Memo

To: Cleaner Air Oregon Regulatory Reform Advisory Committee
From: DEQ and OHA
Date: October 12, 2016
Subject: Screening and Risk Assessment

Request for Advisory Committee Members

The Oregon Department of Environmental Quality (DEQ) and the Oregon Health Authority (OHA) have identified six discussion topics for the advisory committee meetings. The following document describes one discussion topic, with four related program elements. DEQ and OHA are seeking Advisory Committee input on the following questions:

1) What should DEQ and OHA be considering in relation to screening and risk assessment when choosing an approach for Cleaner Air Oregon?
2) Are there additional elements, other than the ones listed, that DEQ and OHA should consider?
3) Are there other air toxics permitting programs that provide unique examples not described in this discussion paper?

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Introduction

The Cleaner Air Oregon rulemaking is a partnership between OHA and DEQ to develop a new regulatory system for managing air toxics emissions from industrial sources. The new rules will be based on the potential risk to human health and will allow DEQ and OHA to carry out their respective missions of cleaner air while protecting and promoting health in Oregon. In developing this new regulatory approach, the two agencies will begin looking at individual sources of industrial emissions across the state in relation to public health.

After receiving input on the different aspects of a risk-based air toxics permitting program from the Technical Workgroup, the Policy Forums, and the Advisory Committee, DEQ and OHA will draft proposed rules. All interested parties will have a chance to comment on the proposed rules during the public notice period in 2017.

DEQ and OHA have evaluated air toxics permitting programs in Louisville, Kentucky; New Jersey; New York; Rhode Island; South Coast Air Quality Management District, California; and Washington. These programs were recommended as being innovative, representing a range of diverse approaches to air toxics permitting programs. In addition, Washington's program was included because it is often compared to DEQ's. Key elements of these air toxics programs were summarized and discussed at Technical Workgroup meetings in June and July 2016. Documentation of Technical Workgroup discussions and background information for Oregon, along with elements to consider are presented below.

DEQ and OHA will be asking for Advisory Committee input for each discussion topic and if there are any additional topics that should be considered.

A glossary of terms can be found at this link:
http://www.oregon.gov/deq/RulesandRegulations/Advisory/8Glossary.pdf

The Technical Workgroup (http://www.oregon.gov/deq/RulesandRegulations/Pages/2017/cleanerair2017w.aspx) provided an evaluation of other state's approaches to human health risk-based air toxics programs for industrial facilities and answered technical questions in support of rulemaking, as requested by DEQ and OHA. The workgroup was tasked with providing focused and specific input to help DEQ prepare policy issues for discussion at Regional Forums and Advisory Committee meetings in the fall of 2016. The workgroup was not a decision-making body. The Technical Workgroup included individuals with expertise in toxicology, modeling, pollution prevention, and representatives of other state air toxics programs.

The Regional Forums occurred in the months of September and October in all regions of the state to provide an opportunity for informal community input.

The Advisory Committee includes a variety of representatives from community level organizations, advocacy groups to city/county government representatives to small businesses and large businesses. (http://www.deq.state.or.us/nwr/docs/metalsem/CAOacroster.pdf)

Purpose

This discussion paper addresses the key elements of screening and risk assessment. There are several questions for consideration related to this topic. Specifically, how have other states approached screening sources? How have they used significant emission rates or de minimis[1] emission

[1] De minimis levels are screening levels of emissions that, if a facility emits less than the de minimus level, no further analysis is needed.

rates? How are health risk-based concentrations or modeling used in a screening approach? How are risk assessments conducted?

For detailed information on the six air toxics permitting programs that DEQ and OHA researched, please see the Appendix below.

AERSCREEN – recommended screening model based on AERMOD. Model will produce estimates of "worst-case" one hour concentrations for a single source, without the need for hourly meteorological data.

