mercaptan	no	no
80-62-6	**methyl methacrylate**	**yes**	no
1184-85-6	methyl methane sulfonamide	no	no
110-43-0	methyl n-amyl ketone	no	no
591-78-6	methyl n-butyl ketone	no	no
9003-11-6	methyl oxirane (pluronic p103)	no	no
82919-37-7	methyl pentamethyl-4-piperidinyl ester of decanedioic acid	no	no
53-36-1	methyl predisolone acetate	no	no
107-87-9	methyl propyl ketone	no	no
124-63-0	methyl sulfonyl chloride	no	no
1634-04-4	**methyl t-butyl ether**	**yes**	no
109-87-5	methylal	no	no
74-89-5	methylamine	no	no
593-51-1	methylamine hydrochloride	no	no
108-87-2	methylcyclohexane	no	no
75-54-7	methyldichlorosilane	no	no
105-59-9	methyldiethanolamine	no	no
16881-77-9	methyldimethoxysilane	no	no
75-09-2	**methylene chloride**	**yes**	yes
101-68-8	**methylene diphenyl isocyanate**	**yes**	no
96-29-7	methylethylketoxime	no	yes
992-94-9	methylsilane	no	no
999-97-3	methylsilazane	no	no
4253-34-3	methyltriacetoxysilane	no	no
75-79-6	methyltrichlorosilane	no	no
2031-67-6	methyltriethoxysilane	no	no
50791-87-2	methylvinylbis(n-methylace	no	no
124-70-9	methylvinyldichlorosilane	no	no
16753-62-1	methylvinyldimethoxysilane	no	no
8012-95-1	mineral oil	no	no
64475-85-0	mineral spirits	unknown	no
1330-20-7	**mixed xylenes**	**yes**	no
7439-98-7	molybdenum	no	no
18868-43-4	molybdenum dioxide	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
1317-33-5	molybdenum disulfide	no	no
1313-27-5	molybdenum trioxide	no	yes
46438-39-5	monobutyl monophenyl phosphoric acid	no	no
1623-15-0	monobutyl phosphoric acid	no	no
95-49-8	monochlorotoluene	no	no
78-96-6	monoisopropanolamine	no	no
701-64-4	monophenyl phosphoric acid	no	no
110-91-8	morpholine	no	no
28729-54-6	m-propyl toluene	no	no
620-23-5	m-tolualdehyde	no	no
98-17-9	m-trifluoromethylphenol	no	no
108-38-3	**m-xylene**	**yes**	no
126803-73-4	n-(2,6-dichloro-3-methylphenyl)-5,7-dimethyoxy(1,2,4)triazo...[de-511]	no	no
113171-12-3	n-(2,6-difluorophenyl)-5-amino-1h-1,2,4-triazole-3-sulfonamide	no	no
98967-55-6	n-(2,6-difluorophenyl)-7-methyl-1h-1,2,4-triazolo(1,5a)pyrimidine-2-su	no	no
1760-24-3	n-(3-(trimethoxysilyl)propyl)-ethylenediamine	no	no
104-78-9	n,n-diethyl-1,3-propanediamine	no	no
606-46-2	n,n-diethyl-o-toluine	no	no
613-48-9	n,n-diethyl-p-toludine	no	no
124-28-7	n,n-dimethyl octadecylamine	no	no
80-73-9	n,n'-dimethylethyleneurea	no	no
68-12-2	**n,n-dimethylformamide**	**yes**	no
99-97-8	n,n-dimethyl-p-toluidine	no	no
110-30-5	n,n'-ethylene bis-octadecanamide	no	no
628-63-7	n-amyl acetate	no	no
8030-30-6	naphtha	no	no
64742-82-1	naphtha (petroleum) hydrodesulfurized heavy	no	no
64741-55-5	naphtha (petroleum), light catalytic cracked	no	no
64741-41-9	naphtha heavy straight run	unknown	no
68955-35-1	naphtha, catalytic reformed	no	no
64741-64-6	naphtha, full range alkylate	no	no
64741-42-0	naphtha, full range straight run	no	no
64741-54-4	naphtha, heavy catalytic cracked	no	no
64741-83-9	naphtha, heavy thermal cracked	no	no
64741-63-5	naphtha, light catalytic reformed	no	no
91-20-3	**naphthalene**	**yes**	yes
71-36-3	n-butanol	no	no
63716-40-5	n-butoxy propanol (mixed isomers)	no	no
123-86-4	n-butyl acetate	no	no
109-69-3	n-butyl chloride	no	no
2426-08-6	n-butyl glycidyl ether	no	no
97-88-1	n-butyl methacrylate	no	no
590-01-2	n-butyl propionate	no	no
109-73-9	n-butylamine	no	no
104-51-8	n-butylbenzene	no	no
--0	n-butylglucamine	no	no
--0	n-chloro-2,6-difluorobenzamide	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
112-55-0	n-dodecyl mercaptan	no	no
1405-10-3	neomycin sulfate	no	no
126-30-7	neopentyl glycol	no	no
17557-23-2	neopentyl glycol diglycidyl ether	no	no
112-06-1	n-heptyl acetate	no	no
110-54-3	**n-hexane**	**yes**	no
7440-02-0	**nickel**	**yes** (Ni comps.)	yes
12035-72-2	**nickel subsulfide**	**yes** (Ni comps.)	yes
7697-37-2	nitric acid	no	no
98-95-3	**nitrobenzene**	**yes**	yes
79-24-3	nitroethane	no	no
77835-42-0	nitrogen trifluoride	no	no
75-52-5	nitromethane	no	yes
107-68-6	n-methyl taurine	no	no
626-67-5	n-methylpiperidine	no	no
872-50-4	n-methylpyrrolidone	no	no
836-30-6	n-nitrodiphenylamine	no	no
1116-54-7	n-nitrosodiethanolamine	no	yes
621-64-7	n-nitroso-di-n-propylamine	no	yes
86-30-6	n-nitrosodiphenylamine	unknown	yes
684-93-5	**n-nitroso-n-methylurea**	**yes**	yes
111-84-2	n-nonane	no	no
25154-52-3	nonyl phenol (mixed isomers)	no	no
64771-72-8	norpar 12	no	no
303-81-1	novobiocin	unknown	no
624-54-4	n-pentyl proprionate	no	no
109-60-4	n-propyl acetate	no	no
71-23-8	n-propyl alcohol	no	no
16369-21-4	n-propylethanolamine	no	no
103-99-1	n-stearoyl-4-aminophenol	no	no
88-12-0	n-vinylpyrrolidinone	no	yes
68309-52-4	nylen 5	unknown	no
--0	o-(1-ethoxyethyl)-2-(propylthio)-3-(trifluoromethyl)phenol	no	no
--0	o-(1-ethoxyethyl)-3-(trifluoromethyl)phenol	no	no
134-29-2	o-ansidine hydrochloride	no	yes
88-65-3	o-bromobenzoic acid	no	no
118-91-2	o-chlorobenzoic acid	no	no
95-48-7	**o-cresol**	**yes**	no
124-26-5	octadecanamide	no	no
627-83-8	octadecanoic acid, 1,2-ethanediyl ester	no	no
27668-52-6	octadecyldimethyl (3-(trimethoxysilyl)propyl) ammonium chloride	no	no
556-67-2	octamethylcyclotetrasilo	no	no
107-51-7	octamethyltrisiloxane	no	no
124-07-2	octanoic acid	no	no
26530-20-1	octylisothiazolone	no	no
68990-79-4	oils, vegetable, mixed with animal oil methylesters, polymerized, oxidixed	no	no
112-80-1	oleic acid	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
93-83-4	oleoyl diethanolamine	no	no
8014-95-7	oleum	no	no
90-43-7	o-phenylphenol	unknown	yes
2530-85-0	organofunctional silane	no	no
20816-12-0	osmium tetroxide	no	no
95-53-4	**o-toluidine**	**yes**	yes
19666-30-9	oxadiazon	no	yes
9063-06-3	oxirane, methyl-, polymer with oxirane, monomethyl ether	no	no
90438-79-2	oxo-heptyl acetate	no	no
88230-35-7	oxo-hexyl acetate	no	no
95-47-6	**o-xylene**	**yes**	no
95-38-5	oyel hydroxyethylimidazoline	no	no
7440-05-3	palladium	no	no
8002-74-2	paraffin wax fume	no	no
98-56-6	p-chlorobenzotrifluoride	no	no
82-68-8	**pentachloronitrobenzene**	**yes**	no
87-86-5	**pentachlorophenol**	**yes**	yes
109-66-0	pentane	no	no
19430-93-4	perfluorobutylethylene	no	no
38436-16-7	perfluorobutylethylmethyldichlorosilane	no	no
382-21-8	perfluoroisobutylene	no	no
93-59-4	peroxybenzoic acid	no	no
8002-05-9	petroleum	no	no
64742-14-9	petroleum distillates, acid treated	unknown	no
68476-86-8	petroleum gases, liquefied, sweetened	no	no
1194-02-1	p-fluorobenzonitrile	no	no
85-01-8	**phenanthrene**	**yes** (POM)	no
10551-21-0	phenethyl alpha picolinium bromide	no	no
108-95-2	**phenol**	**yes**	no
122-79-2	phenyl acetate	no	no
617-94-7	phenyl isopropanol (2-phenyl-2-propanol)	no	no
120-07-0	phenyldiethanolamine	no	no
98-13-5	phenyltrichlorosilane	no	no
2996-92-1	phenyltrimethoxysilane	no	no
75-44-5	**phosgene**	**yes**	no
7803-51-2	**phosphine**	**yes**	no
7664-38-2	phosphoric acid	no	no
7723-14-0	**phosphorus (total)**	**yes**	no
10025-87-3	phosphorus oxychloride	no	no
10026-13-8	phosphorus pentachloride	no	no
7719-12-2	phosphorus trichloride	no	no
1328-53-6	phthalocyanine pigment green	no	no
26952-20-5	picloram, isooctyl ester	no	no
80-56-8	pinene, alpha	no	no
127-91-3	pinene, beta	no	no
2981-10-4	piperdinocyclohexene	no	no
110-89-4	piperidine	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
61477-94-9	pirmenol hydrochloride	no	no
99-87-6	p-isopropyltoluene	no	no
7440-06-4	platinum soluble salt	no	no
4221-98-1	p-mentha-1,5-diene	no	no
9016-87-9	polmeric methylene diphenyl diisocyanate	no	no
26780-96-1	poly(1,2-dihydro-2,2,4-trimethylquinoline)	no	no
9003-13-8	polyalkylene glycol monobutyl ether/ butoxypolypropylene glycol	no	no
68003-28-1	polyamide	no	no
1336-36-3	**polychlorinated biphenyls**	**yes**	yes
--0	**polycyclic aromatic hydrocarbons (pahs)**	**yes** (POM)	no
26062-79-3	polydimethyl diallyl ammonium chloride	no	no
25322-68-3	polyethylene glycol	no	no
9004-74-4	polyethylene glycol methyl ether	no	no
27274-31-3	polyethylene glycol monoallyl ether	no	no
37251-67-5	polyethylene polypropylene glycol	no	no
68410-23-1	polyethylenepolyamine reaction products with c18-unsat. fatty acids	no	no
69029-39-6	polyglycol 26-2	no	no
--0	polyglycol 26-3	no	no
24938-91-8	polyglycol 59-13	no	no
9002-92-0	polyoxyethylene lauryl ether	no	no
25322-69-4	polypropylene glycol	no	no
9002-86-2	polyvinyl chloride	no	no
9003-39-8	polyvinyl pyrrolidone	no	no
9003-22-9	polyvinylchloride/polyvinylacetate	no	no
7789-23-3	potassium fluoride	no	no
1310-58-3	potassium hydroxide	no	no
7758-05-6	potassium iodate	no	no
12136-45-7	potassium oxide	no	no
7722-64-7	**potassium permanganate**	**yes** (Mn comps.)	no
12037-29-5	praseodymium oxide	no	no
57-83-0	progesterone	no	no
3986-89-8	progesterone 4	no	no
98516-30-4	propanol, 1(or 2) ethoxy, acetate isoparaffinic petroleum hydrocarbon	no	no
123-38-6	propionaldehyde	no	no
79-09-4	propionic acid	no	no
106-94-5	propyl bromide	no	no
106-36-5	propyl propionate	no	no
107-10-8	propylamine	no	no
103-65-1	propylbenzene	no	no
115-07-1	propylene	no	no
108-32-7	propylene carbonate	no	no
78-87-5	**propylene dichloride**	**yes**	no
57-55-6	propylene glycol	no	no
19089-47-5	propylene glycol monoethyl ether (alpha)	no	no
1569-02-4	propylene glycol monoethyl ether (beta)	no	no
52125-53-8	propylene glycol monoethyl ether (mixture)	no	no
107-98-2	propylene glycol monomethyl ether	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
1320-67-8	propylene glycol monomethyl ether	no	no
108-65-6	propylene glycol monomethyl ether acetate	no	no
41593-38-8	propylene glycol monophenyl ether	no	no
5131-66-8	propylene glycol n-butyl ether (alpha isomer)	no	no
15821-83-7	propylene glycol n-butyl ether (beta isomer)	no	no
770-35-4	propylene glycol phenyl ether	no	no
57018-52-7	propylene glycol tert-butyl ether	no	no
29387-86-8	propylene glycol, n-butyl ether (mixed isomers)	no	no
75-56-9	**propylene oxide**	**yes**	yes
1067-25-0	propyltrimethoxysilane	no	no
104-87-0	p-tolualdehyde	no	no
104-15-4	p-toluenesulfonic acid	no	no
6192-52-5	p-toluenesulfonic acid monohydrate	no	no
106-49-0	p-toluidine	no	yes
--0	purafect 4000g	no	no
106-42-3	**p-xylene**	**yes**	no
129-00-0	**pyrene**	**yes** (POM)	no
110-86-1	pyridine	no	no
84632-65-5	pyrrolo[3,4-c]pyrrole-1,4-dione,3,6-bis(4-chlorophenyl)-2,5-dihydro	no	no
1047-16-1	quinacridone pigment	no	no
82586-54-7	quinapril step 8	no	no
91-22-5	**quinoline**	**yes**	yes
106-51-4	**quinone**	**yes**	no
64742-62-7	residual oils (petroleum) solvent-dewaxed	no	no
64741-56-6	residues, (petroleum), vacuum	no	no
108-46-3	resorcinol	no	no
1314-28-9	rhenium oxide	no	no
90-02-8	salicylaldehyde	no	no
106917-31-1	sanduvor 3068 liquid	no	no
3081-01-4	santoflex 14	no	no
626-38-0	sec-amyl acetate	no	no
78-92-2	sec-butyl alcohol	no	no
13952-84-6	sec-butylamine	no	no
135-98-8	sec-butylbenzene	no	no
7782-49-2	**selenium**	**yes** (Se comps.)	no
112926-00-8	silica - precipitated	no	no
69012-64-2	silica amorphous fume	no	no
112945-52-5	silica, amorphous, crystalline free, fumed	no	no
10026-04-7	silicon tetrachloride	no	no
7783-61-1	silicon tetrafluoride	no	no
7803-62-5	silicon tetrahydride	no	no
67762-90-7	siloxanes and silicones(silica filled polydimethylsiloxane)	no	no
7440-22-4	silver - soluble	no	no
15096-52-3	sodium aluminum fluoride	no	no
7631-90-5	sodium bisulfite	no	no
7647-15-6	sodium bromide	no	no
630-93-3	sodium dilantin	unknown	yes

