Memo

To: Cleaner Air Oregon Regulatory Reform Advisory Committee
From: DEQ and OHA
Date: October 12, 2016
Subject: Cumulative Risks and Background

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 options for one discussion topic, with five 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 cumulative risks and background 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 public policy 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 Policy 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. (See Advisory Committee Roster)

Purpose

This discussion paper addresses the key elements of cumulative risk levels, including background air toxics levels: How should Oregon address cumulative risk, whether from multiple air toxics or from multiple industrial facilities? Should cumulative risks considered for both cancer and non-cancer risk? How should Oregon consider background, risk? Is it considered for both cancer and non-cancer risks? Should Oregon consider air toxics that can cross into other media (soil, water, fish, etc.)? Should Oregon address past (historical) exposures in the health risk assessment process?

For detailed information on the six air toxics permitting programs that DEQ and OHA researched, please see the Appendix at the end of this paper.

Background on cumulative risks and background

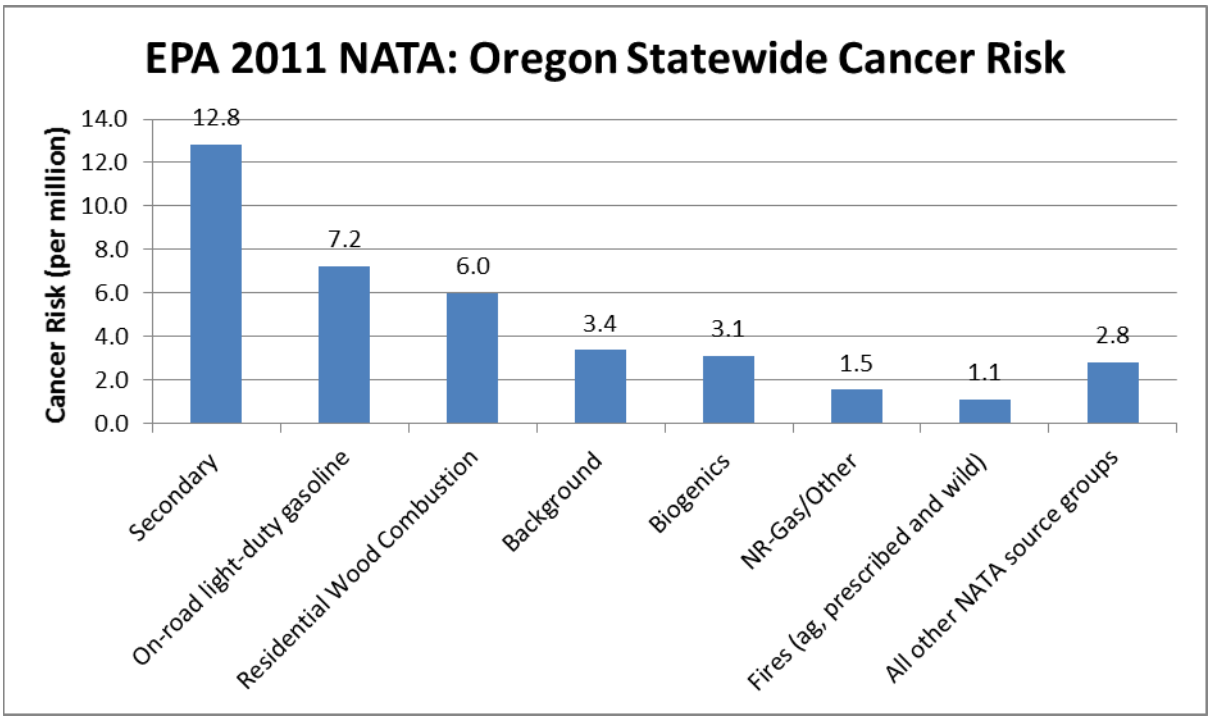
Risks related to the emissions of multiple air toxics, or to emissions of air toxics from multiple industrial facilities, are commonly discussed as cumulative risk. Air programs with risk based permitting have all needed to define what is meant by cumulative risk and whether or not the program will include the consideration of background air toxics concentrations emitted by other sources. For the purposes of this discussion, "cumulative risks" with appropriate descriptors will be used to discuss all of the forms of

cumulative risk described above. For the purposes of this discussion, "background" means ambient concentrations of air toxics emitted by all non-industrial sources of air pollution, including gasoline and diesel engines, wood burning, non-industrial fuel burning for heat and energy, air toxics from atmospheric reactions, and air toxics from regions outside the state.

The chart below shows EPA computer modeling estimates of Oregon cancer risk from air toxics in the most recent National Air Toxics Assessment. The data have several significant limitations, but are still useful to illustrate the prevalence statewide of air toxics from atmospheric formation ("secondary" category), gasoline vehicle engines ("on-road light-duty gasoline" category), and residential wood combustion. The critical limitation of this chart is the absence of diesel particulate, which EPA treats as a non-carcinogen in the NATA model. Under DEQ's diesel benchmark that is currently pending revision, estimated cancer risk from diesel particulate would be among the highest categories statewide.

This chart is based on all air toxics that EPA estimated for all areas of the state. Focusing on smaller, denser urban areas would show more risk from industrial emissions; however atmospheric formation, residential wood burning and engine emissions generally contribute significant cancer risk to all Oregon population centers. For further location specific information, the NATA mapping function is the best way to visualize the breakdown of community risk from air toxics: https://gispub.epa.gov/NATA/.

In the chart below, "background" is generally air toxics from other states and regions, "biogenics" are air toxics emitted by plants and other natural processes, "NR-Gas/Other" is non-road engine emissions, and "All other NATA source groups" are a collection of many other air toxics sources, including industrial emissions.



All six state and local programs investigated use some form of tiered health-based approach. Typically, if cumulative health risks are addressed, this does not occur in the initial screening step, but rather during the second or third step of the health-based approach, which involves the preparation of some form of human health risk assessment.

