Attachment 1 Louisville Chemistry Partnership, Inc. Comments

Data from Historical Studies and Screening Risk Assessment for Air Toxics

Commonwealth of Kentucky
Toxic Air Pollutant Workgroup
December 2, 2004

Introduction

Table of Contents

Revisions for January 26, 2005 Work Group Meeting
"Data from Historical Studies and Screening Risk Assessment for Air Toxics"

Section

Introduction

Replace 'Introduction' (2nd bullet revised)

Calvert City

Replace 'Page 1 of 6', 'Page 2 of 6', and 'Page 3 of 6' (benzene and carbon disulfide values for 1991 corrected, maximum value for benzene corrected, values greater than risk thresholds are now bold text)

Replace color charts (2002 and 2003 data from monitoring locations now shown in separate charts from pre-1999 data. Benzene and carbon disulfide values for 1991 corrected)

Tri-State

Replace all eight pages of data (values greater than one in a million and hazard of 1.0 now bold text)

Introduction

This document presents a collection of air toxics monitoring data gathered by the Kentucky Division for Air Quality and the federal Environmental Protection Agency (EPA) from the late 1980s to the present. It has been assimilated into this document to assist the Commonwealth of Kentucky Air Toxic Pollutants Workgroup in its evaluation of Kentucky air quality and whether additional regulatory measures should be taken.

In an effort to better characterize historic and current statewide air toxic levels, the Department for Environmental Protection has compiled the data and has conducted a risk assessment based on current risk analysis methodologies. Risk assessment is used by U.S. EPA and states for screening and prioritizing sites, evaluating health risks often using protective default exposure factors, and setting goals for cleanup. It is important to note that neither this data nor the risk assessments conducted on this data have been peer reviewed or otherwise quality controlled. Moreover, calculating risk is a dynamic science and air quality is an ever changing variable.

Preliminary assessments indicate that:

- Relative risk screening conducted by U.S. EPA Region 4 indicates that counties that contain large urban centers rank highest, with the combination of population density, potential emissions of chemicals and disease patterns playing a significant role in the total score. It is a screening tool and is <u>not</u> intended to indicate a cause-effect relationship. Based on this study, further studies should be conducted of health impacts from air pollutants in counties in Kentucky with urban centers and large industries.
- Historical toxic air pollutant monitoring data in Kentucky reflects levels that exceed the presumed target risk screening level, in all monitored areas of Kentucky, whether urban or rural, industrial or agricultural. The target risk screening levels of one excess cancer risk in a million and a hazard index of one are commonly used in risk assessment as a screening tool and to focus additional study based on site-specific conditions. These preliminary findings indicate that the target risk levels should not be used as the only criterion for regulatory purposes.
- Monitoring in rural and urban areas also indicates risks above the presumed target risk screening level both in areas of industrial activity and also in areas where little or no industrial activity has occurred. Risk results are similar in rural and urban trends sites with some chemicals being higher in rural samples (metals and carbon tetrachloride, in particular), while others are higher in urban areas. Most of the data appears to be related to general human activity (transportation, ambient conditions) with some impacts from specific industrial activity. Among the volatile organic compounds, benzene is found most frequently.
- When compared with average risks for other cities in U.S. EPA Region 4 and the United States, the upper-bound average risks for Kentucky urban areas are similar to those for other cities.

In general, air quality in Kentucky is improving. This trend is consistent with national air quality trends complied by the federal EPA (http://www.epa.gov/airtrends/reports.html). The majority of trends data compiled to date address the improving air quality from the standpoint of the criteria pollutants of nitrogen dioxide (NO2), ozone (O3), sulfur dioxide (SO2), particulate matter (PM), carbon monoxide (CO), and lead (Pb). These are the pollutants which clinical studies have determined cause respiratory, cardiac and neurological diseases. In response the federal EPA has set health-based ambient air quality standards.

With regard to toxic air pollutants, the federal government has not set regulatory ambient air standards but has first chosen to address them by implementing Maximum Achievable Control Technology (MACT) standards to reduce the amount of toxic air pollutants that are emitted to the atmosphere. The second phase of this program is intended to address the residual risk factor; however, EPA has encountered significant delays and has made very limited progress in the development of regulations to protect the public health from the residual risk posed by ambient levels of hazardous air pollutants after compliance with MACT standards. EPPC is of the opinion that the public interest would be served by the development of a state regulatory program that identifies ambient levels of toxic air pollutants that are consistent with protection of health-related values and establishes clear-cut implementation procedures. Despite this lack of numerical standards, a downward trend in the levels of these pollutants has been realized over the years. This improvement can be seen in the air toxics data depicted in this document.