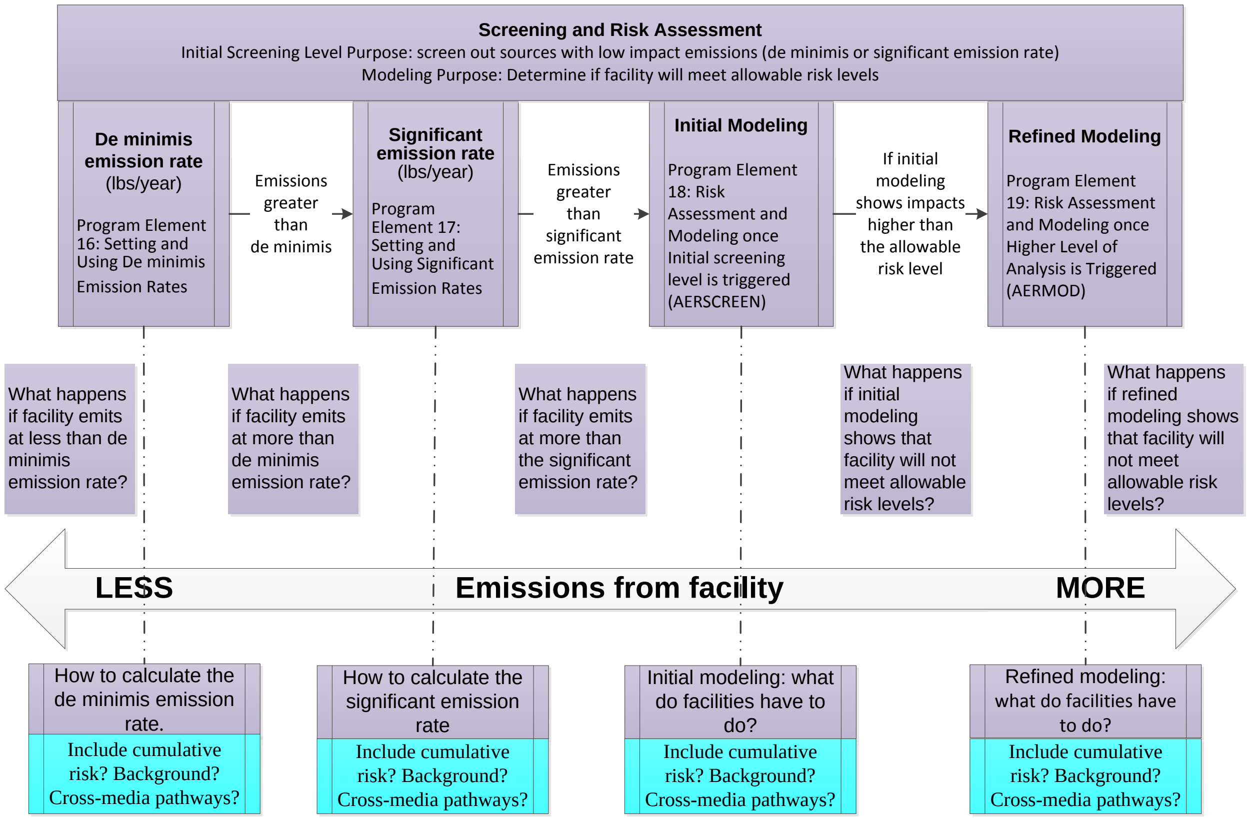
AERMOD – EPA's preferred model for near-field simulations of dispersion of emissions.

Background on screening and risk assessment

The programs reviewed developed a range of screening steps to determine the requirements for modeling, risk analysis, and permit conditions. These screening steps typically included a comparison of facility emissions to emission thresholds, and a comparison of modeled concentrations to risk based concentrations.

Some programs have developed de minimis emission rates. Sources with emissions below these levels are not required to obtain a permit, and is not considered significant in cumulative risk analysis of nearby facility emissions.

In addition, some programs developed significant emission rates to exempt smaller permitted sources from the requirements of a more refined risk-based analysis. If potential emissions are less than the significant emission rates, the sources are exempt from further analysis. If further analysis is necessary, this is often a series of steps with more detailed analysis at each step. When dispersion modeling is required, the models progress in degrees of refinement from screening applications such as AERSCREEN, to refined models like AERMOD. AERMOD is well suited for estimating impacts from industrial facilities and predicting modeled concentrations in areas, including Environmental Justice communities, adjacent to the facility. At each step, modeled concentrations are compared to state-developed risk-based concentrations. In this approach, the final modeled concentrations would be used in an analysis for cancer risk and for short-term and chronic non-cancer risk. A diagram of potential screening steps is also included below for explanatory purposes:



These four program elements, de minimis emission rates, significant emission rates, dispersion model screening, and refined dispersion modeling, are described in more detail below.

DEQ asked the National Association of Clean Air Agencies (NACAA) how they incorporate environmental justice into their permitting programs. Several programs address environmental justice concerns through consideration of cumulative risks. For a description, please refer to the discussion paper on Environmental Justice in Permitting. In addition, DEQ obtained input from Oregon's Environmental Justice Task Force.

Summary of Environmental Justice Task Force Input

- Require permit applicants to provide an emission inventory, dispersion model and demographic overlay in advance of or concurrent with the permit application.
- The Task Force requests that DEQ consider a comprehensive approach to addressing air toxics. DEQ and OHA together can more accurately frame the overall risks faced by Environmental Justice communities, and commit to integrating efforts to address other emission sources such as diesel and wood smoke that are not covered by this rulemaking.

Summary of Individual Environmental Justice Task Force Member Input

- DEQ/OHA need to establish a cumulative risk assessment methodology. This methodology would be triggered when a permit application is made in or adjacent to an Environmental Justice community, in an effort to establish a baseline as well as potential disparate impacts.
- Burden should be on permit applicant to identify potential disparate impacts in initial application; Process should include initial overlay screening to confirm/identify potential disparate impacts, along with monitoring data and/or modeling to identify elevated health-based risks.
- DEQ should first seek to impose terms and conditions on permits that might otherwise pose elevated health risks to communities with environmental justice concerns (increased pollution-control technology, monitoring, compliance).

Program Element 16: Setting and using de minimis emission rates

Facilities are required to calculate their maximum potential emissions of all air toxics, compare those rates to the de minimis emission rates, and determine whether further analysis is required. De minimis emission rates, as noted above, are emission rates below which a source is not subject to permitting requirements. The de minimus emission rate is also not usually considered significant enough to be included in the cumulative analysis of another source. There are two main policy considerations related to de minimis emission rates:

1. Whether or not DEQ shall use de minimis rates in its permit program? If so, how shall DEQ treat sources with emissions greater than de minimis, but below the significant emission rate?
2. How shall DEQ calculate de minimis emission rates?