Some programs regulate each air toxic independently from all others, selecting very conservative acceptable risk levels to account for the fact that actual human exposures are complex mixtures. Other programs explicitly address cumulative risk from multiple air toxics by summing the risk from individual air toxics to approximate risk from the whole mixture. Some programs regulate facilities by regulating emissions from each facility in an area independently from any other sources of air toxics in the area. Others consider cumulative risk to neighborhoods from any or all permitted facilities within an area. Furthermore, some programs require that background air toxics risk (i.e., from sources such as motor vehicles and woodstoves) and air toxics risks from other sources near the facility in question be considered in assessing whether or not single facility risk targets are met. Some states consider cross-media (e.g., air, soil, water) exposure pathways in their assessment of risk from air toxics, while others do not. Finally, although no programs included risk that has occurred to people in the past, typically referred to as past exposure to air toxics, it was a topic of discussion at the Technical Workgroup meetings.

The five decision points for Advisory Committee consideration, included in this discussion paper are:

1. Regulate air toxics independently from each other or consider their cumulative effects;
2. Regulate facilities independently from one another or consider the cumulative risk from multiple nearby facilities on local communities;
3. Regulate facility emissions independently or consider the risk from other emissions in the community;
4. Regulate strictly based on risks from inhalation or consider multiple other routes of exposure such as soil and water; and
5. Whether and how to address past risk from exposure to air toxics.

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 on Cumulative Risk

- Require a cumulative impact assessment and enhanced community engagement when the demographic emissions overlay shows a potential disparate impact within or adjacent to a community with environmental justice concerns (as defined by regionally-significant thresholds).
- The Task Force requests that DEQ consider a comprehensive approach to addressing air toxics, beginning with clearer communication to Environmental Justice stakeholders about the relative likely cumulative risks from multiple emission sources, as well as disproportionate vulnerability to health impacts from air toxics and other social determinants of health. DEQ and OHA together have an opportunity to more accurately frame the overall risks faced by communities of color and low-income

communities, and commit to integrating efforts to address other emission sources such as diesel and wood smoke that are not covered by this rulemaking.

- Environmental Justice stakeholders have fewer resources and less capacity to participate in multiple advisory and rulemaking processes on discrete emission sources. DEQ should provide Environmental Justice stakeholders with targeted technical assistance and include them in weighing the commensurate exposure from different emission sources with the degree of clear statutory authority it has to regulate those sources. DEQ/OHA need to establish a cumulative risk assessment methodology that can be utilized here and now, even if it requires further refinement later. Ideally, 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 genuine baseline as well as potential disparate impacts.

Summary of Individual Environmental Justice Task Force Member Input on Cumulative Risk

- DEQ/OHA need to establish a cumulative risk assessment methodology that can be utilized here and now, even if it requires further refinement later. Ideally, this methodology would be triggered when a permit application is made in or adjacent to a community with environmental justice concerns community, in an effort to establish a genuine baseline as well as potential disparate impacts.
- DEQ/OHA need to establish an Oregon-specific demographic mapping overlay methodology to identify potential disparate impacts; DEQ has already done this for Portland Air Toxics Solutions, and it needn't be "proprietary" – all demographic overlays share a common approach, it's simply a matter of establishing that approach and resourcing it. There is no need to use EJSCREEN; it builds trust with community to develop our own.
- Using a cumulative risk assessment methodology, each permit should be considered in the context of whether it will disproportionately impact POC and low-income communities, whether we're dealing with criteria air pollutants (for which we have health-based National Ambient Air Quality Standards) or hazardous air pollutants (which, unfortunately, we largely only have technology-based standards).
- DEQ should place the initial burden on the permit applicant to conduct an overlay and analysis. By "internalizing" this "cost," it potentially forces permit applicants to be more considerate of and sensitive to their proposed siting/operational location, and it benefits under-resourced agencies and potentially impacted communities alike by providing them with initial analysis that can then be scrutinized and addressed. I.e., it opens the door to more meaningful participation and more equitable decision-making.
- On top of all of this, ORS 182.545 can and should be interpreted in the most liberal light so as to be maximally protective of Environmental Justice communities who are the clear intended beneficiary of the legislation. DEQ has the discretion to do so, and clearly acknowledging such an interpretation would create and foster and environment of trust.

Program Element 8: Cumulative risk from multiple air toxics from a single facility

Some programs direct the facility that is being regulated to sum the cancer and/or non-cancer health risks from multiple air toxics emitted from the facility, and to base decisions for health risks on both the risks from single chemicals and from multiple chemicals. Other programs regulate risk chemical by chemical independently.

Some programs require assessment of emissions from pieces of equipment or portions of the operation of a particular facility, as well as facility-wide consideration of risks from all air toxics emitted. Cumulative non-cancer risks at a facility are typically estimated by summing the facility-wide non-cancer risks from all emitted non-carcinogenic chemicals that affect the same human body organ or body system.

For the purposes of this discussion paper, "single source" will refer to a single facility, and not the parts of operations or pieces of equipment used in that facility.

DEQ asked the National Association of Clean Air Agencies (NACAA) how they incorporate environmental justice into their permitting programs. Several programs have laws that trigger environmental justice provisions within their permitting programs. Other programs follow defined best practices. Programs have several kinds of practices in place to identify and address cumulative impacts for facilities that might contribute to environmental justice issues. These include:

- Require the permit applicant provide information to so the agency can make a determination on whether potential adverse environmental impacts are likely to impact an environmental justice area
- For permit actions in communities with environmental justice concerns, require additional analysis such as air dispersion modeling, multipathway risk analysis, or exposure indicators such as blood lead indicators in children
- Have a process and use demographic and environmental data to identify communities with existing or potential environmental justice concerns.

Other programs do not specifically identify these areas or populations but have protective requirements built into their programs. For example, modeling and analysis are used to estimate and mitigate impacts on sensitive individuals, or factoring existing ambient concentrations or local air toxics emissions into calculations of risk and targeted risk reduction. Because of historic land use and socioeconomic patterns, some programs assume that any area near a permitted industrial facility will have environmental justice concerns.