Nonetheless, the Cabinet takes seriously its responsibility to obtain and evaluate data and respond appropriately to protect public health and the environment of the Commonwealth and to conduct the public's business in a public way. The formation of this workgroup is one step to accomplishing our mission and these objectives.

BACKGROUND

EPA defines air toxics as any air pollutant (other than the criteria pollutants) that has the potential to cause adverse impacts to human health or the environment. Sources of toxic air pollutants can include those from industrial, mobile, indoor and natural sources. EPA's Toxic Substance Control Act (TSCA) Inventory has over 75,000 chemicals listed, many of which can be air toxics. The Toxics Release Inventory part of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPRCA) has 677 chemicals listed, most of which can be air toxics.

Hazardous Air Pollutants (HAPs) are pollutants or groups of pollutants that EPA knows or suspects to cause cancer or other serious human health effects or to have adverse environmental effects. Section 112(b) of the Clean Air Act initially listed 188 HAPS targeted by EPA for reductions in releases to air. These 188 HAPs are sometimes referred to as the "regulated air toxics".

The Environmental and Public Protection Cabinet's Division for Air Quality first started monitoring for air toxics in 1989. Since that time over 10,500 samples have been taken and analyzed for volatile organics, semi-volatile organics, metals, dioxin/furans, PCBs, carbonyls, and acidic/basic gases. The Division's historic focus has been on urban areas and suspected "hot spots" or areas of concern. Examples of specific studies undertaken by the Cabinet include:

- Calvert City Geographic Initiative (1991-1998)
- Tri-State Geographic Initiative Kenova cluster (1996-2000)
- Urban Trends Study (2000-2002)
- West Louisville Air Toxics Study (2000-2001) (participatory role)

Another broader scale project in which the Division participates is the National Air Toxics Trends Site (NATTS) assessment. This program uses emissions and monitoring data to look at air toxics on a national scale. Its focus is an assessment of 33 HAPs of most concern based on:

- Estimated concentrations
- Estimated population exposure
- Characterized potential health effects including cancer and non-cancer effects

The project includes 22 sites across the U.S. with 15 of those being urban sites and 7 sites being characterized as rural in nature. The Division oversees one of the rural sites in Hazard, Kentucky.

Role of Risk Assessment in Environmental Decision-making

Risk assessment plays a vital role in environmental decisions. It is widely utilized and has an established role in a number of site remediation programs, most notably RCRA corrective action and the CERCLA process. These regulatory programs use risk assessment in a variety of applications, usually as an initial screening tool, as a prioritization for further action, as an aid in determining the required extent of remediation (i.e., cleanup standards) and as a means of determining the adequacy of the selected remediation. The National Academy of Sciences paradigm for risk assessment is a four-part process and was developed in 1983 and has been widely used in the environmental community.

> Because cancer and noncancer health impacts associated with environmental exposures generally cannot be directly isolated and measured, EPA scientists and others have spent more than two decades developing an extensive set of risk assessment methods, tools, and data to estimate environmental health risks. Although significant uncertainties remain, this risk assessment methodology has been extensively peer-reviewed, is widely used and understood by the scientific community, and continues to expand and evolve as scientific knowledge advances. (http://www.epa.gov/ttn/atw/toxsource/paradigm.html)

Risk assessment is also incorporated into the residual risk process for toxic air pollutants. Risk assessment for air toxics consists of an initial screening approach that may be followed by a site-specific risk assessment, incorporating exposure assumptions based on site-specific conditions. The data summaries and initial evaluation in this report utilizes the screening risk assessment methodology with default exposure assumptions including, an inhalation rate of 20 cubic meters per day (that assumes a mixture of resting, light, moderate, and heavy activity rates), and assumes that the individual is exposed 350 days per year over a duration of 70 years from child through adult. Like its use in other environmental programs, risk assessment serves as a screening tool that considers potential health-based outcomes for an individual with upper-bound exposure conditions. It does not reflect actual effects that will occur. It is useful for prioritizing actions, and the need for further study including a baseline or site-specific risk assessment.

> The dose-response assessment is part of the toxicity characterization in the NAS Risk Paradigm. Generally, the dose-response assessment consists of two parts: the evaluation of data in the observable range, and the extrapolation from the observable range to low doses/risks. The nature of the dose-response assessment typically varies among air pollutants. Sufficient data may exist for some criteria air pollutants, such as ozone or carbon monoxide, so that relatively complete dose-response relationships can be characterized. In such cases, there is no need for extrapolation to lower doses because adequate human health effects data are available at environmentally relevant levels. However, this has not often been the case for air toxics. Epidemiologic and toxicological data for air toxics have

typically resulted from exposure levels that were high relative to environmental levels. (http://www.epa.gov/ttn/atw/toxsource/paradigm.html)

The toxicity and dose response evaluation is represented by toxicity values developed by the United States Environmental Protection Agency (U.S. EPA). The following information was developed by the to describe the toxicity values (reference concentrations and unit risk values) on their Technology Transfer Network, Air Toxics Website:

> Each assessment in these tables is best visualized as an estimate within a range of possible values, surrounded uncertainty and variability. This range of possible values may change as better data become available. They are generally appropriate for screening-level risk assessments, including assessments to select contaminants, exposure routes, or emission sources of potential concern, or to help set priorities for further research. For more complex, refined risk assessments developed to support regulatory decisions for single sources or substances, we recommend evaluating dose-response in detail for each "risk driver" to incorporate appropriate new toxicological data.