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
128-04-1	sodium dimethyl dithiocarbamate	no	no
7681-49-4	sodium fluoride	no	no
13007-85-7	sodium glucoheptonate	no	no
31138-65-5	sodium glucoheptonate	no	no
1310-73-2	sodium hydroxide	no	no
7681-52-9	sodium hypochlorite	no	no
10039-56-2	sodium hypophosphite monohydrate	no	no
7681-82-5	sodium iodide	no	no
14960-06-6	sodium lauriminodipropionate	no	no
124-41-4	sodium methylate	no	no
7631-95-0	sodium molybdate	no	no
12401-86-4	sodium monoxide	no	no
7632-00-0	sodium nitrite	no	no
7632-04-4	sodium perborate	no	no
68608-26-4	sodium petroleum sulfonate	unknown	no
16893-85-9	sodium silicofluoride	no	no
67701-11-5	sodium soap 900602	no	no
67701-10-4	sodium soap 903923	no	no
7757-83-7	sodium sulfite	no	no
1300-72-7	sodium xylenesulfonate	no	no
109265-71-6	solsperse 12000	unknown	no
86753-78-8	solsperse 5000	unknown	no
68458-91-3	solvar & lv 820	no	no
8005-02-5	solvent black	no	no
64742-96-7	solvent naphtha (petroleum) heavy aliphatic	no	no
64742-89-8	solvent naphtha light aliphatic	unknown	no
64742-88-7	solvent naphtha medium aliphatic	unknown	no
64741-88-4	solvent refined heavy paraffnic distillate	unknown	no
67784-80-9	soybean oil, methyl esters	no	no
68071-85-2	spenkel f34	unknown	no
--0	sponto 11	no	no
--0	sponto 723	no	no
30705-14-7	sr 1153	no	no
1912-83-0	stannous octoate	no	no
57-11-4	stearic acid	no	no
7803-52-3	**stibine**	**yes** (Sb comps.)	no
8052-41-3	stoddard solvent	no	no
64741-44-2	straight run middle distillate	no	no
100-42-5	**styrene**	**yes**	yes
9003-55-8	styrene-butadiene polymer	no	no
505-48-6	suberic acid	no	no
5329-14-6	sulfamic acid	no	no
7704-34-9	sulfur (elemental)	no	no
7446-11-9	sulfur trioxide	no	no
7664-93-9	sulfuric acid	no	no
68516-16-5	sulfuric acid c6-10 alkyl esters	no	no
64741-86-2	sweetened middle distillate	unknown	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
14807-96-6	talc	no	yes
61790-33-8	tallow alkylamines	no	no
75-65-0	t-butanol	no	no
107-71-1	t-butyl peroxyacetate	no	no
75-64-9	t-butylamine	no	no
4620-70-6	t-butylaminoethanol	no	no
98-29-3	t-butylcatechol	no	no
2160-93-2	t-butyldiethanolamine	no	no
3006-82-4	t-butylperoxy-2-ethylhexanoate	no	no
9036-19-5	t-det c08	no	no
--0	t-det c-40	no	no
9014-92-0	t-det dd-14	no	no
68131-40-8	tergitol 15-s-3	no	no
540-88-5	tert-butyl acetate	no	no
98-06-6	tert-butylbenzene	no	no
1333-13-7	tert-butyl-m-cresol	no	no
994-05-8	tertiary amyl methyl ether	no	no
2157-45-1	tetra-2-methoxyethoxy-silane	no	no
136-47-0	tetracaine hyrochloride	no	no
20536-16-7	tetrachlorodisilane	no	no
127-18-4	**tetrachloroethylene**	**yes**	yes
10469-09-7	tetrachloropicolinic acid	no	no
116-14-3	tetrafluoroethylene	no	yes
109-99-9	tetrahydrofuran	no	yes
97-99-4	tetrahydrofuryl methanol	no	no
9014-85-1	tetramethyl decyndiol	no	no
632-22-4	tetramethyl urea	no	no
22407-51-8	tetramethylchlorovinyldisiloxane	no	no
3277-26-7	tetramethyldihydrogendisiloxane	no	no
7691-02-3	tetramethyldivinyldisila	no	no
2627-95-4	tetramethyldivinyldisiloxane	no	no
75-76-3	tetramethylsilane	no	no
509-14-8	tetranitromethane	no	yes
3982-82-9	tetraphenyldimethyl-2-dimethyltrisiloxane	unknown	no
3390-61-2	tetraphenyldimethyl-2-phenylmethyltrisiloxane	unknown	no
807-28-3	tetraphenyldimethyldisiloxane	unknown	no
6904-66-1	tetraphenylhexamethyltetrasiloxane	unknown	no
25265-77-4	texanol	no	no
1314-32-5	thallic oxide	no	no
7440-28-0	thallium	no	no
64485-82-1	thiazole ester	no	no
7719-09-7	thionyl chloride	no	no
137-26-8	thiram	no	no
7440-31-5	tin	no	no
13463-67-7	titanium dioxide	no	no
1643-19-2	t-n-butyl ammonium bromide	no	no
1156-19-0	tolazamide	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
108-88-3	**toluene**	**yes**	no
26471-62-5	**toluene diisocyanate**	**yes**	yes
8001-35-2	**toxaphene**	**yes**	yes
156-60-5	trans-1-2,dichloroethylene	no	no
102-76-1	triacetin	no	no
28961-43-5	triacrylate ester	no	no
621-77-2	triamylamine	no	no
126-73-8	tributyl phosphate	no	no
102-82-9	tributylamine	no	no
79-01-6	**trichloroethylene**	**yes**	yes
75-69-4	trichlorofluoromethane	no	no
10025-78-2	trichlorosilane	no	no
68526-86-3	tridecanol	no	no
102-71-6	triethanolamine	no	no
77-93-0	triethyl citrate	no	no
121-44-8	**triethylamine**	**yes**	no
--0	triethylammonium suleptanate	no	no
1559-37-1	triethylene glycol mono-2-ethyhexyl ether	no	no
112-50-5	triethylene glycol monoethyl ether	no	no
112-24-3	triethylene tetramine	no	no
280-57-9	triethylenediamine	no	no
76-05-1	trifluoroacetic acid	no	no
358-67-8	trifluoropropylmethyl dimethoxysilane	no	no
130014-38-9	trifluoropropylsilsesquioxane, dimethylhydrogensilyoxy-terminated	no	no
592-09-6	trifluoropropyltrichlorosilane	no	no
122-20-3	triisopropanolamine (tipa)	no	no
121-43-7	trimethoxyborine	no	no
1185-55-3	trimethoxymethylsilane	no	no
3236-53-1	trimethyl hexamethylenediamine	no	no
75-50-3	trimethylamine	no	no
25551-13-7	trimethylbenzenes (mixed isomers)	no	no
75-77-4	trimethylchlorosilane	no	no
1445-45-0	trimethyl-o-acetate	no	no
3290-92-4	trimethylolpropane trimethacrylate	no	no
149-73-5	trimethylorthoformate	no	no
993-07-7	trimethylsilane	no	no
1066-40-6	trimethylsilanol	no	no
76-83-5	triphenyl methyl chloride	unknown	no
102-69-2	tripropylamine	no	no
42978-66-5	tripropylene glycol diacrylate	no	no
25498-49-1	tripropylene glycol methyl ether	no	no
20324-33-8	tripropylene glycol methyl ether, dowanol 62b	no	no
55934-93-5	tripropylene glycol n-butyl ether	no	no
126-72-7	tris(2,3-dibromopropyl) phosphate	no	yes
9002-93-1	triton x100	no	no
88851-61-0	trospectomycin sulfate	no	no
51811-38-2	tryfac 5556	no	no