Oregon Information

DEQ currently uses de minimis emission levels for regulated air pollutants other than air toxics (i.e., particulate matter, carbon monoxide, sulfur dioxide). These de minimis levels are used as thresholds to determine if a facility is required to obtain a modified permit based on emission increases above de minimis.

Summary of Technical Workgroup Input

- De minimis levels should not be so conservative so that they catch almost every source. However, the levels need to be conservative enough so that any sources that could pose a public health risk are evaluated;
- Washington State uses de minimis levels, calculated as the significant emission rate divided by 20, to avoid the need for permit applications for small, insignificant sources. Other than wanting a very low level, there is no specific rationale for this calculation. If an individual toxic pollutant is emitted below the de minimis level, nothing else is required. For the purposes of cumulative risk analysis for consideration of multiple pollutants, de minimis could be lower or otherwise adjusted. The de minimis level is also tied to TBACT. If source emissions are greater than de minimis, TBACT is required, even if source emissions are less than the significant emission rate;
- Southwest Clean Air Agency in Vancouver, WA makes the de minimis threshold determination, not the source;

- Does the use of de minimis emission rates and other screening tools assure that the risk based benchmarks and public health are protected while not placing an undue burden on permitted sources? The progression of steps is the right framework to ensure this.

Summary of considerations for setting and using de minimis emission rates

This is preliminary information DEQ and OHA have gathered in discussions with the Technical Workgroup, the Environmental Justice Task Force, public comment, and from experience in the air program. This should be considered the starting point for Advisory Committee discussion and input.

- Generally speaking, de minimis values are very conservative with the goal of providing health protection for sensitive and vulnerable populations.
- De minimis values can be effective tools for pollution prevention and emission reduction because sources may reduce their emissions levels below the de minimis level in order to avoid being subject to risk based permitting requirements.
- Use of de minimis levels can quickly resolve applicability issues by screening out small sources from risk based permitting. This can serve as a simple, less resource intense step for facilities determining whether or not risk based permitting requirements apply to them. There would be a high level of regulatory certainty about de minimis levels because they would be specified in rule.
- Use of de minimis levels is scientifically sound because the values are usually back calculated from Risk Based Concentrations using EPA models.
- De minimis levels would apply uniformly across all facilities as an initial screening tool. It would be an effective way to remove facilities with insignificant emissions and focus state resources on facilities with more potential to impact public health.
- DEQ has the authority to regulate air toxics, including establishing de minimis levels for risk based permitting.

Potential elements for setting and using de minimis emission rates

The following are potential elements for which DEQ and OHA are seeking additional discussion and input from the Advisory Committee. If there are additional elements not included below, please raise them.

Please note that these elements might be affected by other program elements, such as whether to include existing facilities, regulating by whole facility or by individual equipment, and whether cumulative impacts are included in this particular program element.

Potential Elements
A. Do not use a de minimis emission rate threshold
B. Include a de minimis threshold. If sources emit at levels **below** the de minimis, exempt sources from further evaluation requirements, and are not included in other source cumulative analysis
C. Include a de minimis threshold. If sources emit at levels **above** the de minimis, include emissions in cumulative analysis of nearby sources

Potential Elements
D. Include a de minimis threshold. If sources emit at levels **above** the de minimis, require registration (for unpermitted facilities) and reporting requirements (every 5 years). These emissions would also be incorporated into the statewide emissions inventory.
E. Include a de minimis threshold. If sources emit at levels **above** the de minimis, require further evaluation to determine if source emits at above the significant emission rate or not.
F. Include a de minimis threshold. If sources emit at levels **above** the de minimis, require TBACT
G. Derive de minimis emission rates from the significant emission rate (for example add a safety factor to account for potential multiple air toxics or other cumulative risk) (For WA it is significant emission rate divided by 20)
H. Include cumulative risk from multiple air toxics: Sum the ratios of each air toxic's emission rate: significant emission rate. If the sum of these ratios is > 1 (or other chosen value), then refined modeling may be necessary.
I. To use de minimis emission rates to evaluate an increase resulting from a modification or from new sources: add the increase to existing emissions and compare to de minimis
J. Require permit applicants to provide an emission inventory, dispersion model and demographic overlay in advance of or concurrent with the permit application (Based on the Minnesota PCA and New York DEC approaches)
K. Require a cumulative impact assessment and enhanced community engagement when the demographic emissions overlay shows a potential disparate impact within or adjacent to an Environmental Justice community (as defined by regionally-significant thresholds)
L. Placeholder for elements developed by advisory committee members

Program Element 17: Setting and using significant emission rates

Significant emission rates are used to exempt smaller permitted sources from the requirements of a more refined risk-based analysis. If potential emissions are less than the significant emission rate, the analysis is complete. Significant emission rates are typically calculated from backward modeling of the risk based concentrations, and are very conservative or health protective.

Oregon Information

Significant emission rates play a very important role in the Criteria Pollutant EPA New Source Review program as it is implemented in Oregon. In New Source Review, sources with emissions greater than the significant emission rate are required to do modeling to evaluate impacts from those emissions.

