LOR-IR90-10.76 PID 107714, Qualitative Analysis of Mobile Source Air Toxics

BACKGROUND

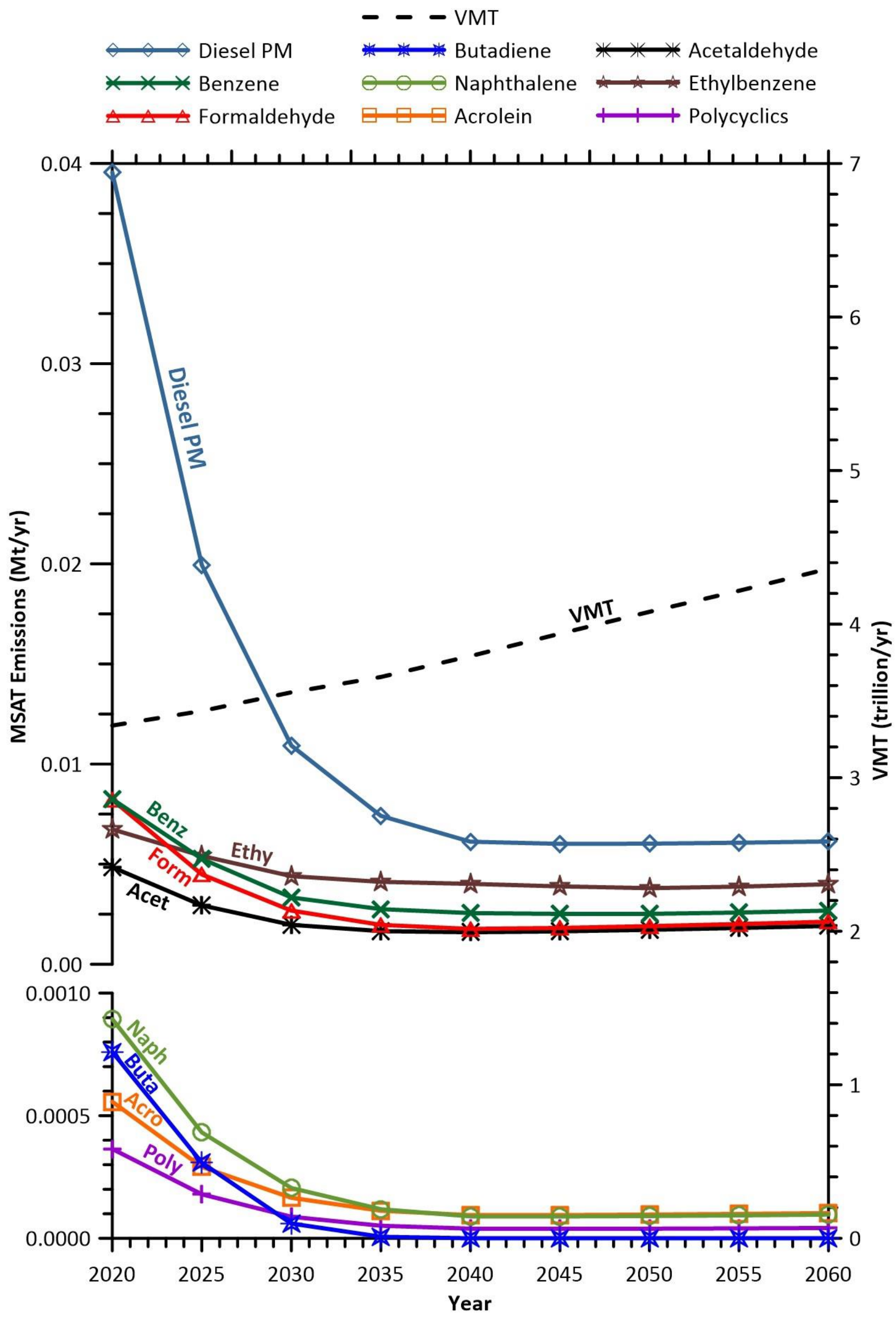
Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the U.S. Environmental Protection Agency (EPA) regulate 188 air toxics, also known as hazardous air pollutants. The EPA assessed this expansive list in its rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007), and identified a group of 93 compounds emitted from mobile sources that are part of EPA's Integrated Risk Information System (IRIS).2011 National Air Toxics Assessment (NATA).[2] In addition, EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors from the [3] These are *1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter.* While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules.