What are EPA MACT Standards?

The EPA developed Maximum Achievable Control Technology Standards, or MACT standards, to reduce the effects of Hazardous Air Pollutants (HAPs) generated by industry.

There is a common misconception that the term "control technology" refers to expensive emission control devices, such as scrubbers, thermal oxidizers and bio-filters. In fact, the term "control technology" can actually mean measures, processes, methods, systems or techniques that are used to limit the emissions of hazardous air pollutants.

MACT standards affect sources (new and old) by making them meet specific emissions limits. These limits are based on the emissions levels already achieved by the best-performing similar facilities.

Oregon Information

Currently, Oregon implements EPA's federal industrial technology and risk-based standards (National Emission Standards for Hazardous Air Pollutants or NESHAPs) through air permits. In setting these standards, EPA generally considered industrial air toxics emissions from large and small sources with the most potential to impact public health, and set standards to reduce emissions based on the top 12% of best performing sources (Maximum Achievable Control Technology for large sources, Generally Achievable Control Technology for small sources). EPA was then required to evaluate the residual risks remaining after the application of MACT standards and determine if additional standards are needed to reduce residual risk and protect people nearby within a range of acceptable risk, revising the MACT standards as necessary.

In most cases the NESHAPs identify and seek to control key or "risk driver" air toxics and the most significant industrial process

contributors to those air toxics. In some NESHAP regulations, all air toxics from a category may be controlled, but in others there can be gaps in addressing all air toxics from a source. For example a NESHAP may focus on controlling a very toxic form of metal in a painting operation, but not address the volatile compounds in the paint solvents.

To supplement the NESHAP emission reductions, the Air Toxics Safety Net Program (OAR 340-246-0190 through 0230) seeks to quantify and reduce individual industrial air toxic emissions to the goal of less than 1 in 1 million persons developing cancer or a hazard quotient of 1. There are many steps in the process, including gathering a year of monitoring data, risk assessment, and determination and use of best available retrofit technology. This part of DEQ's air toxics program was intended to apply case by case, and since air toxics benchmark adoption in 2006, has never been used. However, the Safety Net Program addresses all emissions of air toxics from a facility one air toxic at a time.

Oregon's air toxics benchmarks help DEQ identify, evaluate and address air toxics problems. Oregon air toxics benchmarks are based on concentration levels that would result in a cancer risk of one-in-a-million additional cancers based on a lifetime of exposure. For non-carcinogens, the benchmarks are levels you could breathe for a lifetime without any non-cancer health effects

Summary of Technical Workgroup Input

- South Coast Air Quality Management District (CA) risk assessments look at all toxics identified, not single air toxics unless there is only one emitted.
- Consider using an approach in the screening process, such as a significant emission rate or de minimis threshold, that takes into account multiple chemicals.
- Synergistic and antagonistic effects: Synergy is when the toxicity of the overall mixture is greater than would be predicted by the sum of the toxicities of the individual air toxics. Antagonism is when the toxicity of the overall mixture is less than predicted by summing the toxicities of individual air toxics in the mixture. Because science is lacking to address synergy and antagonism in a quantitative way, air toxics are evaluated one by one and then summed. Risk assessments typically assume additivity, meaning that the toxicity of the overall mixture is assumed to be equal to the sum of the toxicities of the individual air toxics in the mixture.
- Southwest Clean Air Agency in Vancouver, WA looks at all air toxics from a new facility but does not sum the risk from multiple air toxics; instead, conservatism is built into the individual health risk-based screening numbers by making the screening numbers lower and triggering evaluation more often.
- In CA and at EPA, risk assessment for non-cancer risk is evaluated differently than for cancer risks:
    - Cancer risk: Theoretically, exposure to even one molecule of a carcinogen causes an unknown amount of cancer risk but this potential risk increases as exposure time increases. Therefore, carcinogenic risks are added together. EPA looks at exposures for 70 years for cancer effects, assuming someone lives in one location on their porch breathing ambient air for 70 years. This is considered to be health protective.
    - Non-cancer risk: With non-carcinogens, there are exposure levels below which there is no measurable impact. For non-cancer effects, EPA has target-organ specific hazard indices for some air toxics because some of the different air toxics affect the same organ. EPA looks at exposures for 20-30 years. For example, in evaluating multiple non-carcinogens, there would be separate non-cancer risk levels expressed for effects like neurological or respiratory damage.

- From a toxicological perspective, it makes the most sense to add the non-cancer risks for a particular organ, rather than to add all of the non-cancer risks together, because the non-cancer effects are organ or system specific.
- Washington considers emissions from individual pieces of equipment that are being installed or modified. If an existing facility modifies or installs only one piece of equipment, then they evaluate the increased risks posed by that unit. For a new facility with multiple units, they evaluate the ambient impact from all the equipment together by air toxic for screening. If required to go beyond the screening approach, then they sum the risks from the air toxics and equipment.

Summary of considerations for cumulative risk from multiple air toxics from a single source