Summary of Technical Workgroup Input

- Any successful program should have a tiered analysis that allows smaller, low risk sources to be screened out from a refined modeling analysis. Applicants can use lookup tables as a control method to ascertain what emission limits can be used without going on to the next tier of review and also without taking unnecessarily high permit limits if allowed without further review.
- All of the air toxics permitting programs evaluated used annual average significant emission rates, either for the initial screening level analysis, or for the screening level after a de minimis is exceeded. Significant emission rates are useful because they screen out sources that pose low risk and do not require the use of a dispersion model to calculate concentrations and refined analysis for these sources, which could cause an undue burden.
- Significant emission rates need to be conservative enough so that sources that pose a public health risk are evaluated, but facilities whose emissions do not pose a public health risk are screened out. Significant emission rates and their derivation should be clear and transparent.
- Consider ways to incorporate the additive effects of toxics into the screening methodology. Significant emission rates represent only a single facility's emissions. If there are many facilities in an area, it is important that the significant emission rates be sufficiently conservative to account for that. For the purposes of cumulative risk analysis considering multiple pollutants, significant emission rates could be lowered or otherwise adjusted for additional protection. For example, a facility that emits dozens of toxics may have emissions of each air toxic that are below respective significant emission rates, but additively may amount to a cancer or non-cancer risk that should trigger a regulatory response. Washington uses 1-hour, 24-hour and annual significant emissions rates. The significant emission rates have been useful in screening out those projects most likely to not cause problems. The use of the significant emission rate is an incentive for sources to reduce emissions to avoid having to undertake a more refined analysis but not many sources can screen out of permitting requirements using the significant emission rate. Possible alternative: if using significant emission rates, sum the ratios of each air toxic's emission rate to the significant emission rates. If the sum of these ratios is greater than one (or other chosen value), refined modeling may be necessary. In the example below, three air toxics are emitted from a facility, all below the significant emission rate for that air toxic. However, the sum of the ratios is above one, therefore the facility would be considered above the significant emission rate.

Air Toxic	**Significant emission rate (lb/year)**	**Emission rate from facility (lb/year)**	**Ratio**
1,1,1,2-Tetrachloroethane	25.9	10.1	.38
1,3-Butadiene	1.13	1	.89
2-Naphthylamine	0.376	.05	.133
Sum of ratios			**1.4**

- In Washington, the refined analysis process typically results in a lower concentration than if one only looked at the ratio of the proposed emission rate to the significant emission rate, as in the example above. This occurs because the ratio of emission rate to significant emission rate is typically larger than the ratio of refined model concentration to risk based concentration. All of this is because the method used to derive the significant emission rate is generally conservative (i.e., erring on the side of caution). For example, a known toxic with a significant emission rate of 1.0 pound/hour is assumed to be protective of its RBC of 0.1 µg/m^3. However, refined modeling using an applicant's specific building and emissions parameters may show that a 1.0 pound/hour emissions rate results in a modeled concentration of only 0.01 µg/m^3, well below the RBC. As a result, the significant emission rate is very conservative and protective.

Summary of considerations for setting and using significant emission rates

This is preliminary information DEQ and OHA have gathered in discussions with the Technical Workgroup, the Environmental Justice Task Force, public comment, and from experience in the air program. This should be considered the starting point for Advisory Committee discussion and input.

- Significant emission rates are conservative and should be protective of sensitive and vulnerable populations.
- Significant emission rates can be effective tools for pollution prevention and emission reduction because sources may reduce emissions below significant emission rates to avoid being subject to risk based permitting requirements.
- Use of significant emission rates can quickly resolve applicability issues by screening out small sources from risk based permitting. This can serve as a simple, less resource intense method for facilities determining whether risk based permitting requirements apply to them. Since significant emission rates would be defined in rule, there would be a high level of regulatory certainty about them. Use of significant emission rates is scientifically sound because the values are usually back calculated from risk based concentrations using EPA models.
- Including cumulative risk from multiple chemicals from a facility and multiple sources nearby in the calculation of significant emission rates would provide more protection to human health, but might result in more facilities needing to conduct modeling. This would result in a higher cost of compliance for some facilities.
- Significant emission rates would be applied uniformly across all facilities as an initial screening tool. This would be an effective way to remove facilities with insignificant emissions in order to focus on facilities with more potential and significant to impacts public health.
- DEQ has the authority to regulate air toxics, including establishing significant emission rates.

Potential elements for setting and using significant emission rates

The following are potential elements for which DEQ and OHA are seeking additional discussion and input from the Advisory Committee. If there are additional elements not included below, please raise them.

Potential Elements
A. Don't use significant emission rates. All sources must model.

Potential Elements
B. Include a significant emission rate. If sources emit at levels **below** the significant emission rate, and there is no de minimis in use, exempt these sources from further requirements and from cumulative analysis of nearby sources.
C. Include a significant emission rate. If sources emit at levels **above** the significant emission rate, • Require TBACT; • Require screening or refined dispersion modeling; and • Include emissions in cumulative analysis of nearby sources.
D. Require permit applicants to provide an emission inventory, dispersion model and demographic overlay in advance of or concurrent with the permit application (Based on the Minnesota PCA and New York DEC approaches)
E. Require a cumulative impact assessment and enhanced community engagement when the demographic emissions overlay shows a potential disparate impact within or adjacent to an EJ community (as defined by regionally-significant thresholds)
Methods to Calculate Significant Emission Rates
F. Derive significant emission rate by backward modeling of risk based concentrations. Do not consider cumulative risks until a later step.
G. Include cumulative risk from multiple air toxics: Sum the ratios of each air toxic's emission rate: significant emission rate. If the sum of these ratios is > 1 (or other chosen value), then refined modeling may be necessary.
H. In addition to the significant emission rate, require an assessment of nearby sources to address cumulative risk from community sources or nearby industrial sources.
I. Allow plant-wide emission offsets in determining emissions for comparison to the significant emission rate.
J. Placeholder for elements developed by advisory committee members

Program Element 18: Initial modeling - risk assessment and modeling once initial screening level is triggered (AERSCREEN)

The use of air dispersion modeling for analysis has advantages because when coupled with significant emission rates, use of the AERSCREEN and AERMOD modeling system makes the process of estimating screening concentrations relatively transparent. The use of AERSCREEN at the initial level of the analysis paves the way for refined modeling using AERMOD, if it is required.