Appendix K - Comparison of HAP and TAC Screening Level Lists

MDNRE AQD Toxic Air Contaminants with Health-Based Screening Levels

January 25, 2010

(EPA HAPs appear in **BOLD** type)

CAS No.	Chemical Name	HAP?	Carcinogen?
12070-12-1	tungsten carbide	no	no
8006-64-2	turpentine	no	no
110-62-3	valeraldehyde	no	no
3153-26-2	vanadium oxide bis (2,4-pentanedionate)	no	no
1314-62-1	vanadium pentoxide	no	no
68990-52-3	vegetable oil fatty acid methyl ester	no	no
108-05-4	**vinyl acetate**	**yes**	no
593-60-2	**vinyl bromide**	**yes**	no
75-01-4	**vinyl chloride**	**yes**	yes
5906-75-2	vinyl dimethylsilanol	no	no
25013-15-4	vinyl toluene	no	no
30030-25-2	vinylbenzylchloride	no	no
75-35-4	**vinylidene chloride (1,1-dichloroethylene)**	**yes**	no
75-38-7	vinylidene fluoride	no	no
5507-44-8	vinylmethyldiethoxysilane	no	no
75-94-5	vinyltrichlorosilane	no	no
2768-02-7	vinyltrimethoxysilane	no	no
8032-32-4	vm & p naphtha	no	no
8042-47-5	white mineral oil	no	no
--0	witconol al 69-66	no	no
8002-09-3	yarmor pine oil	no	no
1314-13-2	zinc oxide	no	no
557-05-1	zinc stearate	no	no

APPENDIX L:

BENCHMARKING SURVEY OF STATE AIR TOXICS ASSESSMENTS IN NEW SOURCE PERMITTING

Benchmarking Survey of State Air Toxics Assessments in New Source Permitting

Robert Sills, Supervisor, Toxics Unit, Air Quality Division, Michigan Department of Natural Resources and Environment
February 25, 2010

Background and Introduction

The Michigan Department of Natural Resources and Environment (MDNRE) Air Quality Division (AQD) implements the "air toxics rules" (Rules 224-232) of Part 55 of the Natural Resources and Environmental Protection Act (NREPA) as part of the New Source Review (NSR) permitting program. Because the federal government has not required air toxics risk assessment in NSR, except for the limited and long-delayed requirements of the Clean Air Act under Section 112(f), many states have developed their own requirements to better ensure public health protection. Recently AQD has become aware of interest regarding the scope and basis for the MDNRE air toxics regulatory requirements, and how they compare to other state's programs. In particular, there is interest in comparing the issue of "the list", i.e., the scope of the air toxics included in the state's programs.

Previous "benchmarking" surveys have been conducted, however, they do not provide sufficient detail on this particular issue. For example, previous surveys by MDEQ (2009) and the Louisville (2005) local air pollution control agency are helpful for many purposes, but do not provide sufficient and current program details regarding the key question about "the list" which is the present interest. And, given the broad variety of state air toxics programs, and the many nuances in their scope and applicability, some surveys only provide a simple "yes" or "no" indication of the requirement for air toxics risk assessment.

Proper framing of the survey questions is critical to obtaining the desired information. The present survey sought to find if state air permitting programs go beyond the federal technology-based requirements and address public health concerns for ambient air impacts of air toxics emissions. Care was taken to avoid "false-negative" responses. For example, "false negative" responses could result if a question is phrased, "Is air toxics risk assessment required as part of New Source Review?" In response to that question, a state representative may unfortunately reply "no", if only because, 1) they evaluate modeled ambient air impacts in comparison to some health-based criteria such as TLV/100, but they consider that "screening" rather than "risk assessment"; 2) they have established permissible emission rate limits, which were derived based on assumed facility parameters (e.g., building and stack height and distance to fenceline), dispersion modeling, and health-based ambient air exposure criteria, which they may not think of as being essentially "risk assessment based"; or, 3) they don't perform the assessment as a *requirement* of their rules, but as a matter of policy. With regard to this 3rd point, the present survey found that there are many states which do not have air toxics risk assessment-based requirements in state statutes or rules *per se*, however, they do conduct air toxics impact and risk assessment as a *policy* under broad "safety net" language in statute or rule. The "safety net" language cited by many states generally requires that air emissions shall not pose a threat to the public health (similar to Michigan's Rule 901 under NREPA Part 55).