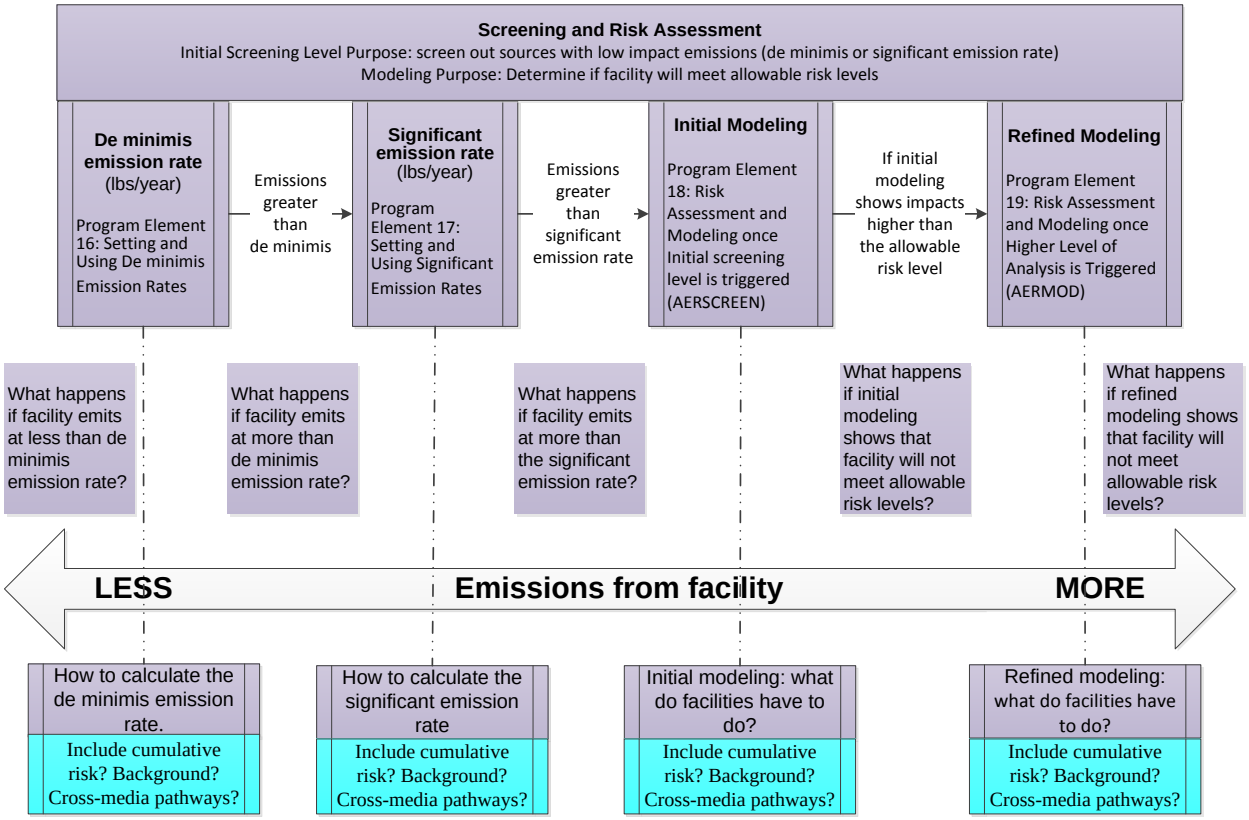
This is preliminary information DEQ and OHA have gathered in discussions with the Technical Workgroup, the Environmental Justice Task Force, public comment, and from experience in the air program. This information should be considered the starting point for further Advisory Committee discussion and input.

- Including cumulative risk from multiple air toxics from a single source in the permitting program:
    - Is more protective of human health, sensitive populations, and overburdened communities than not including it, and better represents the air people are actually breathing;
    - Recognizes the disproportionate burden of exposure experienced by communities with environmental justice concerns;
    - Will likely result in a higher cost of compliance for some permittees, as they will need to learn the process and the inclusion of multiple air toxics could result in requirements for control technologies;
    - Will increase DEQ workload negligibly for permit review, but might require more technical assistance as permittees learn the process.
- If cumulative effects are included, cancer risk from individual chemicals should be summed, while non-cancer risks from multiple chemicals affecting the same organ should be summed
- If a screening step shows that none of the individual air toxics from a facility exceed cancer risk or non-cancer risk targets for individual air toxics, it is still possible that once the individual risks are summed, the total risk may exceed risk levels. Identify a way to either address this issue at the screening step or to make sure it is considered later in the risk assessment process. It would be equitable to require facilities emitting smaller amounts of multiple air toxics that may add up to unacceptable risk to assess their emissions the same as facilities that only emit one or two pollutants in larger quantities to see if regulatory actions are triggered.
- It is not feasible to include synergistic or antagonistic effects at this point in time because the science behind chemicals that have synergistic or antagonistic effects is not developed enough to allow anything but educated guesses about the risk related to these effects. Therefore, although synergistic and antagonistic effects of air toxics may be occurring, there is no way at this time to actually quantify (assign a numerical risk value to) the related risks.
- DEQ has the authority to regulate cumulative risk from multiple air toxics from a single source

Potential elements for cumulative risk from multiple air toxics from a single source

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 if cumulative risk from multiple air toxics from a single source is included, the permitting program could address cumulative risk many different ways. It could be included in an early screening step or at a later step in the risk assessment process. These elements are discussed in the "Screening and Risk Assessment" and the "Setting Risk Based Concentrations" discussion paper. A diagram of potential screening steps is also included below for explanatory purposes:



Potential Elements
A. Sum the individual cancer risks for multiple air toxics from a single source to estimate cumulative cancer risk
B. Sum the organ-specific risks for multiple non-carcinogen air toxics from a single source
C. Do not include assessment of cumulative risks from multiple air toxics
D. Placeholder for elements developed by Advisory Committee members

Program Element 9: Cumulative risk from multiple sources within an area

Some communities have air quality impacts from multiple industrial facilities. Different programs approach cumulative risk from multiple industrial facilities within an area in different ways. Out of the six air toxics programs reviewed in depth, Washington's program requires facilities to consider background risk in their permit, and one of the ways they are allowed to estimate background is by modeling emissions from other industrial sources emitting the same air toxics within 1.5 kilometer radius. New York incorporates cumulative risk from multiple sources in the area in the calculation of maximum allowable off-site impact. Rhode Island does not consider cumulative risk from multiple sources in an area.

Cumulative risk from multiple sources could be included in several different program elements. See the discussion paper on "Setting and Administering Acceptable Risk Levels."

The input from the Environmental Justice Task Force on page 4 regarding environmental justice, also applies to cumulative risk from multiple sources within an area.