Dispersion models predict concentrations at modeling receptors. Computer modelers call the location where they are looking for impacts a "receptor." Usually these receptors are laid out in grids of varying coarseness, but receptors can also be placed along a facility's fenceline and at locations of particular concern or sensitivity, such as schools. It is important to consider where the receptors are located, and at what step in the screening analysis they are used.

Both fenceline and residential/sensitive receptors are used by the programs in this review. There are advantages to both, especially when used together. Criteria pollutant[2] modeling considers ambient air to begin at the fenceline so receptors are placed along the fenceline. If the source going through a toxics analysis has already conducted criteria pollutant modeling, the receptor grid, starting at the fenceline, is already established. However, the use of residential and sensitive receptors reinforces the concept of human exposure and risk, especially for carcinogenic and chronic risk, and therefore, may better provide more realistic estimates of risk to the exposed population.

For example, conservative fenceline receptors can be used in early screening steps, and in more refined modeling, receptor locations can be limited to residential and sensitive areas.

AERSCREEN predicts concentrations at distances from the emission point along radials that are affected by several factors, including building configuration and wind flow. Concentrations can be estimated at the distance to the fenceline for a given facility, or they can be estimated at the distance to nearest residential area.

The Environmental Justice Task Force input above on page 4, as well as the "Cumulative Risks and Background" discussion paper (page 4) applies to the discussion here.

Summary of Technical Workgroup input

- A screening model as a first step is a wise approach. However, model results can vary depending on the assumptions and data used in the model.
- For modelers, AERSCREEN can be run as a single source model. However, it does require expertise in setting up input data for running the model.
- Input data includes site specific data such as: 1) emissions and stack parameters, 2) building dimensions which are used to account for downwash, which could cause an order of magnitude difference in concentrations, 3) land surface characteristics, and 4) local terrain data.
- AERSCREEN is frequently used in concert with AERMOD, if more refined modeling is required. For example, in the South Coast Air Quality Management District, sources can use both AERSCREEN and AERMOD to do a risk assessment.
- Models and model results can become outdated. For example, if the locations of sensitive receptors change, such as with the construction of a new hospital or residential area, then the model results become outdated. This could lead to an implementation issue that would require a new analysis when additional industrial sources enter into the area.
- Considerations for fenceline or residential/sensitive receptors:
    - Demographic information from census blocks can be used to identify residential receptors for chronic impacts. Land use information can identify commercial uses, including office buildings, which have been identified as important areas to evaluate. For acute effects, EPA considers all receptors and their impacts beyond the facility fenceline.

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[2] A defined set of regulated pollutants. Includes: nitrogen oxides, volatile organic compounds, particulate matter, PM10, PM2.5, sulfur dioxide, carbon monoxide, and lead. Criteria pollutants are the only air pollutants with national air quality standards that define allowable concentration of these substance in ambient air.

  - South Coast Air Quality Management District (CA) looks at commercial buildings and sensitive receptors. However, children are not often found at commercial receptors, so the exposure scenario is different. There are other infrequent situations that may create difficulty in determining the location of sensitive receptors. For example, how to address a permitted source located on a college campus. DEQ and OHA should look at fenceline, residential, and commercial receptors, when appropriate, for modeling risk.

- South Coast Air Quality Management District (CA) uses screening steps with multiple tiers and increasing levels of refinement; a vast majority of sources do not make it to the highest tier. Screening tiers are a balance between relatively simple and easy to use steps at one end of the scale, and refined methods at the other end that can account for varying levels of emissions, multiple types of compounds, multiple sources, and varying exposure scenarios. DEQ and OHA should develop a system that is simple and effective, but can allow complex analysis when appropriate.
- In Washington, the first step that employs screening modeling (AERSCREEN) is meant to be relatively conservative and looks at fenceline as ambient air. The second modeling tier (AERMOD) is more refined and evaluates concentrations and risk where people are actually exposed. Land use and zoning are important considerations as some currently undeveloped areas may have the potential for future development. For example, an undeveloped area that is zoned residential should be included as a residential or sensitive area for modeling and risk assessment.

Summary of considerations for risk assessment and modeling once initial screening level is triggered (AERSCREEN)

This is preliminary information DEQ and OHA have gathered in discussions with the Technical Workgroup, the Environmental Justice Task Force, public comment, and from experience in the air program. This should be considered the starting point for Advisory Committee discussion and input.

- Using distance-to-fenceline as a default method for placing modeling receptors is an approach that would be protective of sensitive and vulnerable populations that live at a greater distance away.
- Sources may choose to reduce emissions and therefore avoid refined modeling. This would result in pollution prevention and lower overall emissions.
- AERSCREEN is in wide use and can be run expeditiously. It is a reliable model, developed by EPA. When a source screens out using AERSCREEN, they do not have to run a more expensive and complex higher tier model. This reduces costs and simplifies analysis for many sources. DEQ could either review a facility’s run of AERSCREEN, or DEQ could perform the model.
- DEQ has the authority to regulate air toxics, including establishing AERSCREEN requirements and protocols.