Some states have air toxics impact assessment requirements which are fairly unusual or unique. For example, some state programs specifically evaluate (or exclude from evaluation) selected

source categories, or, they utilize air toxics monitoring data for targeted geographic areas to drive initiatives to reduce emissions of selected air toxics. The present benchmarking survey attempted to note some of these significant program nuances, while primarily attempting to clarify if the air toxics addressed were limited to a specific list or not. As indicated in the "reference/contact" column of the table below, the results of the previous surveys by MDEQ (2009) and Louisville (2005) were relied upon in many cases, while in many other cases an appropriate state contact person was interviewed. It should also be noted that many state air permitting programs, like Michigan's, have a number of permit exemptions, permits by rule, or allowable emission thresholds, which would circumvent the need to perform modeling of ambient air impacts for air toxics to determine acceptability. Those program nuances have not been compiled in the present exercise, but are a significant and relevant aspect of state program comparisons nevertheless.

Results

State	Reference / contact	For proposed new/modified air emission sources, are ambient air impacts of any air toxics evaluated? If yes, what is the regulatory basis?	What air toxics are included?	What are the ambient air impacts compared to in order to determine acceptability?
Alabama	Wes Thornhill 334-271-7887	Yes, by policy but not in rules.	All air toxics with TLVs or other OELs.	If the substance has an OEL AND is emitted at > 0.1 lb/hr, then the modeled ambient air impact cannot exceed TLV/40 (8 hr AT) or TLV/420 (annual AT).
Alaska	MDEQ (2009); Louisville (2005)	No.		
Arizona	MDEQ (2009); Louisville (2005)	No.		
Arkansas	MDEQ (2009); Louisville (2005)	No.		
California	Louisville (2005)	Yes, by Hot Spots regulation; sources causing fenceline or community monitored levels of excess risk addressed via control measures (existing; point, area or mobile); modeling done for new sources.	748 total air toxics; 438 must be quantified in risk assessment (as of 2005 survey)	CA-OEHHA Reference Exposure Levels (RELs), or, one in 1 million cancer risk.
Colorado	MDEQ (2009); Louisville (2005)	No.		
Connecticut	Jim Grillo 860-424-4152; Louisville (2005) survey.	Yes. In rules. New and existing sources; major and area sources.	The HAPs list (187). Hazardous Limiting Values (HLVs) were derived for the HAPs based on modified occupational standards.	The rules provide 2 equations (one for under 20 m stacks, one for over 20 m stacks) relating air emissions to ambient impacts, which are compared to HLVs; it is a pass/fail standard for all permits.

Delaware	Jim Snead 302-323-4542	Yes, by policy but not in rules. Policy is under a general "safety net" provision (regulation 1102).	All substances; no discrete list.	Maximum ambient air impacts cannot exceed TLV/100 if there is a TLV available; if not, then impact cannot exceed the default value of 100 $\mu g/m^3$. This is the same approach for carcinogens as well as noncarcinogens.
Florida	MDEQ (2009); Louisville (2005)	No.		
Georgia	Eric Cornwell 404-363-7020	Yes, in guidance only; not by rule; under "safety net" rule provisions.	No discrete list; any substance with IRIS value or OEL.	Hierarchy used; 1) most stringent value between cancer-based value (one in 1 million if "A" carcinogen, otherwise, 1 in 100,000) or RfC; 2) TLV/100 (or, TLV/300 if "A" carcinogen), then scaled by 40 hrs/168 hrs (approx. a factor of 4) to derive acceptable ambient concentration (AAC) with 24 hr AT; for OELs which are ceiling limits or STELs, divide by 10 and also scale by a factor of 1.32 to account for 15" AT of OEL (per SCREEN3).
Hawaii	MDEQ (2009); Louisville (2005)	Yes; new/modified sources only; major and area sources.	HAPs only.	
Idaho	Carl Brown 208-373-0206	Yes. In rules. New/modified sources only. Does not apply if a MACT rule applies.	Approximately 350 toxic air pollutants; list was developed before the 1990 HAPs list	Utilize conservative pph emission thresholds; if exceeded, then ambient air impacts modeled; acceptable ambient concentrations (AACs) are based on 1E-06 cancer risk, and for noncarcinogens, OEL/UF.
Illinois	Jeff Sprague 217-524-4692	No, unless there are public concerns. Do have an internal screening for ethanol plants.		
Indiana	Bryan Wolff 317-234-3499	Yes. By policy; air toxics impacts are assessed only if requested by citizen or applicant. No routine screening.	No discrete list; any substance with any state or federal criteria or any health data may be included.	Commission has discretionary basis for permit denial if impacts are deemed adverse.

Iowa	MDEQ (2009); Louisville (2005)	No.		
Kansas	MDEQ (2009); Louisville (2005)	No.		
Kentucky	Taimur Shaikh 502-564-3999 x4480	Yes, as a policy regarding new/modified source permitting, under a general "safety net" regulation regarding public health protection.	EPA HAPs plus all substances regulated by EPA under the chemical accident prevention provisions (CAAA Section 112(r)).	Risk assessment based levels associated with HQ=1 or one in 1 million incremental cancer risk.
Louisiana	Louisville (2005)	Yes.	HAPs plus other air toxics.	Ambient impacts cannot exceed TLV/factor, or one in 10,000 cancer risk.
Maine	Lisa Higgins 207-287-7023; Louisville (2005) survey	Yes.	Have ambient air quality guidelines for HAPs plus additional compounds.	Have calculated health-based guideline values. Have a State statute mercury emission limit of 25 lbs/yr for any new or existing facility.
Maryland	Louisville (2005)	Yes.	All HAPs plus others; database of 6329 substances as of 2005 survey.	Maximum ambient air impacts cannot exceed TLV/100 or one in 1 million cancer risk.
Massachusetts	Marc Wolman 617-292-5515	Yes, as ambient air guidelines. Apply to only: incinerators, WWTPs and residuals mgmt., major remedial actions, and PSD projects.	Discrete list of air toxics (n~120) which pre-dates the EPA 1990 HAPs list	They have derived threshold effects exposure limits (TELs; 24 hr AT) and allowable ambient limits (AALs; annual AT) for all the targeted air toxics.
Michigan	Robert Sills 517-335-6973	Yes. Required by air toxics rules. New / modified sources only.	There is an open-ended definition of Toxic Air Contaminants (TACs); includes all substances other than 41 listed non-TACs. Health-based screening levels have been developed for approx. 1200 TACs.	Screening levels (SLs) for carcinogens are at 1E-06 risk per chemical for the proposed process; or, 1E-05 is acceptable for facility-wide emissions per chemical. Noncancer SLs are derived from RfCs, RfDs, OELs, or other data; default = 0.1 $\mu g/m^3$. SLs on website.

Minnesota	Mary Dymond 651-757-2327	Yes. By policy, an Air Emissions Risk Analysis (AERA) is needed for proposed new/modified sources exceeding emission thresholds, or if "flexible air permit", or if needed per MPCAs discretion; existing sources may also need an AERA if significant public interest.	All substances which have a health benchmark value from MN Dept of Health, EPA-IRIS, or California-OEHHA.	Facility-wide emissions, multi-media impacts: risk guidelines are for a cancer risk of 1E-05 and cumulative hazard index of 1 for pollutants with the same toxic endpoint.
Mississippi	Danny Jackson 601-961-5225	No; risk provisions are only implemented as needed, and are not being triggered by anything at present.		
Missouri	MDEQ (2009)	No.		
Montana	MDEQ (2009); Louisville (2005)	No, except incinerators must demonstrate negligible risk.		
Nebraska	MDEQ (2009); Louisville (2005)	No.		
Nevada	MDEQ (2009); Louisville (2005)	No.		
New Hampshire	Pat North 603-271-0901	Yes; by rule; new and existing sources of all types.	Utilize a discrete list of ~800 air toxics, including all HAPs plus substances with ACGIH TLVs or IRIS values.	OELs are divided by UFs depending on the OEL type. Three cancer classifications are recognized.
New Jersey	Olga Boyko 609-633-1108	Yes; by regulations.	Regulations reference the HAPs list, and also an older pre-HAPs list of air toxics. Risk screening is done for ALL compounds with health benchmarks from EPA, CA, etc.	They utilize permit reporting thresholds which trigger a reporting requirement; utilize HI=1, and one in 1 million cancer risk for a process (one in 100,000 for facility-wide emissions).
New Mexico	Ted Schooley 505-476-4334; Louisville (2005)	Yes. New/modified sources only.	HAPs plus substances with OELs.	Use chemical-specific pph emission thresholds; if exceeded, then modeled ambient air impacts cannot exceed OEL/100 or MDL if carcinogenic.