Oregon information

Oregon DEQ addresses cumulative risk from multiple sources within an area using the Geographic Approach, which supplements the NESHAP emission reductions. The Geographic Program (OAR 340-246 0130 through 0170) is currently the primary existing strategy to address multiple air toxics. Using this approach, DEQ uses modeling information to identify airsheds statewide with air toxics posing the greatest potential risk to public health. DEQ then evaluates risk using a comprehensive model of all emissions, including mobile, non-road, area and point sources, identifies the highest risk emissions, and with local stakeholders develops a plan to reduce those emissions to benchmark goals. DEQ has undertaken this strategy only once in the Portland Air Toxics Assessment. Oregon delineates the boundaries of an air toxics geographic area by looking at the extent of development, topography that affects air pollution concentrations, areas of impact and influence, and other boundaries such as preexisting pollution control areas and geopolitical boundaries. In the Portland geographic area, the impacts from an industrial source of air toxics do not extend to the entire region.

Summary of Technical Workgroup input

- Addressing cumulative impacts from multiple sources in the final decision on permit issuance is not specified in Washington's rule, which causes confusion. The rule only specifies the threshold or the significant emission rate for the increased risk posed by the new or modified source of toxic air pollutants. The rules specify that other sources of toxic air pollutants in an area must be considered using these methods:
    - A modeling approach that considers sources that emit that air toxic in 1.5-mile radius;
    - EPA's National Air Toxics Assessment census block;
    - Monitoring, which has not been used to date.
- Individual air toxics from multiple facilities may be just under the significant emission rate but when the contribution from many release points are added up, the total is over. DEQ and OHA could use EPA's spreadsheet tool called Total Risk and Exposure (TREX) to add up all air toxics to see if they are below a combined threshold.

- To model everything within a certain distance in order to include the cumulative health risk from nearby sources, DEQ needs a good emissions inventory.
- South Coast Air Quality Management District (CA) treats cumulative risk different for new and existing sources. They have done a study similar to the National Air Toxics Assessment called Multiple Air Toxics Exposure Study that uses more local monitoring data and more refined emission estimates. The average risk is 900 in one million for cancer risk. The data is used as an informational tool, not a permitting tool. For new sources, they don't look at cumulative risk except as required by the California Environmental Quality Act.
- Fugitive emissions are very hard to quantify if they need to be included in any modeling exercise. The best way to quantify fugitives is through monitoring. You can use both modeling and monitoring to estimate fugitive emissions and to craft mitigation to reduce air toxics exposures.

Summary of considerations for cumulative risk from multiple sources within an area

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 information should be considered the starting point for further Advisory Committee discussion and input.

- Including cumulative risk from nearby industrial facilities in the permitting program:
    - Is more protective of human health, sensitive populations, and overburdened communities than not including it, and better represents the air people are actually breathing;
    - Is important for communities with environmental justice concerns;
    - Will likely result in a higher cost of compliance for some permittees, in both workload as permittees learn the process and because including air toxics from multiple facilities could result in more requirements for control technologies;
    - Will increase the workload for DEQ for identifying and sharing emissions from nearby sources, permit review, and more technical assistance as permittees learn the process.
- If cumulative effects are included, cancer risk from individual chemicals should be summed, while non-cancer risk from multiple chemicals affecting the same organ should be summed
- If cumulative risk from multiple industrial facilities in an area is to be considered, it is very important to have accurate emission inventory data for all of the industrial facilities in the area.
- There are technical challenges with using monitoring as a way to assess cumulative risks from multiple industrial facilities because monitoring can't differentiate air toxics from industrial facilities versus non-permitted area or mobile sources.
- There may be fairness issues related to land use. A source located in an industrial area might have to include more nearby industrial facilities in permitting than one that is in a remote location with no nearby industry. This could result in more requirements for control technologies and an increase in cost of compliance for some facilities but not others.
- Having prescriptive distances for calculating cumulative risk from nearby sources provides more certainty and reduces workload for permittees and DEQ, but may have the disadvantage of not addressing a variety of situations. For example, a set distance might not adequately characterize cumulative risk from sources that are outside the set distance with high stacks and greater dispersion.

Potential elements for cumulative risk from multiple sources within an area

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

Please note that if cumulative risk from multiple sources is included, the permitting program could address this in many different ways. It could be included in an early screening step or at a later step in risk assessment. These elements are discussed in the "Screening and Risk Assessment" discussion paper.

Potential Elements
A. Include industrial facilities within a set distance (for example, WA uses 1.5 km)
B. Include facilities nearby – determined on a case-by-case basis
C. Use monitoring to try to determine contributions from other industrial facilities in an area
D. Do not include nearby industrial facilities
E. Placeholder for elements developed by Advisory Committee members

Program Element 10: Use of Background Concentrations in the Assessment of Risk

As related to air quality, background air toxics levels can be used to describe the monitored or estimated concentrations of pollutants that are already present in the air, apart from any emissions from industrial facilities. This strategy pertains to ambient levels of air toxics not associated with any of the sources explicitly included in the modeling analysis (definition from Maine). In some states, background levels not associated with permitted facilities are established for each regulated air toxic and averaging period being assessed. These values are added to modeled impacts to obtain total impacts, which are then compared with applicable ambient air quality standards.

The Washington program requires that background concentrations of toxics be considered along with assessment of potential health risks related to facility emissions in the second tier of their risk-based program. Recent additions to the New York rules stipulate that the National Air Toxics Assessment data be used to identify background air toxics risks in the ambient air and considered along with potential risks related to facility emissions.

The input from the Environmental Justice Task Force on page 4 regarding environmental justice, also applies to the use of background concentrations in the assessment of risk.

Oregon Information

Oregon has ambient air toxics data from two sources: monitoring and modeling. Both have distinct limitations in use for cumulative effects analysis.

Monitoring: DEQ performs air toxics monitoring statewide, focusing on communities and areas that are likely to experience higher levels of air toxics. Historically, funding for air toxics monitoring has been low, making comprehensive data collection difficult. DEQ has requested additional funding in the 2017 legislative session. Current summaries of air toxics data are available in DEQ's annual data summary

starting on page 71 http://www.deq.state.or.us/aq/forms/aqdatasum2014.pdf . If a facility is located in a community where DEQ monitors for air toxics, ambient air toxics data may be available for a cumulative impacts analysis.