Potential elements for risk assessment and modeling once initial screening level is triggered (AERSCREEN)

The following are potential elements for which DEQ and OHA are seeking additional discussion and input from the Advisory Committee. If there are additional elements not included below, please raise them.

Potential Elements
A. Default receptor location at fenceline for initial analysis
B. Default receptor location beyond fenceline to where people live and/or work.
C. In addition to running AERSCREEN, evaluate impact distance and presence of potential nearby sources. If significant other sources are present, require refined modeling, including cumulative impact analysis.
D. Facility-wide or single piece of equipment
E. Require an assessment of whether the facility is in an environmental justice area, and if so, require refined modeling
F. Require permit applicants to provide an emission inventory, dispersion model and demographic overlay in advance of or concurrent with the permit application (Based on the Minnesota PCA and New York DEC approaches)
G. Require a cumulative impact assessment and enhanced community engagement when the demographic emissions overlay shows a potential disparate impact within or adjacent to an Environmental Justice community (as defined by regionally-significant thresholds)
H. Placeholder for elements developed by advisory committee members

Program Element 19: Refined modeling - risk assessment and modeling once higher level of analysis is triggered (AERMOD)

AERMOD is a refined EPA dispersion model for analyzing Criteria Pollutant impacts in the New Source Review program. Its use in the toxics program would be triggered by the need for a more refined analysis following AERSCREEN, or other screening step. The model would be used if the impacts of a facility's emissions using the AERSCREEN model were shown to be above the allowable risk level. This would be done by comparing the output from AERSCREEN to risk based concentrations.

The discussion above, in Program Element 15 (AERSCREEN) regarding fenceline and sensitive modeling receptors, also applies to the refined model, AERMOD.

The Environmental Justice Task Force input above on page 4, as well as the "Cumulative Risks and Background" discussion paper (page 4) applies to the discussion here.

Oregon information

AERMOD is routinely used for New Source Review modeling in Oregon. It is also used for non-regulatory applications to estimate impacts from industrial sources.

Summary of Technical Workgroup input

- State programs usually require AERMOD as the refined dispersion model for risk analysis, which requires professional input to setup and run.

- Site specific data, such as emissions and building/stack data, are needed to run the models. Building downwash effects can be significant and cause an order of magnitude difference in modeled concentrations near the source.
- AERMOD modeled predictions are estimates of ambient concentrations. However, people are exposed to these concentrations in varying degrees depending on their location and activities. For example, exposure to ambient air is different for those who stay in their homes than for people who spend a significant amount of time outside. People who live largely outside have 24 hour exposure, as do people who leave windows open 24 hours/day. As a result, exposure concentrations can be different across a range of receptor locations and receptor types, for example, residential or commercial sensitive receptors.
- The calculation of exposure concentrations can be very onerous. However, it is possible to use the NATA[3] modeled-to-exposure concentration ratios to derive exposure concentrations from AERMOD modeled concentrations. Exposure concentrations, calculated using census tract information, are the basis for the NATA risk estimates.
- Exposure concentrations and risk based on exposure concentrations are generally lower than modeled ambient concentrations and risk. Using exposure concentrations can make the analysis more realistic, but less conservative. It is recommended that for the basic screening steps modeled concentrations be used to calculate risk, rather than exposure concentrations.
- Taking exposure into account for more refined analyses can be appropriate, and there are examples of this in both California and Washington programs.
- Risk assessment guidance from EPA and California can be used to derive exposure scenarios that account in large part for differences in exposure duration and exposure frequency at different receptors. Note: OEHHA guidance also includes other exposure factors such as inhalation rate, body weight, etc.
- Significant emission rates, based on the RBCs, assume continuous exposure. For more refined steps in the risk analysis, concentration and risk can be adjusted based on exposure frequency and duration.
- As noted above for AERSCREEN, models and model results can become outdated. For example, if the locations of sensitive receptors change, such as with the construction of a new hospital or residential area, then the model results could be outdated. This could be an implementation issue that could require a new analysis when additional industrial sources come into the area.

Summary of considerations for risk assessment and modeling once higher level of analysis is triggered (AERMOD)

This is preliminary information DEQ and OHA have gathered in discussions with the Technical Workgroup, the Environmental Justice Task Force, public comment, and from experience in the air program. This should be considered the starting point for Advisory Committee discussion and input.

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[3] The EPA's National Air Toxics Assessment, the ongoing comprehensive evaluation of air toxics in the U.S. These activities include the expansion of air toxics monitoring, improving and periodically updating emission inventories, improving national and local scale modeling, continued research on health effects and exposures to both ambient and indoor air, and the improvement of assessment tools.

- AERMOD can model the impacts for specific areas that might have concerns about sensitive or vulnerable populations.
- All sources that fail the AERSCREEN test are subject to refined modeling. Sources may choose to reduce emissions ahead of an AERMOD analysis in order to reduce modeled concentrations. This would be protective of sensitive and vulnerable populations.
- Depending on available meteorological data and source characterization, AERMOD can be completed expeditiously. AERMOD is a reliable model developed by EPA.
- AERMOD requires more resources from both the facility and the reviewing agency than AERSCREEN. However, the workload would be similar to the current criteria pollutant modeling requirements. DEQ would establish the modeling protocol and review the AERMOD results, likely performed by the facility.
- DEQ has the authority to regulate air toxics, including establishing AERMOD requirements and protocols.