New York	Tom Gentile 518-402-8402	Yes. Required in rules. New and existing sources, excluding fossil fuel combustion sources (which are regulated separately).	Regulated air pollutants (RAPs) defined as criteria pollutants, HAPs, and CAA 112(r) compounds.	Guideline values derived via risk assessment. Currently considering draft rulemaking to restrict RAPs to a shorter list of high priority cpds., due to limited r.a. staffing.
North Carolina	MDEQ (2009); Louisville (2005)	Yes.	HAPs plus a discrete list of other air toxics.	Acceptable ambient pollutant levels established.
North Dakota	MDEQ (2009); Louisville (2005)	Yes; new/modified major and area sources.	700 air toxics, including HAPs, as of 2005 survey.	TLV/100 or one in 1 million cancer risk cannot be exceeded in ambient air.
Ohio	Paul Koval 614-644-2270	Yes. Per rules. For new or existing sources with over 1 ton/yr emissions of TAPs.	Toxic Air Pollutants (TAPs) = 303 substances.	TLV/42 for noncarcinogens.
Oklahoma	MDEQ (2009); Louisville (2005)	Yes.	1500 air toxics as of 2005 survey.	TLV divided by a factor which depends on the degree of toxicity.
Oregon	Patricia Huback 503-229-6932	No. Development of a program is under consideration.	Have 3 strategies in place to address air toxics concerns: 1) geographic approach based on NATA to identify areas of concern and develop strategies to reduce risks; 2) statewide source sector strategy approach (e.g., wood stoves); 3) safety net program, to address concerns identified by fenceline monitoring or source modeling.	Their Air Toxics Advisory Committee has established public health protective levels ("ambient benchmark concentrations") for 51 air toxics. Diesel, benzene, manganese, formaldehyde, steel foundry emissions, and wood stoves are among the higher priorities.
Pennsylvania	Dean Van Orden 717-787-1455	No, not routinely or as a broad policy. State statute does have a "safety net" provision, and under that, permit engineers have discretion to evaluate air toxics impacts and risks. Landfill gases, combustors, and cement kiln emissions have been evaluated.	HAPs plus other air toxics of concern (source-specific).	
Rhode Island	MDEQ (2009); Louisville (2005)	Yes.	HAPs plus a discrete list of other air toxics.	RfCs and other noncancer benchmarks; one in 1 million to one in 100,000 cancer risk.

South Carolina	Louisville (2005)	Yes; new/modified and existing.	257 toxic air pollutants (TAPs), as of 2005 survey.	
South Dakota	MDEQ (2009); Louisville (2005)	No.		
Tennessee	MDEQ (2009); Louisville (2005)	No, except in a few cases where public interest is high.		
Texas	Manuel Reina 512-239-1816	Yes. "Safety-net" rule for the protection of the public; policy under that for the modeling and assessment procedure. New / modified sources only.	All substances are subject; list of substances identified in air emissions with Effect Screening Levels (ESLs) developed has grown since 1980's to over 3000 substances.	Target cancer risk = 1E-05 per substance, facility-wide emissions. For noncarcinogens, TLV/100 (1 hr AT) and TLV/1000 (annual AT); default=1 $\mu g/m^3$. Draft ESLs and justifications public noticed. All appear on website.
Utah		No.		
Vermont	MDEQ (2009); Louisville (2005)	Yes; new/modified and existing sources; major and area sources.	382 hazardous air pollutants, all HAPs, plus any new air toxic if toxicological information is available.	TLV divided by UF; one in 1 million incremental cancer risk.
Virginia	Patricia Buonviri 804-698-4016	Yes, unless source is covered by a MACT standard; requirement is in regulations.	HAPs list with a couple of exceptions.	TLV divided by UF. No cancer risk-based criteria. Currently considering rule revisions to adopt a more risk-based program.
Washington	MDEQ (2009); Louisville (2005)	No.		
West Virginia	MDEQ (2009); Louisville (2005)	Yes.	HAPs plus substances with OELs.	
Wisconsin	Jeff Myers 608-266-2879	Yes. By rule; applies to new and existing sources, except for HAPs covered by a MACT std., or if chemical-specific health-based emission thresholds are not exceeded.		Noncarcinogens: use RfCs or TLV/42 as ambient standards not to be exceeded by aggregate impacts of the source, bkgd. levels, and impacts from other sources. Carcinogens: technology-based control only (LAER), or, can use low-risk modeling demonstration (1E-06 per cpd., or 1E-05 facility-wide) as a compliance option.
Wyoming	MDEQ (2009); Louisville (2005)	No.		

Discussion

Thirty states evaluate and regulate air toxics emissions in their permit reviews, based on public health exposure concerns, although there are many state-specific nuances regarding the regulatory basis, the types of sources included, the air toxics included, the acceptability criteria, and exemptions. Of the six states in EPA Region 5, five states generally and routinely evaluate air toxics ambient air impacts for public health acceptability; only Illinois generally does not (but may in exceptional cases). Of the eight Great Lakes states, six states generally and routinely evaluate air toxics ambient air impacts for public health acceptability; only Illinois and Pennsylvania generally do not (but they may in exceptional cases).

Acronyms and abbreviations not defined in text or table:

1E-05= one in 100,000 incremental cancer risk
1E-06= one in 1 million incremental cancer risk
AT= averaging time
bkgd.= background
CAA= clean air act
cpd.= compound
HAPs= hazardous air pollutants
HI= hazard index
HQ= hazard quotient
LAER= lowest achievable emission rate
MDL= method detection limit
NATA = National-Scale Air Toxics Assessment
OEL= occupational exposure level
pph= pounds per hour
RfC= reference concentration
RfD= reference dose
TLV= threshold limit value
UF= uncertainty factor
$\mu g/m^3$= micrograms per cubic meter

References

Louisville Air Pollution Control. 2005. Summary of State Air Toxics Programs. Unpublished report.

Michigan Department of Environmental Quality (MDEQ; currently MDNRE). 2009. Survey of State Air Permitting Programs. By Doreen Lehner, MDNRE-AQD. Unpublished report.

APPENDIX M:

EPA REGION 5 STATES BENCHMARKING COMPARISON TABLE

January 17, 2013 R. Sills **EPA Region 5 States Benchmarking Comparison Table**
HRA = Health risk assessment; i.e., modeling of ambient air impacts and comparison to health-protective benchmark values
N/M = New or modified sources. E = Existing sources.

Air Toxics Program Characteristic		MI	MN	OH	WI	IN	IL
Impetus for HRA of air emission sources	Required by statute or rules	yes	yes (statute requires cumulative RA for certain sources and locations)	yes	yes		
	By policy		yes (except as noted above)			yes	yes
	If significant interest by public or applicant (i.e., not routine)		yes (for existing sources)			yes	Not routine, done only if significant public concerns.
	Discretionary by agency					No criteria for max. ambient air impacts, but permit may be denied if "adverse."	
HRA done for **new/modified (N/M) or existing (E)** sources		N/M	N/M, and also E if significant public interest	N/M. Also existing sources are evaluated on a case-by-case basis	N/M or E	N/M	N/M

Source types or emission rate **exemptions** from HRA?		Yes	Yes	Yes (i.e., exempt if each TAP emission is ≤1 ton/yr)	Yes (i.e., HAPs exempt if covered by a MACT, but only if chem-specific emission thresholds not exceeded)		
What air toxics are subject to HRA?	Any					yes	
	All except 41 exemptions	yes					
	Unique list beyond HAPs (how many CPDs/Groups)		yes (any with a benchmark value from IRIS, Cal or MDH)	yes (n= 303 TAPs; includes all HAPs plus others)	yes (n= 535; 26 HAPs not included)		
	HAPs only						
How are **cumulative** air toxics impacts accounted for?	Generally not accounted for in permit review.	yes		yes	yes	yes	
	Can be considered in permit review	yes (Rule 228)	Done under statutory requirements for Minneapolis.	yes (combined impacts; not background conc.)			
	Routinely accounted for in permit review.						

How are **cumulative** air toxics impacts accounted for? (continued)	? Routinely evaluated via statewide monitoring or modeling initiative, ± risk reduction targets?	Detroit ambient air evaluated in 2005 and 2010 Detroit Air Toxics Initiative reports; no risk ↓ target; several facility-specific monitors are in operation.		Specific monitoring or modeling studies have been conducted to evaluate specific concern sources/areas. No risk ↓ target.	RAIMI statewide HAPs modeling of cumulative impacts of all sources; goal of 50% reduction (from 2002 to 2012) of people at >1E-6 CA risk.	Focused studies of monitoring and risk assessment completed for Indianapolis, and underway for the lakeshore area; statewide RAIMI modeling; are evaluating high-risk NATA'05 facilities. No risk ↓ target.	
Acceptable risk **benchmarks**		1E-6 per cpd for the process. 1E-5 per cpd for the facility. 10X higher for roads and indus. areas. EPA or other agency values; TLV/100; or derived from short-term studies. Default ITSL= 0.1 $\mu g/m^3$.	Provided to MPCA by MDH, based on values from EPA or other agencies, or derived by MDH.	IRIS values; modeled 1 hr AT max impacts not to exceed TLV/42.	1E-6 per cpd. 1E-5 all cpds. EPA RfCs etc. TLV-TWA/42 with 24-hr AT. TLV-Ceiling/10 with 1-hr. AT.	Use various EPA approved sources and databases.	