Motor Vehicle Emissions Simulator (MOVES)

According to EPA, MOVES3 is a major revision to MOVES2014 and improves upon it in many respects. MOVES3 includes new data, new emissions standards, and new functional improvements and features. It incorporates substantial new data for emissions, fleet, and activity developed since the release of MOVES2014. These new emissions data are for light- and heavy-duty vehicles, exhaust and evaporative emissions, and fuel effects. MOVES3 also adds updated vehicle sales, population, age distribution, and vehicle miles travelled (VMT) data. MOVES3 incorporates the effects of three new Federal emissions standard rules not included in MOVES2014. These new standards are all expected to impact MSAT emissions and include Tier 3 emissions and fuel standards starting in 2017 (79 FR 60344), heavy-duty greenhouse gas regulations that phase in during model years 2014-2018 (79 FR 60344), and the second phase of light duty greenhouse gas regulations that phase in during model years 2017-2025 (79 FR 60344). In the November 2020 EPA issued MOVES3 Mobile Source Emissions Model Questions and Answers [4] EPA states that for on-road emissions, MOVES3 updated heavy-duty (HD) diesel and compressed natural gas (CNG) emission running rates and updated HD gasoline emission rates. They updated light-duty (LD) emission rates for hydrocarbon (HC), carbon monoxide (CO) and nitrogen oxide (NOx) and updated light-duty (LD) particulate matter rates, incorporating new data on Gasoline Direct Injection (GDI) vehicles.

Using EPA's MOVES3 model, as shown in Figure 1, FHWA estimates that even if VMT increases by 31 percent from 2020 to 2060 as forecast, a combined reduction of 76 percent in the total annual emissions for the priority MSAT is projected for the same time period.

FHWA PROJECTED NATIONAL MSAT EMISSION TRENDS 2020 – 2060 FOR VEHICLES OPERATING ON ROADWAYS



Note: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.
Source: EPA MOVES3 model runs conducted by FHWA, March 2021.

Diesel PM is the dominant component of MSAT emissions, making up 36 to 56 percent of all priority MSAT pollutants by mass, depending on calendar year. Users of MOVES3 will notice some differences in emissions compared with MOVES2014. MOVES3 is based on updated data on some emissions and pollutant processes compared to MOVES2014, and also reflects the latest Federal emissions standards in place at the time of its release. In addition, MOVES3 emissions forecasts are based on slightly higher VMT projections than MOVES2014, consistent with nationwide VMT trends.

MSAT Research

Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how potential public health risks posed by MSAT exposure should be factored into project-level decision-making within the context of NEPA.

Nonetheless, air toxics concerns continue to arise on highway projects during the NEPA process. Even as the science emerges, the public and other agencies expect FHWA to address MSAT impacts in its environmental documents. The FHWA, EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with highway projects. The FHWA will continue to monitor the developing research in this field.

NEPA CONTEXT

The NEPA requires, to the fullest extent possible, that the policies, regulations, and laws of the Federal Government be interpreted and administered in accordance with its environmental protection goals, and that Federal agencies use an interdisciplinary approach in planning and decision-making for any action that adversely impacts the environment (42 U.S.C. 4332). In addition to evaluating the potential environmental effects, FHWA must also take into account the need for safe and efficient transportation in reaching a decision that is in the best overall public interest (23 U.S.C. 109(h)). The FHWA policies and procedures for implementing NEPA are contained in 23 USC 139 and 23 CFR Part 771.

Consideration of MSAT in NEPA Documents

The FHWA developed a tiered approach with three categories for analyzing MSAT in NEPA documents, depending on specific project circumstances:

(1) No analysis for projects with no potential for meaningful MSAT effects'
(2) Qualitative analysis for projects with low potential MSAT effects; or
(3) Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects

Project Description

The project involves a Major Rehabilitation of IR90 with Complete Pavement Replacement and Lane Addition to convert from a 4 lane facility to a 6 lane facility from SR611 to SR2, a distance of 8.37 miles. The Ohio Turnpike Booth to SR2 will remain a 4 Lane facility, a distance of 1.21 miles.

The project is an example of a "Minor Widening" because the project adds capacity on IR90. These projects are those in which the design year traffic is predicted to be less than140,000 – 150,000 AADT***.*** The areas that would potentially be sensitive to a change in air quality are the residential communities along the IR90 corridor.

The analysis years are 2025 and 2045. Alternatives considered include the Build and the No Build.

In accordance with the Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents (October 18, 2016) this project would fall under the category of project having ***low potential MSAT Effects*** and is not expected to be associated with meaningful difference in emissions for project alternatives. The project is an example of a "minor widening". For this project, the amount of MSATs emitted would be proportional to the vehicle miles traveled (VMT) assuming that other variables such as fleet mix are the same for each alternative. Vehicle miles traveled (VMT) and Average daily traffic (ADT) for the project are shown in Table 1.