The risk assessment must be used with a clear understanding of its intended purpose and inherent uncertainties. It is intended to be a tool for decision-making rather than identifying effects from exposure. The fourth part of the risk paradigm, Risk Characterization, includes a characterization of uncertainties that document the assumption that were made in the Hazard Identification, Exposure Assessment, and Toxicity Assessment. The initial application of risk assessment is often as a screening tool, followed by refinement using site-specific information. The site-specific risk assessment should utilize sound science and defensible assumptions.

Interpreting Risk Summaries for the Air Toxics Data
(Rural Trends, Urban Trends, Scott County, and Georgetown)

The data presented in the Risk Summary Tables can be misleading if only the risk or hazard values for each constituent are the sole focus. Several factors influence the strength of the risk or hazard estimations and these factors should be considered as well.

Additionally, it should be understood that risk calculations were not performed for all chemicals detected. The risk and hazard estimations were performed for only those chemicals with a maximum detection that exceeded the most sensitive relevant toxicity criteria. In most cases, chemicals that were detected in less than 5% of the samples were eliminated. These two screening steps focused the assessment on only those chemicals that potentially present a concern under a chronic exposure scenario such as in a residential setting.

Standard risk assessment methodology was utilized in developing the risk and hazard estimations. For example, when calculating the exposure concentration (the lesser of the 95% UCL of the mean or maximum), one-half (1/2) of the method detection limit was substituted for non-detections when the constituent was expected to be present. This is an assumption that is used when a chemical is found in several or many samples, but not every sample. This approach is best suited for situations where the detection limit is below the toxicity criteria. In cases where there are relatively few detections and the one-half of the detection limit approximates or exceeds the risk–based criteria, the detection limit can drive the risk, as seen in the example below.

Chemical	Frequency of detection	½ Detection limit	Risk-based criteria	Maximum detection	95% UCL
Trichloroethene	6/94	0.65	0.5	1.19	0.69

All units in ug/m3

Chemical	Carcinogenic Risk estimate (based on max detection)	Carcinogenic Risk estimate (based on 95% UCL)
Trichloroethene	2.4E-05	1.4E-06

Although the calculated risk levels for trichloroethene exceeds the target risk of 1×10^{-6}, the data indicates that the risk calculated using the 95% UCL is significantly influenced by the number of non-detections and the magnitude of the detection limit relative to the risk-based criteria.

Future air monitoring programs should make every attempt to reduce the detection limits to levels below risk-based criteria. This will help reduce the uncertainty surrounding risk estimates for constituents that are infrequently detected.

West Louisville Air Toxics Study

The Louisville Metro Air Pollution Control District and the West Jefferson County Community Task Force conducted an air monitoring study of air toxics in West Louisville. The website for the air pollution control district is located at:

http://www.apcd.org/

The risk assessment report and risk management plan published in the following documents can also be found on the APCD website.

Final West Louisville Air Toxics Risk Assessment Report
West Louisville Air Toxics Risk Assessment Report
Appendices
Errata
West Louisville Air Toxics Study Risk Management Plan, Part 1: Process and Framework

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The Department for Environmental Protection Risk Assessment Branch issued the following comments on the West Louisville Air Toxics Study Risk Assessment and Risk Management Plan:

(KDEP Risk Assessment Branch TB-1217a, October, 2002)

- … in order to prioritize where resources should be spent, the air quality in West Louisville must be compared to air quality in other areas where the resources may also be allocated. A stable, objective basis for comparison is a fundamental necessity for prioritization. If the intent is to use calculated risk values (i.e., Target Risk Levels) with their associated uncertainty as the basis for prioritizing the allocation of resources without comparison to analogous data from areas outside West Louisville, then the use of Target Risk Values is inappropriate. Using the Target Risk Values to prioritize resource allocation will require a comparison to similar quality data from other areas where the resources might be allocated.

- A clear risk communication strategy should be part of the plan.

- Before the sources of pollution are identified, it may be wise to have participating stakeholders outline a series of steps that they are willing to take to reduce pollution. The Management Plan outlines some potential steps, but it would be useful to have possible corrective steps agreed upon by the stakeholders before the data is known.