APPENDIX N:

CONSISTENCY WITH OTHER STATES

Air Toxics Workgroup
"Consistency with Other States" Discussion Paper
April 10, 2013

ORR (2011) Report Recommendation A-1(7):
R 336.1225 should be amended and specifically include the following:
Make the acceptable exposure limits consistent with other nearby states.

ATW discussion
Discussion with the ATW indicates that some members have concerns for a lack of consistency between MDEQ and the nearby states with regard to the air toxics screening level values and/or averaging times, which can contribute to an un-level playing field. AQD staff committed to developing some information and comparisons to help inform the discussion.

AQD impressions
There are differences between states' air toxics health-based screening levels for several possible reasons, which may be summarized as follows:

1. States may use different target risk level for carcinogens (e.g., 1E-5 vs. 1E-6). WDNR applies a 1E-6 target risk per chemical (and 1E-5 for cumulative risk), while MPCA and MDEQ allow 1E-5 per chemical (see **Table 3** cancer risk values and risk levels).

2. States may use different methods for deriving a benchmark. For example, OEL/100 vs. OEL/42. States have different methods to address (or not address) data-poor situations; see the discussion below.

3. States may adopt their screening levels from benchmarks provided by other recognized sources. Many substances have multiple applicable benchmarks already available from recognized sources, such as EPA-IRIS values, EPA-PPRTVs (from the Superfund program office), ATSDR MRLs, and CalOEHHA RELs, and Texas TCEQ ESLs. The benchmarks available from these sources are often different. A state may review all of those available, or utilize a hierarchy, and choose to adopt any one of these available benchmarks as-is or with modification. States may vary in their choices. Also, states establish their screening levels at different points in time, when different key studies and different benchmarks may be available. Many of DEQ's screening levels were developed in the 1990s and 2000s. See **Table 1** for general hierarchies utilized by States for establishing chronic inhalation screening levels. See the **Table 3** manganese example; the DEQ ITSL is based on the EPA-IRIS RfC (1993), while the MPCA screening level was derived in the 2000s by MDH.

4. Different critical effects may be addressed by the different state's benchmarks. For example, see the styrene example in **Table 3**: DEQ regulates it as a carcinogen, while MPCA and WDNR do not.

5. States may establish acute screening levels in addition to chronic noncancer screening levels. These can be derived by the agency or adopted from a recognized agency source; as with #3 above, such values may differ. There are some widely accepted sources of acute benchmarks: acute inhalation Minimum Risk Levels (MRLs) from the ATSDR; Acute Exposure Guidance Levels (AEGLs) from EPA's National Advisory Committee; and, California OEHHA's Acute Reference Exposure Levels (ARELs). Texas TCEQ also derives acute ESLs. Occupational Exposure Levels

(TLVs, Ceiling Limits, Short-term Exposure Limits) are also used by MDEQ and other agencies to derive acute benchmarks, with the application of an uncertainty factor to help ensure protection of sensitive individuals.

6. States may have different conventions for setting averaging times for their screening levels. **Table 3** has examples of different states having the same screening level value, but different ATs for this reason.

Data-Poor Situations

One of the most significant programmatic differences between DEQ and the other R5 State agencies is in the treatment of data-poor situations for noncancer risk assessment. Based on the recommendations from the 1981, 1989, and 1997 stakeholder workgroup reports, MDEQ has adopted rules and algorithms for utilizing short-term study results (short-term NOAELs and LOAELs; LC50s and LD50s) to derive ITSLs (with annual ATs) that are presumptively protective from chronic noncancer exposure and adverse effects, when the preferred studies or ITSL bases are not available (Rule 232). Ohio, Wisconsin and Minnesota would not extrapolate to derive chronic benchmarks, although they may address such limited datasets by setting acute screening levels. Texas TCEQ is an example of another state agency that utilizes LC50 data to derive acute and chronic benchmarks; their acute benchmark method is more restrictive than the DEQ approach.

Table 1. General Hierarchy of Basis for Chronic Inhalation Health Benchmarks

Hierarchy / rank[1]	Michigan DEQ	Minnesota PCA	Ohio EPA	Wisconsin DNR
Relatively higher	IRIS RfC value. Rules have default AT of 24 hours, which can be overridden by staff for an annual AT.	MDH health-based value (hbv)	IRIS or other available appropriate benchmark from reputable agency. 1 hr AT.	EPA values and ACGIH TLVs.
↓	EPA RfD, ATSDR MRL, EPA PPRTV, Cal REL, or staff-derived RfC[2]. AT may be 24 hours (default in rules for RfD).	MDH health risk value (hrv)	OEL (TLV/42). 1 hr AT.	
↓	OEL (TLV/100). AT is 8 hrs.	IRIS value		
↓	Subchronic study (e.g., 2-week) with extrapolation to chronic. Annual AT.	Cal REL, EPA HEAST, ATSDR MRL	Compare to other chemicals with similar structures, apply SAR.	
↓	LC_{50} value with extrapolation to chronic. Annual AT.	EPA Superfund PPRTV		
↓	LD_{50} value with extrapolation to chronic. Annual AT.			
Relatively lower	Default ITSL = 0.1 µg/m^3 (annual AT).	No default	No default	No default
Comments	Methods for deriving ITSLs from very limited data are protective, and have a long history at AQD.	Rarely use OELs (exception: ethanol facilities). Do not use short-term bioassay data to derive screening values. Chemicals with inadequate data are evaluated qualitatively in context with the entire facility.	Chemicals with inadequate data may be evaluated by comparison to similar compounds with better tox data (computational toxicology).	They do not address air toxics without benchmarks available from other reputable sources.

[1] MDEQ-AQD, and presumably the air toxics permitting agencies of the other EPA R5 states, utilizes a general hierarchy system that is not rigidly applied; professional judgment and consideration of the age and basis for the available benchmarks and methods are important factors in adopting health-based screening levels that are appropriate and defensible.

[2] Depending on the age and basis for the available benchmarks from other reputable agencies, AQD toxicologist staff may perform an updated literature review and utilize key studies differently than other available benchmarks in deriving an ITSL utilizing EPA's RfC methodology.

Table 2. Access to R5 State's Air Toxics Information and Screening Levels

State Agency	Location
Michigan DEQ	http://www.michigan.gov/deq/0,4561,7-135-3310_4105---,00.html
Ohio EPA	http://epa.ohio.gov/dapc/regs/3745_114.aspx (Toxics compound data sheets ONLY; NOT a list of benchmarks.)
Minnesota PCA	http://www.pca.state.mn.us/index.php/air/air-monitoring-and-reporting/air-emissions-modeling-and-monitoring/air-emission-risk-analysis-aera/risk-assessment-screening-spreadsheet-rass-and-g/chi-spreadsheet-aera.html Open the zipped file, "Protected RASS for 25 Stacks" Select the ToxValues tab to access the "Master Chemical List"
Wisconsin DNR	http://dnr.wi.gov/topic/airquality/toxics.html Select the tab for: Download the combined chemical spreadsheet tool (XLS).

Table 3. Comparison of R5 States' Health-Based Screening Levels for Select Air Toxics (acute and chronic noncancer; cancer at specified risk level, with annual AT; all values in µg/m^3).

Chemical	MDEQ-AQD	MPCA	Ohio EPA[1]	WDNR
Acetaldehyde #75-07-0	9 (24 hr AT) 5 (1E-5 cancer)	470 (1 hr AT) 9 (chronic) 4.5 (1E-5 cancer)		4504 (1 hr AT) 0.45 (1E-6 cancer)
Acrolein #107-02-8	5 (1hr AT) 0.02 (annual AT)	5 (1 hr AT) 0.4 (chronic)		22.9 (1 hr AT)
Ammonia #7664-41-7	100 (24 hr AT)	3200 (1 hr AT) 80 (chronic)		418 (24 hr AT) 100 (annual AT)
Benzene #71-43-2	30 (24 hr AT) 30 (annual AT) 1 (1E-5 cancer)	1000 (1 hr AT) 30 (chronic) 1.3 (1E-5 cancer)		0.13 (1E-6 cancer)
Benzo(a)pyrene #50-32-8	5E-3 (1E-5 cancer)	9.1 E-3 (1E-5 cancer)		9.1E-4 (1E-6 cancer)
Cadmium #7440-43-9	6E-3 (1E-5 cancer)	0.02 (chronic) 5.6E-3 (1E-5 cancer)		5.6E-4 (1E-6 cancer)
Chlorine #7782-50-5	500 (8 hr AT) 0.3 (annual AT)	290 (1 hr AT) 0.2 (chronic)		34.8 (24 hr AT)
Diethylene glycol monobutyl ether	20 (24 hr AT)	0.1 (chronic)		2320 (24 hr AT) 13000 (annual