Potential elements for risk assessment and modeling once higher level of analysis is triggered (AERMOD)

The following are potential elements for which DEQ and OHA are seeking additional discussion and input from the Advisory Committee. If there are additional elements not included below, please raise them.

Potential Elements
A. Include multiple air toxics in the refined analysis
B. Include cumulative risk from air toxics that are prevalent in background or from nearby sources in the refined analysis
C. Default receptor location at fenceline for all levels of analysis
D. Choose receptor locations based on acute vs chronic/carcinogenic effects (fenceline or occupied area locations)
E. Locate specific receptors at locations with sensitive populations (schools, hospitals, etc.) to collect information about community impacts
F. Require permit applicants to provide an emission inventory, dispersion model and demographic overlay in advance of or concurrent with the permit application (Based on the Minnesota PCA and New York DEC approaches)
G. Require a cumulative impact assessment and enhanced community engagement when the demographic emissions overlay shows a potential disparate impact within or adjacent to an Environmental Justice community (as defined by regionally-significant thresholds)
H. Use Risk Assessment and environmental justice guidance to define sensitive and vulnerable populations
I. Use exposure concentrations (more realistic but less conservative), rather than modeled concentrations at higher screening steps

Potential Elements	
J.	Use averaging time concentrations (for example 24-hr and annual) to compare acute and chronic RBCs, respectively
K.	Address cross-media impacts in a case-by-case process
L.	Placeholder for elements developed by advisory committee members

APPENDIX

This appendix contains OHA and DEQ’s research on other air toxics industrial permitting programs. This information was presented to the Technical Workgroup.

1. How are risk-based concentrations and modeling used in a screening approach?

The table below describes program screening approaches for the six selected programs. Where possible, the use of risk based concentrations and modeling in their approach is identified in the program description.

Program	**Program Description**
Louisville, Kentucky	For new, modified, and existing sources, a four tier set of screening steps ranging from simple to complex, is used. All results from the four tiers are compared to Benchmark Ambient Concentrations. • Tier 1: Emissions from a process or equipment are divided by a factor from Table 1: Simple Factor for Determining Maximum Ambient Concentration for each of four averaging times to derive a concentration. • Tier 2: The annual factor from Tier 1 is adjusted with another factor from a table that incorporates the distance to property line, stack height, and height of influential buildings to give the maximum ambient concentration. • Tier 3: The maximum concentration is estimated using a screening model, such as SCREEN3 and Toxics Screening Model (TSCREEN), now replaced with AERSCREEN. • Tier 4: Uses the refined model AERMOD.
New Jersey	For new and modified sources, a two level process is defined for individual equipment. • Step 1: Uses an Excel spreadsheet that requires stack information, annual and hourly emission rates, and stack distance to property line. The spreadsheet calculates concentrations and incremental cancer risk and non-carcinogenic impacts. The Level 1 assessment can be

Program	Program Description
	performed by the New Jersey Department of Environmental Protection or the applicant. If a source fails the first-level risk screening by exceeding the cancer risk guidelines for new and modified sources, a second-level risk screening will be conducted. • Step 2: Uses AERMOD as the dispersion model to do a refined analysis to more accurately estimate ambient air concentrations by using stack and source specific data and representative meteorological data. If the second-level risk screening analysis predicts air concentrations where risk falls into the “negligible” category, no further risk assessment or modification is needed. If the risk predicted by a second-level risk screening for a specific source is still not “negligible,” the New Jersey Department of Air Quality Risk Management Committee may recommend that the applicant apply better air pollution controls or change stack characteristics for better dispersion before the permit is approved. The applicant can also submit a risk minimization strategy. The Level 2 analysis can be performed by New Jersey Department of Environmental Protection or the applicant. Facilities required to conduct a facility wide risk assessment must develop a protocol which is submitted for review and approval.
New York	New York Department of Environmental Conservation established an Environmental Rating system that classifies air contaminants (A-D) according to the severity of their adverse impact on the environment, with A being worst. In addition, New York established two other tables: a table of High Toxicity Air Contaminants with corresponding Mass Emission Limits, and a Degree of Air Cleaning Required that determines the percent of emissions reductions based on the Environmental Rating and emissions levels. • Step 1: For process emissions less than the High Toxicity Air Contaminant Mass Emission Limits, no further analysis is required. The source can take an enforceable permit limit to meet this emissions requirement. If not, further analysis is necessary. • Step 2: DEC will assign an Environmental Rating to the toxic contaminant from the process emission source based on the following: o Toxicity, other properties and the emission rate potential of the air contaminant; o Location of the source with respect to residences or other sensitive environmental receptors; o Emission dispersion characteristics at or near the source; and