Modeling: DEQ has the National Air Toxics Assessment (NATA) data covering census tracts statewide. NATA is screening level data based on 2011 emissions, and includes all sources of air toxics for 180 pollutants. NATA uses a hybrid modeling approach combining a model that is more accurate for point sources with a model that performs well for area and mobile sources. In the Portland area, DEQ has performed a more refined modeling assessment for 19 air toxics with emissions projected for the year 2017. The Portland Air Toxics Assessment completed in 2011 provides more current projected data but has limited data for industrial facilities because of the smaller set of pollutants studied and also the use of a general purpose model not specifically designed to estimate point source emissions.

Summary of Technical Workgroup Input

This section paraphrases comments made by individual members of the Technical Workgroup on the topic of cumulative risk from background air in an area. This discussion mainly focused on the best way to estimate/measure background concentrations of air toxics. The two main methods are monitoring or modeling. Each has advantages and disadvantages and these are the focus of the Technical Workgroup below. Some of the points from the workgroup presented here were also relevant to the discussion on cumulative risk from multiple industrial facilities in an area and are presented in that section as well.

- A good inventory is needed when modeling all air toxics sources within a certain distance. When evaluating cumulative risk from background, one option is to build that into the risk based concentration value by dividing it by some factor (for example 10 or 20) to allow room for risk contributions from other unknown or unquantified sources.
- Monitoring data is excellent to calculate background air toxics concentrations, but it is very costly and time consuming. Care should be taken to avoid double counting monitored and modeled pollutants. Some states use highest monitored value as background but toxics are a very local issue. There is a lot of uncertainty in this so DEQ should build it into the de minimis or significant emission rate rather than trying to model all sources.
- Fugitive emissions are very hard to quantify if they need to be included in any modeling exercise. The best way to address fugitives is through monitoring. You can use both modeling and monitoring to estimate fugitive emissions, and to craft mitigation plans to reduce air toxics exposures.
- Unless the background concentrations somehow factor into the regulatory decisions, then it may not be too important to focus a lot of resources on determining these risks. If it is included, then estimating background concentrations can be difficult to obtain with very sparse monitoring data.
- Traffic related air toxics may be the biggest concern in an area. Oregon may want to consider concentrations from non-stationary (traffic) sources.

Summary of considerations for use of background concentrations in the assessment of risk

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 information should be considered the starting point for further Advisory Committee discussion and input.

- Including contributions from sources beyond the permitted facility in a geographically defined region in the permitting program:
    - Is more protective of human health, sensitive populations, and overburdened communities than not including it, and better represents the air which people actually breathe;
    - Is important for communities with environmental justice concerns;
    - Will likely result in a higher cost of compliance for some permittees, in both workload as permittees learn the process and because including air toxics from background concentrations could result in more requirements for control technologies;
    - Could increase the workload for either DEQ or for permittees for estimating background concentrations.
- The Technical Workgroup emphasized that collection of real-time data to accurately determine area-wide background air toxics risk would likely be very difficult and resource-intensive. Obtaining credible ambient air data could require a broad and comprehensive monitoring system or modeling approach.
- The NATA data for air toxics could be used to estimate background levels of air toxics around a particular facility, as New York does.
- Any estimate of background air toxics concentrations will include uncertainty, whether it is based on modeling or monitoring.
- There may be more accuracy, efficiency, and consistency if DEQ calculates all background concentration levels.

Potential elements for use of community/ambient concentrations in the assessment of risk

The following are potential elements that DEQ and OHA want the Advisory Committee to discuss. If there are additional elements not included below, please raise them.

Please note that if consideration of community air toxics concentrations is included, the permitting program could address this in many different ways. It could be included in an early screening step or at a later step in risk assessment. These elements are discussed in the "Screening and Risk Assessment" discussion paper.

Potential Elements
A. Calculate background levels using National Air Toxics Assessment data
B. Calculate background levels using monitoring data if available
C. Calculate background levels using local model if available (e.g., Portland Air Toxics Assessment)
D. Calculate background levels by modeling sources within 1.5 km
E. Do not include consideration of background levels
F. Placeholder for elements developed by Advisory Committee members

Program Element 11: Cross-media exposure pathways

Cross-media exposure pathways refer to air toxics that settle onto other environmental media such as soil or water. Once in another medium, people can be exposed to that chemical through pathways other than inhalations (e.g., drinking the contaminated water, eating fish with bio accumulated toxics, handling soil where air toxics have settled, etc.). Some state programs require or allow the assessment of multiple pathways risks, which means that exposure to a chemical through more than one exposure pathway is quantified, and the multiple pathway results are reviewed in total to determine whether adverse health risks (cancer risks or non-cancer risks) are occurring. Some states build an additional safety factor into risk based concentrations for air toxics to account for this cross-media migration for air toxics that have this potential. However, most state and local programs OHA and DEQ reviewed (Louisville, New York, Rhode Island, and South Coast) do not account for cross-media exposure pathways until later steps in the permitting process such as a risk assessment.

The input from the Environmental Justice Task Force on page 4 regarding environmental justice, also applies to cross-media exposure pathways.

Oregon Information

To date, Oregon's air toxics program has addressed cross-media exposure pathways only in setting the ambient benchmark concentrations for mercury, which includes consideration of exposure to methylmercury; for polychlorinated biphenyls (PCBs); and for dioxins and furans. Oregon's Air Toxics Science Advisory Committee originally performed calculations for these three groups of compounds because of potential cross-media impacts to soil, water, and fish, and the resulting risks to human health from multiple pathways of exposure. The resulting Ambient Benchmark Concentrations identified for these three groups of compounds were protective of potential impacts to human health from media other than air. It was therefore determined that no additional modifications needed to be made to the Ambient Benchmark Concentrations to account for these cross-media exposure pathways. In some of DEQ's water quality standards there is an additional protective factor applied to protect against potential inhalation or soil contact pathways.