(butyl cellosolve) #112-34-5				AT)
Epichlorohydrin #106-89-8	1 (24 hr AT) 8 (1E-5 cancer)	1300 (1 hr AT) 1 (chronic) 8.3 (1E-5 cancer)		45.4 (24 hr AT) 0.83 (1E-6 cancer)
Ethylene glycol #107-21-1	1000 (1 hr AT)	400 (chronic)		N/A
Ethylene oxide #75-21-8	0.3 (1E-5 cancer)	30 (chronic) 0.11 (1E-5 cancer)		1.1E-2 (1E-6 cancer)
Table 3, continued…				
Chemical	**MDEQ-AQD**	**MPCA**	**Ohio EPA[1]**	**WDNR**
Formaldehyde #50-00-0	9 (8 hr AT) 0.8 (1E-5 cancer)	94 (1 hr AT) 9(chronic) 2 (1E-5 cancer)		7.7E-2 (1E-6 cancer)
Hexane #110-54-3	700 (24 hr AT)	2000 (chronic)		4320 (24 hr AT) 200 (annual AT)
Hydrogen chloride #7647-01-0	2100 (1 hr AT) 20 (annual AT)	2700 (1 hr AT) 20 (chronic)		746 (1 hr AT) 20 (annual AT)
Hydrogen sulfide # 7783-06-4	100 (24 hr AT) 2 (annual AT)	42 (1 hr AT) 2 (chronic)		335 (24 hr AT)
Manganese	0.05 (annual AT)	0.2 (chronic)		4.8 (24 hr AT)
Mercury #7439-97-6	(no ITSL; inhalation-only RfC= 0.3 $\mu g/m^3$)	0.6 (1 hr AT) 0.3 (chronic)		Inorganic: 0.6 (24 hr AT); 0.3 (annual AT). Alkyl cpds: 0.24 (24 hr AT)
Methyl bromide #74-83-9	5 (24 hr AT)	2000 (1 hr AT) 5 (chronic)		93.2 (24 hr AT) 5 (annual AT)
Naphthalene #91-20-3	3 (24 hr AT) 0.8 (1E-5 cancer)	200 (1 hr AT) 9 (chronic) 0.29 (1E-5 cancer)		1258 (24 hr AT)
Nickel #7440-02-0	4.2E-2 (1E-5 cancer)	11 (1 hr AT) 0.014 (chronic) 2.1E-2 (1E-5 cancer)		3.8E-3 (1E-6 cancer)
Phenol #108-95-2	190 (8 hr AT)	5800 (1 hr AT) 200 (chronic)		462 (24 hr AT)
Styrene #100-42-5	1000 (24 hr AT) 17 (1E-5 cancer)	21000 (1 hr AT) 1000 (chronic)		2045 (24 hr AT) 1000 (annual AT)
Toluene #108-	5000 (24 hr AT)	37000 (1 hr AT)		4522 (24 hr AT)

88-3		400 (chronic)		400 (annual AT)
Trichloroethylene #79-01-6	10000 (24 hr AT) 2 (annual AT) 2 (1E-5 cancer)	2000 (1 hr AT) 2 (chronic) 3 (1E-5 cancer)		0.5 (1E-6 cancer)
Vinyl chloride #75-01-4	100 (24 hr AT) 1.1 (1E-5 cancer)	180000 (1 hr AT) 100 (chronic) 1.1 (1E-5 cancer)		100 (annual AT) 0.11 (1E-6 cancer)
Xylenes #1330-20-7	100 (24 hr AT)	43000 (1 hr AT) 100 (chronic)		10421 (annual AT)

[1] Ohio EPA does not publish their air toxics benchmarks; no list is available. They have Toxic Compound Data Sheets available (see link in **Table 3**), however, these appear to be justifications for listing with a summary of known hazards and toxicity information sources (e.g., IRIS unit risk values and RfCs; ACGIH OELs). It is unclear how permit applicants and staff permit reviewers determine if modeled impacts are approvable.

APPENDIX O:

TESTING REQUIREMENTS IN PERMITS TO INSTALL

Testing Requirements in Permits to Install

April 16, 2013

ORR Recommendation A-1(8)

The AQD should stop requiring permit holders to conduct elaborate and costly stack tests to provide emissions research data, since the DEQ does not use this information for subsequent permit reviews.

Update

There are many reasons why stack testing requirements are included in permits to install. These include compliance demonstrations where it is required via regulations (i.e. NSPS, NESHAPs, etc.); there is uncertainty in the quality of the emissions data; the proximity of the projected emissions to key regulatory thresholds; the source category in question has not tested to verify emissions. Stack testing is not a research project. Stack testing is a compliance demonstration and is a core component of the air program.

The AQD and many applicants routinely use historical stack test data in the evaluation of permit applications. If the data is representative of a similar process, an applicant may use it in quantifying their emissions. AQD may also use this data as a way to determine if emissions, as presented by the applicant, are similar to what other sources have provided and/or demonstrated.

Over the past several years, AQD required stack testing to confirm toxic air contaminant emissions from new asphalt plants. Effective June 1, after an evaluation of the test results, AQD determined that routine testing of asphalt plants was no longer warranted.

The need for stack testing will be determined on a case by case basis. This is consistent with how AQD routinely evaluates the need for stack testing of various

source categories. AQD will continue to make such evaluations in the future, thus not requiring stack testing where it is not warranted.

While all stack test data submitted to AQD is public information and available to applicants for review and use, it is not currently easily accessible. AQD will work with the regulated community to develop a standardized stack test result submittal template. Also, with input from the regulated community, AQD will explore ways to post stack test results on the internet to increase accessibility.

Based upon the above, AQD believes that this item has been completely addressed and can be listed as resolved.

APPENDIX P:

RULE 228 DISCUSSION PAPER

Air Toxics Workgroup (ATW)
Rule 228 Discussion Paper
May 9, 2013

ORR (2011) Report Recommendation A-1(9):

R 336.1228 should be rescinded. This rule allows the Air Quality division to go beyond the requirements of the rule for any reason.

ATW Discussion

This ORR report recommendation has not been discussed with the ATW yet. It is on the agenda for the May 15, 2013 meeting. The purpose of this draft discussion paper is to provide the ATW with background information relevant to that discussion.

Rule 228 reads as follows:

R 336.1228 Requirement for lower emission rate than required by T-BACT and health based
screening levels.
Rule 228. The department may determine, on a case-by-case basis, that the maximum allowable emission rate determined in R 36.1224(1), R 336.1225(1), R 336.1225(2), or R336.1225(3) may not provide adequate protection of human health or the environment. In this case, the department shall establish a maximum allowable emission rate considering all relevant scientific information, such as exposure from routes of exposure other than direct inhalation, synergistic or additive effects from other toxic air contaminants, and effects on the environment.

Background Information and AQD discussion

The air toxics screening levels are benchmarks for public health protection for *single-substance inhalation exposure only*. Beyond the protections provided by the screening levels, the intent of Rule 228 was to enable the agency to evaluate *additional* concerns for air toxics emissions and, if justifiable, to restrict their emissions beyond the restrictions required by T-BACT (Rule 224) or the screening levels (Rule 225). These types of additional concerns may be categorized as follows:

1. Indirect exposure pathways, such as from mercury, dioxins, and other persistent bioaccumulative toxics (PBTs).
2. Exposure to multiple air toxics in an emission, and their potential interactive effects from inhalation exposure.
3. Environmental effects, such as the impacts on vegetation and aquatic biota from mining emissions and deposition.

For the great majority of Permit to Install (PTI) applications, the comparison of modeled ambient air impacts to the screening levels is sufficient, and no further "heightened" risk assessment steps are warranted. However, some PTI applications (perhaps one or two per year) are anticipated to be particularly controversial to the public, and staff identify specific issues in categories 1-3 above that can be informed by "heightened" risk assessment. In those cases, staff are less confident that reliance on the screening levels would, by default, ensure sufficient protection of the public health or environment. Staff and AQD management then discuss how to proceed, in order to develop needed information to address public concerns. In some cases, AQD staff develop the needed information, while in most such cases, AQD requests additional information from the applicant and supplements that information with further analysis and data presentation. **Appendix 1** provides a summary of the types of sources and concerns that have been addressed under the authority of Rule 228, and the roles of the applicant and AQD staff.

The scope of a "heightened" risk assessment, when it has been pursued, has been specific to the source and the situation. AQD has focused on the key issue(s) and has not broadly pursued extraneous information. For example, coal-fired power plants have been evaluated for mercury emissions, deposition and bioaccumulation in fish in one or (at most) a few nearby inland lakes. Incinerator dioxin emissions have been evaluated for local deposition, accumulation, and transfer up the food chain. Copper mining emissions have been evaluated for copper, nickel, arsenic and sulfuric acid deposition and environmental impacts. An iron mine was evaluated for mercury emissions, deposition, and bioaccumulation in fish in local inland lakes. The potential interactive inhalation effects of multiple emitted air toxics have been evaluated for several PTI applications. See **Appendix 1** for more information.

The public comment process for such PTI applications can be contentious. AQD staff have addressed public concerns at public meetings, both orally (panel Q&A or "open house" format) and in written form (Staff Report and FAQs documents), using the heightened risk assessment information. If a permit is issued, AQD has used the heightened risk assessment information in responding to public comments that were in opposition to permitting, in Response to Comments documents. AQD has faced litigation, and, environmental justice complaints to the EPA Office of Civil Rights. Thus far, complainants have not prevailed in showing that AQD permitting was unprotective and inappropriate. It is difficult for AQD to envision being able to adequately address public concerns, and defend some permitting decisions, without "heightened" risk assessment information in such cases.