Table 1.
Vehicle miles traveled (VMT) and Average daily traffic (ADT)

Roadway	Existing 2025 ADT	Length (miles)	Existing 2025 VMT	No Build 2045 ADT	Length (miles)	No Build 2045 VMT	Build 2045 ADT	Length (miles)	Build 2045 VMT
Murray Ridge Rd - SR2/I90 Interchange (West of Lake Rd)	55270	0.52	28740	60590	0.52	31507	60590	0.52	31507
Turnpike Toll Booth - SR2/I90 Interchange (2500' West of Lake Rd)	16000	1.21	19360	20420	1.21	24708	20420	1.21	24708
SR2/I90 Interchange (2500' West of Lake Rd) - SR57	71270	1.25	89087	81010	1.25	101263	81010	1.25	101263
SR57 - SR254	63580	2.43	154500	72650	2.43	176540	72650	2.43	176540
SR57 - 1200' West of SR611	67970	2.96	201191	77430	2.96	229193	77430	2.96	229193

For the build and no build alternatives evaluated for the Project, the amount of MSATs emitted would be proportional to the vehicle miles traveled (VMT) assuming that other variables such as fleet mix are the same for each alternative year. VMT is calculated by multiplying the amount of average daily traffic (ADT) on a section of roadway by the length of the roadway section. The calculated VMT for roadway segments within the study area are shown in Table 2.

Table 2.
Daily Vehicle Miles Traveled (VMT)

Roadway Section	Existing Year 2025	No Build Alternative 2045	Change – Existing to No Build 2045	Build Alternative 2045	Change – Existing to Build Alternative	Change – No Build to Build
Murray Ridge Rd - SR2/I90 Interchange (West of Lake Rd)	28740	31507	+9.6%	31507	+9.6%	0
Turnpike Toll Booth - SR2/I90 Interchange (2500' West of Lake Rd)	19360	24708	+28%	24708	+28%	0
SR2/I90 Interchange (2500' West of Lake Rd) - SR57	89087	101263	+13.6%	101263	+13.6%	0
SR57 - SR254	154500	176540	+14.3%	176540	+14.3%	0
SR57 - 1200' West of SR611	201191	229193	+13.9%	229193	+13.9%	0

For this project, the traffic volumes for the 2045 build alternative are higher than the 2025 existing year and the same as the 2045 no build alternative. The 2045 build alternative is expected to increase MSAT emissions and the 2045 no build alternative is expected to increase MSAT emissions. Regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce MSAT emissions by over 80% from 2010 to 2060. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATs:

Research into the health impacts of MSATs is ongoing. For different emission types there are a variety of studies that show that some either are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses. Exposure to toxics has been a focus of a number of EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1996 to evaluate modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a national or State level. The EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at http://www.epa.gov/iris. The following toxicity information for the six prioritized MSATs was taken from the IRIS database Weight of Evidence Characterization summaries. This information is taken verbatim from EPA's IRIS database and represents the Agency's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

- **Benzene** is characterized as a known human carcinogen.
- **Acrolein** is potentially carcinogenic, but cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.
- **Formaldehyde** is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.
- **1,3-butadiene** is characterized as carcinogenic to humans by inhalation.
- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- **Diesel exhaust (DE)** is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases. Diesel exhaust also represents chronic respiratory effects, possibly the primary non-cancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

There have been other studies that address MSAT health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway MSAT hot spots, the health implications of the entire mix of mobile source pollutants, and other topics. The final summary of the series is not expected for several years. Some recent studies have reported that proximity to roadways is related to adverse health outcomes -- particularly respiratory problems. Much of this research is not specific to MSATs, instead surveying the full spectrum of both criteria and other pollutants. The FHWA cannot evaluate the validity of these studies, but more importantly, they do not provide information that would be useful to alleviate the uncertainties listed above and enable us to perform a more comprehensive evaluation of the health impacts specific to this project.

While available tools do allow us to reasonably predict relative emissions changes between alternatives for larger projects, the amount of MSAT emissions from each of the project alternatives and MSAT concentrations or exposures created by each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. (As noted above, the current emissions model is not capable of serving as a meaningful emissions analysis tool for smaller projects.) Therefore, the relevance of the unavailable or incomplete information is that it is not possible to make a determination of whether any of the alternatives would have "significant adverse impacts on the human environment."

INCOMPLETE OR UNAVAILABLE INFORMATION FOR PROJECT-SPECIFIC MSAT HEALTH IMPACTS ANALYSIS

In FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in mobile source air toxic (MSAT) emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

The Environmental Protection Agency (EPA) is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the Clean Air Act and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (EPA, https://www.epa.gov/iris/). Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

Other organizations are also active in the research and analyses of the human health effects of MSAT, including the Health Effects Institute (HEI). A number of HEI studies are summarized in Appendix D of FHWA's Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents. Among the adverse health effects linked to MSAT compounds at high exposures are: cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations (HEI Special Report 16, https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects) or in the future as vehicle emissions substantially decrease.

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts – each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.