Summary of Technical Workgroup input

- DEQ should consider multi-pathway exposures, ecological effects and risks especially for vulnerable populations, at least qualitatively in their assessments. EPA considers these analyses in their residual risk determinations after a National Emission Standard for Hazardous Air Pollutants is implemented.
- One challenge with evaluating cumulative risk from cross-media pathways is that chemicals often have different health effects and different target organs depending on whether they are swallowed or inhaled. That makes it difficult in some cases to add up the risk across exposure pathways.
- A recommendation was made to include persistent and bioaccumulative toxics in the list of air toxics.
- Washington only looks at inhalation during the initial screening step, but considers other pathways of exposure during subsequent tiers of analysis, which makes it difficult to address other media without having the specific expertise available. The Washington State Environmental Policy Act requires applicants to document what they are doing and how will it affect all aspects of the environment. The resulting document is circulated to agencies around the state to help inform others about multimedia impacts.

- From an environmental justice perspective, it may be important to consider cumulative exposures that occur from various exposure pathways, such as groundwater pollution, exposure to gases and chemicals in contaminated soil, and air pollution.
- In California, different media are governed by different agencies, so it's hard to look comprehensively at cumulative risk from different pathways, which are handled by different agencies. South Coast Air Quality Management District performs a full multi-pathway assessment every time a risk assessment is done for new or existing sources. Total Risk Integrated Methodology (TRIM) is EPA's model that evaluates multipathway chemical fate, transport, exposure and risk. It establishes de minimis emission levels based on ingestion, consumption, etc.
- Pollution prevention looks at multiple kinds of cross-media impacts. In the so-called "toxic soup," there are so many other factors to consider besides the air toxics emitted from facilities, such as the food we eat and the water that we drink.

Summary of considerations for cross-media exposure pathways

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 information should be considered the starting point for further Advisory Committee discussion and input.

- Including cross-media impacts in the permitting program:
    - Is more protective of human health, sensitive populations, and overburdened communities than not including it, and better represents the air that people actually breathe;
    - Is important for communities with environmental justice concerns;
    - Will likely result in a higher cost of compliance for some permittees, in both workload as permittees learn the process and because including air toxics from cross-media exposure pathways could result in more requirements for control technologies;
    - Could increase the workload for DEQ to evaluate cross-media exposure pathways.
- Certain air toxics can cause potential adverse health risk in other environmental media besides air. Particulates carried in air can deposit on soils and surface waters, and bioaccumulative air toxics distributed this way can end up in fish tissue and other animal tissue, eventually being consumed by humans, and by animals higher up the food chain.
- Air toxics identified thus far by the Oregon program as having potential cross-media effects include mercury, polychlorinated biphenyls (PCBs), and dioxins and furans. If additional cross-media information for other compounds becomes available, Oregon's Air Toxics Science Advisory Committee, or DEQ can take this under consideration to insure that risk based concentrations protect for all likely media impacts.
- Consistent and accurate assessment of cross-media impacts due to air toxics is hard to accomplish, primarily due to the fact that different environmental media tend to be regulated by different environmental programs. It has been difficult in other state programs to integrate the information from different environmental programs in order to address real-world cross-media impacts.

Potential elements for cross-media exposure pathways

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

Please note that if cumulative risk from cross-media exposure pathways is included, the permitting program could address this in many different ways. It could be included in an early screening step or at a later step in risk assessment. These elements are discussed in the "Screening and Risk Assessment" discussion paper.

Potential Elements
A. Include bioaccumulative, persistent chemicals
B. Include cross-media considerations for all chemicals
C. Analyze potential for cross-media impacts chemical by chemical
D. Do not include cross-media impacts
E. Placeholder for elements developed by Advisory Committee members

Program Element 12: Past exposure to air toxics

Individuals' past exposure to air toxics is a topic that was brought up at the Technical Workgroup meetings in June and July, 2016. None of the six programs reviewed directly address past exposure. Although the members of the Technical Workgroup acknowledged this issue as a concern, they also pointed out that there is no known way to quantify risks that have occurred in the past.

Oregon Information

To date, Oregon's air program has not addressed past risk as part of permitting for industrial facilities.

In some very specific cases for Portland art glass facilities, OHA is addressing public health risks from exposure to past conditions in their public health assessment. OHA does not generally do public health assessments for operating industrial facilities. OHA is doing this work in these specific cases because there was existing air monitoring data that was representative of past conditions. Typically, there are no environmental sampling data that are representative of past exposures conditions at operating industrial facilities. With these data, a public health assessment that addresses past exposure is not possible.

Summary of Technical Workgroup Input

- It is possible to consider cumulative risk through time by doing risk assessments with the best information available at the time. Historical exposure is real to the population but difficult to quantify what the impacts are. Sometimes we have to acknowledge that there are previous exposures that we don't know how to quantify. One option in a risk assessment is to discuss retrospective risk qualitatively in the uncertainty section.
- How can Oregon take retrospective risk into account? Through litigation and looking at responsible parties? How much risk is assigned to each facility? Litigation is not best way, but has developed some sophisticated analyses which can help.

- Academic longitudinal epidemiological studies are used to inform the regulatory approach and risk assessments in CA. There is not a direct connection to permitting. These involve following what people's actual exposures were. These require a lot of research and resources.

Summary of considerations for past exposures

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

- It is difficult to quantify past risk.
- No other program investigated addresses past risk in their air permitting program, either for air toxics or criteria pollutants.

Potential elements for past exposure

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

Potential Elements
A. Acknowledge there are previous exposures that we may not technically be able to quantify
B. Discuss past exposure to air toxics qualitatively in the uncertainty section of a risk assessment
C. Do not address past exposures to air toxics
D. Placeholder for elements developed by Advisory Committee members

APPENDIX

1. How do other states account for risks from multiple air toxics, multiple sources, background, or cross-media pathways?