While the "heightened" risk assessment information has been very valuable, AQD has not used the authority under R 228 to require a lower allowable emission rate. A summary of the historical application of R 228 is attached in Appendix 1. While the impact findings have not yet been used to require lower emission rates than would be allowed otherwise, the focus on these concerns may have influenced T-BACT requirements in some cases. The findings have been very helpful to the AQD in presenting proposed projects to the public, and have addressed concerns raised by the public or by staff.

The concern with Rule 228, as expressed in the ORR report, is that the rule allows the AQD to go beyond the requirements of Rule 225 "for any reason". As written, the rule language does give the agency broad discretion to develop and consider air toxics impact information and to restrict emissions, "considering all relevant scientific information". And, the pursuit of such information does in many cases place an additional burden on the applicant and contribute to delays in permit application and review. However, it is AQD's opinion that the agency has been judicious in exercising this authority to pursue further relevant scientific information, has found a great benefit of that information to the agency, to the public, and to the permit applicants, and has not used the findings to require lower allowable emission rates.

AQD request for ATW discussion

AQD has significant concerns for rescinding the rule, because it would greatly diminish the agency's ability to adequately address some future air toxics issues raised in permitting contentious sources. In order to attempt to address the ORR report's point about the breadth of the rule, AQD has considered potential options for limiting the scope and application of the rule. We have considered potential ways to revise the rule so that it is explicitly focused on more specific situations. AQD is unsure to what extent any such approaches would be acceptable to the regulated community in lieu of rescinding the rule, and, we have identified some concerns / disadvantages to all of the potential approaches that we have considered. AQD would also appreciate feedback on a potential, simple change in the rule language which may lessen the concern that AQD has too much discretionary authority, by changing, "The department may determine, on a case-by-case basis…", to, "The Director may determine, on a case-by-case basis…".

Appendix 1. Summary of the types of sources and issues that have been subjected to heightened impact assessments under the authority of R 228.

Source type	Focus of evaluation	Provided by the Applicant (beyond air dispersion modeling for R225)	Provided by AQD Staff	Outcome / AQD finding
Hazardous Waste Incinerator	Dioxin emissions, deposition, bioaccumulation, and multipathway exposure, cumulative with the existing local contamination.	Deposition modeling, multipathway risk assessment.	Verified applicant's modeling and risk assessment, added further characterization and perspectives on the impacts, presented results to the public, responded to comments.	Not found to pose significant concerns. The incremental impacts were small relative to health protective benchmarks and relative to the existing contamination.
Municipal Waste and Sewage Sludge Combustors	Cumulative air toxics exposures and effects; dioxins and mercury multipathway risks; lead deposition and children's exposure and neurological effects[1].	Deposition modeling, multipathway risk assessment (in one case); nothing additional (in one case).	Verified applicant's modeling and risk assessment, added further characterization of the impacts, presented results to the public, responded to comments.	Not found to pose significant concerns.
Coal-fired power plants	Mercury deposition and bioaccumulation, cumulative with background Hg levels; cumulative air toxics cancer and noncancer effects; lead impacts[1].	Deposition modeling, multipathway risk assessment.	Verified applicant's modeling and risk assessment, added further characterization of the impacts, presented results to the public, responded to comments.	Not found to pose significant concerns.
Tire-derived fuel (TDF) use at a wood-fired power plant	Sulfur emission ↑, acid deposition, ecosystem impacts.	None.	Acid deposition modeling for potential impacts to a nearby lake.	Not found to pose significant concerns; permit denied due to lack

Source type	Focus of evaluation	Provided by the Applicant (beyond air dispersion modeling for R225)	Provided by AQD Staff	Outcome / AQD finding
				of scrubbers (BACT).
Petroleum refinery	Cumulative air toxics impacts.	None. (Note: applicant did an EJ analysis of NAAQS only.)	Cumulative air toxics cancer and noncancer exposures and risks (for facility emissions).	Not found to pose significant concerns.
Source type	**Focus of evaluation**	**Provided by the Applicant (beyond the usual air dispersion modeling)**	**Provided by AQD Staff**	**Outcome**
Auto plant, painting & coating	Cumulative air toxics effects of VOCs. One facility was a known source of significant solvent odors.	None.	Cumulative VOC exposure and risk assessment based on modeling (for facility emissions) and on local air monitoring data.	Not found to pose a significant public health risk. One facility added controls to address the odor issue.
Mining	Deposition of metals and sulfates (acid dep), ecosystem impacts. Mercury deposition and multipathway risk assessment also evaluated for one iron mine.	Deposition modeling for local watersheds. Mercury impacts modeling for local lakes, for one mine.	Assessment of potential loading to local surface waters, comparison of incremental deposition rates to background rates, comparison of topsoil loading to soil cleanup criteria.	Not found to pose a significant risk of adverse ecosystem impacts. For one mine, mercury impacts to anglers or piscivorous wildlife were found to be low.
Cement kiln	Mercury deposition and multipathway risk assessment.	Deposition modeling for one selected local lake.	Verified deposition modeling, modeled fish bioaccumulation, characterized impacts.	Pending.
Steel mill; Metal shredder	Mercury deposition and multipathway risk assessment.	None.	Deposition modeling, multipathway risk assessment.	Not found to pose significant concerns.

Source type	Focus of evaluation	Provided by the Applicant (beyond air dispersion modeling for R225)	Provided by AQD Staff	Outcome / AQD finding
	One steel mill: cumulative inhalation; lead impacts to children[1].		Cumulative impacts and lead impacts to children[1] (one steel mill).	
Asphalt plants	Cumulative air toxics cancer and noncancer effects.	None.	Cumulative air toxics cancer and noncancer exposures and risks, for facility emissions plus background (from NATA and mon. data).	Not found to pose significant concerns.

[1] It may be noted that, prior to EPA's 10-fold reduction in the lead NAAQS in 2008, AQD performed several multipathway risk assessments for lead air emissions from various proposed sources. However, since lead is not a TAC, these assessments were performed under the authority of R 901 rather than R 228. The current NAAQS, unlike the previous NAAQS, is based on the current toxicology of lead exposure and more fully accounts for deposition impacts and exposure via the oral route as well as inhalation. Lead assessments are included in this table only to indicate the scope of the assessment.

APPENDIX Q

ADDITIONAL AIR TOXICS RULE ISSUES

MDEQ-AQD Air Toxics Workgroup (ATW) "Other Issues" September 19, 2013

Besides the proposed air toxics rule revisions that will implement the ATW report's recommendations, there are some additional proposed rule changes that are needed for consistency with the current EPA risk assessment guidance and practice. AQD does not believe that these are controversial. However, review and consideration by the ATW of the following is desirable.

Issue	In the Current Rule:	Proposed Change and Rationale:
Rule 231 Cancer Risk Assessment Screening Methodology	Rule 231 cites and adopts by reference the EPA 1986 Guidelines for Carcinogen Risk Assessment. The method for deriving the **unit risk estimate (q_1^*)** is consistent with that guidance.	The 1986 guidance has been superseded by the EPA (2005(a)) "Guidelines for Carcinogen Risk Assessment". Staff has utilized the 2005(a) guidance under the flexibility provided by Rule 229 to use a more appropriate methodology. AQD proposes to cite and adopt by reference the 2005(a) EPA guidance. The Rule language for q_1^* derivation should be revised to be consistent with that guidance. This is not anticipated to cause any general or significant change in the magnitude of the IRSLs or SRSLs.
Rule 231 Cancer Risk Assessment methodology	As in the 1986 EPA guidance, the Rule 231 methodology does not address differently the carcinogens that have a mutagenic mode of action. In other words, the methodology does not direct the application of Age-Dependent Adjustment Factors (ADAFs) as recommended by EPA (2005(b)).	The EPA 2005(b) "Supplemental Guidance for Assessing Susceptibility for Early-Life Exposure to Carcinogens" recommends that ADAFs should be applied to q_1^* values for 20 carcinogens that have a mutagenic mode of action. This list includes B(a)P, which is the reference chemical for the carcinogenic PAHs. AQD proposes to adopt by reference EPA 2005(b) and apply ADAFs in these cases. The effect of this would be the reduction of the IRSLs and SRSLs for these substances by a factor of 1.6.
Rule 232 Methodology for Determining the Initial Threshold Screening Level	ITSLs can be derived from a "no observed adverse effect level (NOAEL)" or a "lowest observed adverse effect level (LOAEL)".	Cite and adopt by reference the EPA (2012) "Benchmark Dose Technical Guidance". Besides the continued use of NOAELs and LOAELs, some datasets are amenable to modeling the dose-response (using benchmark dose (BMD) modeling) to derive a Point of Departure (POD). The POD is essentially equivalent to a NOAEL. The Rule 232 language will need to be revised to address the BMD method, and define the key terms. An ITSL can be derived from the POD or NOAEL by the application of uncertainty factors, by the same method. The modeled POD may be somewhat higher or lower than a NOAEL, on a case-by-case basis. The proposed draft of the new Rule 233 (method for deriving acute ITSLs) includes the BMD method for that Rule.