Program	Program Description
	o The projected maximum cumulative impact of taking into account emissions from all sources in the facility under review and the pre-existing ambient concentration of the air contaminant under review. • Step 3: If an Environmental Rating of A is assigned and the uncontrolled emissions are less than 0.1 pound/hour, or if an Environmental Rating of B or C is assigned and emissions are less than 10 pounds/hour, a dispersion model (AERSCREEN, AERMOD) is used to estimate maximum offsite concentrations. These should be less than the Annual Guideline Concentrations and Short-term Guideline Concentrations. • Step 4: If an Environmental Rating of A is assigned and emissions are equal to or greater than 0.1 pounds/hour, or if and Environmental Rating of B or C is assigned and emissions are equal to or greater than 10 pounds/hour, then the level of control is determined by a Degree of Air Cleaning table.
Rhode Island	Rhode Island Department of Environmental Management established a significant emission rate, Minimum Quantities, and Acceptable Ambient Levels. DEM requires the use of California Air Resources Board's Risk Assessment Standalone Tool to determine risk. Modeling receptors are located in residential and other sensitive areas where people gather or work. The analysis steps are: • Step 1: Sources with emissions less than the Minimum Quantities are exempt from further analysis. Facilities which emit the listed substances in quantities at or above the MQ levels are subject to the Air Toxics Operating Permit requirements in the regulation unless specifically exempted. • Step 2: AERSCREEN is used as the screening model. If model concentrations for short-term and annual emissions are equal to or less than the Acceptable Ambient Levels, the cancer risk does not exceed 100 in one million, and the chronic and acute Hazard Index does not exceed 1, then the project is approved, otherwise Step 3. • Step 3: AERMOD is used as the refined model. If the concentration and risk criteria described in Step 2 are met, then the project is approved.
South Coast Air Quality Management District (CA)	A four-tier set of screening steps are used, ranging from screening emissions level to a detailed risk assessment. • Tier 1: Uses a look up table by Toxic Air Contaminant for hourly and annual emissions from new/modified equipment for distances of 25, 50,

<table>
<tr><th>Program</th><th>Program Description</th></tr>
<tr><td></td><td>and 100 meters to the nearest receptor locations (residential, worker, sensitive receptor). The Tier 1 screening emissions are based on 1 in 1 million additional cancer risk.

Tier 2: Is a screening risk assessment that incorporates look up tables for calculating dispersion factors (x/Q). The variables used in the tables include hourly and annual emissions, stack height, building dimensions, operating schedule, geographic location (meteorology), and distance to receptors. For chronic/carcinogenic Toxic Air Contaminants, distance is to residential and sensitive receptors; for acute Toxic Air Contaminants distance is to fenceline. A risk assessment using the estimated concentrations from the tables is made with data from additional tables that include adjustments for cancer potency, and exposure variables.
Tier 3: Uses the AERSCREEN model together with modified risk estimation equations used in Tier 2.
Tier 4: Requires a detailed risk assessment be performed using the California Air Resources Board Hotspots Analysis Reporting Program model that incorporates AERMOD, which requires actual meteorological data and modeled concentrations.
</td></tr>
<tr><td>Washington</td><td>Washington Ecology established Acceptable Source Impact Levels as ambient benchmark concentrations for Toxic Air Pollutants, de minimis emission thresholds, and Small Quantity Emission Rates as screening emission rates. New and modified emission units are subject to the program. If potential emissions exceed the de minimis emission levels, then a Tier 1 review is required. Receptors are placed at the fenceline and beyond. Ecology uses a structured tier review:

Tier 1 review:

Step 1: Compares increase in Toxic Air Pollutant emissions after T-BACT is installed with the Small Quantity Emission Rate thresholds. If emissions are greater than the thresholds, then next step is required.
Step 2: Uses AERSCREEN as a screening model and compares concentrations to the Acceptable Source Impact Level. If concentrations are greater than the Acceptable Source Impact Levels, then next step is required.
Step 3: Uses AERMOD or other refined model. The analysis can account for Toxic Air Pollutant emissions

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Program	Program Description
	reductions from another emission unit at the same facility being analyzed. If concentrations greater than Acceptable Source Impact Levels, then Tier 2 is required. • Tier 2 review considers the model results from Tier 1 and requires: o A health impact assessment, o The inclusion of background concentrations from National Air Toxics Assessment or monitored values and modeled emissions from other sources within 1.5 kilometers, o Emission reductions of the Toxic Air Pollutant from other existing sources. Ecology may also consider a risk level of 10 in one million in its determination. o Ecology may recommend approval of a project that is likely to cause an exceedance of acceptable source impact levels for one or more Toxic Air Pollutants only if it determines that the emission controls for the new and modified emission units represent T-BACT and the applicant demonstrates that the increase in emissions of Toxic Air Pollutants is not likely to result in an increased cancer risk of more than one in one hundred thousand and ecology determines that the noncancer hazard is found to be acceptable. If Tier 2 review thresholds are exceeded, then Tier 3 review is required. • Tier 3 review includes a risk management analysis and considers other offsetting benefits that provide greater environmental benefit than the adverse impacts from the new project. The offsetting benefits could include reductions in Toxic Air Pollutants other than from the project.

2. What do we need to consider for types and location of modeling receptors? What have other states done?

Program	Program Description
Louisville, Kentucky	Ambient Air (Environmental Acceptability Goals are adjusted for roadways and industrial properties)

Program	Program Description
New Jersey	Fenceline (or location of highest impact not on the facility's property), nearest sensitive receptor
New York	Residential and sensitive receptor
Rhode Island	Residential and sensitive receptor
South Coast Air Quality Management District (CA)	Nearest long-term human exposure (aka "residential and sensitive")
Washington	Fenceline or highest off-site impact for Tier 1, use of receptor-specific exposure factors for Tier 2