Many programs prioritize their permitted facilities in order to determine which facilities must go through all steps of a tiered process. The New York program assigns environmental ratings to individual air contaminants being emitted, after certain facility characteristics are first considered, such as proximity of facility to residences or other sensitive environmental receptors and existing ambient concentrations of the air toxics under review. South Coast Air Quality Management District (CA) prioritizes their permitted facilities and assigns them levels of either high-priority, interim-priority, or exempt; only the high-priority sites are required to perform a (human) health risk assessment. The Rhode Island program also prioritizes their permitted facilities based on emissions concentrations and other considerations, such as concerns about odors or health impacts; proximity of facility to other sources of air emissions, residential areas, schools, and other sensitive receptors; and consideration of elevated short-term emissions of an air toxic.

Program	**Program Description**
Louisville, Kentucky	Protection of both human health and the environment is encompassed in the Strategic Air Toxics Reduction program-related regulations. When the STAR program recommends application of best available technology for air toxics, which they refer to as T-BAT, it is stated that T-BAT must take into account "energy, environmental, and economic impacts and other costs, and health and welfare benefits." Their regulatory definition of welfare states "when referring to effects on welfare, includes, but is not limited to, effects on soils, water, crops, vegetation, man-made materials, animals, wildlife, weather, visibility, and climate, damage to and deterioration of property, and hazards to transportation, as well as effects on economic values and on personal comfort and well-being, whether caused by transformation, conversion, or combination with other air pollutants." Summation of cancer risks are addressed based on Environmental Acceptability Goal values of 7.5 in one million for cancer risks from all processes or process equipment from a single existing stationary source or 3.8 in one million for a new stationary source. Target-organ-specific Hazard Index analysis is required for any request to modify the Environmental Acceptability Goal for a noncarcinogen.
New Jersey	Generally, multiple source modeling is only done when determining compliance with a National Ambient Air Quality Standard (NAAQS).
New York	The computer program called AG-1 is used as primary tool to implement ambient impact analyses required for all new or modified sources of air contaminants, and includes assessment of cumulative source impacts (also referred to as multiple point source impacts) by separating sources properly, rather than adding maximum results from each source. 6 NYCRR (New York

Program	Program Description
	Codes Rules and Regulations) Part 212 also applies to existing sources upon issuance of a renewal for an existing permit or registration. Proximity of facility to residences or other sensitive environmental receptors, including consideration of area's anticipated growth and projected maximum cumulative impacts; and taking into account emissions from all sources at facility under review and the pre-existing ambient concentration of the air contaminant under review (background) will be considered in setting an environmental rating for the facility. Note that environmental ratings are assigned to individual air contaminants. Annual guideline concentrations, used as screening values, are protective of the environment and public health. Originally, background concentrations were assumed to be insignificant or zero for non-criteria pollutants, due to uncertainty associated with establishing credible, non-industrial background concentrations for non-criteria pollutants. However, as part of pending new rules, National Air Toxics Assessment will be used to identify background concentrations of non-criteria pollutants. Odor detection values can be used to evaluate acceptable short-term impacts in a qualitative way only (not a quantitative way, due to uncertainty associated with odor data collection).
Rhode Island	New sources applying for permits must perform a multiple pathway Human Health Risk Assessment utilizing CalEPA's Risk Assessment Standalone Tool. Residents, non-resident sensitive populations, and maximally impacted workplaces must be assessed. Existing sources are included per Air Pollution Control Regulation No. 9. Cumulative effects of emissions of two or more air toxics that affect same organ system (i.e., indicates non-cancer effects) may be unacceptable even if Ambient Air Levels for the individual substances are not exceeded. Total cancer risk related to facility emissions impact to Maximally Exposed Individual and other receptors cannot exceed 100 in one million (10^{-4} risk). During facility prioritization process, consideration of other factors may shift a source to a higher priority position. Such other factors can include: concerns about odors or health impacts; proximity to other sources of air emissions or to residential areas, schools, sensitive receptors; elevated short-term emissions of a substance with a 1-hour or 24-hour Ambient Air Levels.
South Coast Air Quality Management District (CA)	Considers cumulative risk from multiple chemicals coming from single source as part of Tier 1 screening emission levels. (Rule 1401 & 212 – new and modified sources). Multiple pathways adjustment factors are used during calculation of risks and hazards in the Tier 2 step (1401 & 212 – new and modified sources). No evidence that ecological risk or secondary effects are considered in the risk assessment process. It also does not appear that they consider airshed-wide

Program	Program Description
	risk, although in some cases background risks related to criteria pollutants are used in conjunction with facility risks to make decisions about respiratory health effects. Rule 1402 has goal of reducing health risks related to emissions of Toxic Air Contaminants from existing sources by specifying limits for maximum individual cancer risk, cancer burden, and noncancer acute and chronic (8-hr and chronic) Hazard Index applicable total facility emissions and requiring risk reduction plans to achieve specified risk limits. Risk reduction is required for any facility that exceeds action risk levels.
Washington	Background concentrations of Toxic Air Pollutants will be considered as part of Second-Tier review (i.e., a Health Impact Assessment). WAC 173-460-090 states that the Health Impact Assessment will use existing data and characterize risks, including existing Toxic Air Pollutant sources in the area, and anticipated risk from new source. The rule specifies that background can be determined in one of three ways: The latest National Air Toxics Assessment concentration at the appropriate census tract Ambient monitoring data for the project's location (note: this is not practical or ever considered unless it was located near the only National Air Toxics Trends Station site in the state) Modeling of emissions of the Toxic Air Pollutants subject to second tier review from all stationary sources with 1.5 kilometers of the source location. The rule does not specify how a consideration of the background concentrations may affect the final decision/acceptable risk. Health Impact Assessments must include additive cancer risk for all carcinogenic Toxic Air Pollutants which may be emitted by the source. Although not directly related to the assessment of cumulative risk, the first step involves comparing each Toxic Air Pollutant emission rate to its respective de minimis levels.