It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways; to determine the portion of time that people are actually exposed at a specific location; and to establish the extent attributable to a proposed action, especially given that some of the information needed is unavailable.
There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (Special Report 16, https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA states that with respect to diesel engine exhaust, "[t]he absence of adequate data to develop a sufficiently confident dose-response relationship from the epidemiologic studies has prevented the estimation of inhalation carcinogenic risk." (EPA IRIS database, Diesel Engine Exhaust, Section II.C.

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the Clean Air Act to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine an "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two-step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than deemed acceptable (https://www.cadc.uscourts.gov/internet/opinions.nsf/284E23FFE079CD598525780000 5 0C9DA/$file/07-1053-1120274.pdf).

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

Due to the limitations cited, a discussion such as the example provided in this Appendix (reflecting any local and project-specific circumstances), should be included regarding incomplete or unavailable information in accordance with Council on Environmental Quality (CEQ) regulations [40 CFR 1502.21(c)] The FHWA Headquarters and Resource Center staff, Victoria Martinez (787) 771-2524, James Gavin (202) 366-1473, and George Noel (978) 758-5824, are available to provide guidance and technical assistance and support.
https://iris.epa.gov/static/pdfs/0642_summary.pdf).

FHWA Sponsored Mobile Source Air Toxics Research Efforts

Human epidemiology and animal toxicology experiments indicate that many chemicals or mixtures termed air toxics have the potential to impact human health. As toxicology, epidemiology and air contaminant measurement techniques have improved over the decades, scientists and regulators have increased their focus on the levels of each chemical or material in the air in an effort to link potential exposures with potential health effects.

Air toxics emissions from mobile sources have the potential to impact human health and often represent a regulatory agency concern. The FHWA has responded to this concern by developing an integrated research program to answer the most important transportation community questions related to air toxics, human health, and the NEPA process. To this end, FHWA has performed, or funded several research efforts.

There are hundreds, if not thousands of published analyses of air pollution, air pollution from mobile sources, near road air pollution, and health. It would not be practical to list them all, as they vary in terms of quality, methodology, spatial, temporal and geographic applicability and other possible factors. However, several of the studies either initiated or supported by FHWA are described below.

THE NATIONAL NEAR ROADWAY MSAT STUDY

The FHWA, in conjunction with the EPA and a consortium of State departments of transportation, studied the concentration and physical behavior of MSAT and mobile source PM 2.5 in Las Vegas, Nevada and Detroit, Michigan. The study criteria dictated that the study site be open to traffic and have 150,000 Annual Average Daily Traffic or more. These studies were intended to provide knowledge about the dispersion of MSAT emissions with the ultimate goal of enabling more informed transportation and environmental decisions at the project-level. The Las Vegas study was unique in that the monitored data was collected for the entire year. Both the Las Vegas, NV and Detroit, MI reports revealed there are a large number of influences in these urban settings and researchers must look beyond the roadway to find all the pollution sources in the near road environment. Additionally, meteorology played a large role in the concentrations measured in the near road study area. More information is available at http://www.fhwa.dot.gov/environment/air_quality/air_toxics/index.cfm.

DIESEL EMISSIONS

Advanced Collaborative Emissions Study

In 2015 the Health Effects Institute (HEI) released the last in a three part series of reports in a multiyear research effort to study the health effects of diesel emissions: *Advanced Collaborative Emissions Study* (ACES) https://www.healtheffects.org/publication/advanced-collaborative-emissions-study-aces-lifetime-cancer-and-non-cancer-assessment. This included reports on Subchronic

Exposure Results: Biologic Responses in Rats and Mice and Assessment of Genotoxicity and Lifetime Cancer and Non-Cancer Assessment in Rats Exposed to New-Technology Diesel Exhaust. The Executive Summary "summarizes the main findings of emissions and health testing of new technology heavy-duty diesel engines capable of meeting US 2007/2010 and EURO VI/6 diesel emissions standards. The results demonstrated the dramatic improvements in emissions and the absence of any significant health effects. The Executive Summary presents the main findings of all three phases of the project and places the results in the context of health risk assessment, noting that 'the overall toxicity of exhaust from modern diesel engines is significantly decreased compared with the toxicity of emissions from traditional-technology diesel engines.'"

Diesel Emissions and Lung Cancer: An Evaluation of Recent Epidemiological Evidence for Quantitative Risk Assessment (Special Report 19)

In 2015 the Health Effects Institute (HEI) released Special Report 19 https://www.healtheffects.org/publication/diesel-emissions-and-lung-cancer-evaluation-recent-epidemiological-evidence-quantitative that contains "the intensive review and analysis of the studies of mine and truck workers exposed to older diesel engine exhaust." The purpose was to review two epidemiological studies of diesel exhaust and lung cancer "to consider whether data or results from these studies might also be used to quantify lung cancer risk in populations exposed to diesel exhaust at lower concentrations and with different temporal patterns, such as those experienced by the general population in urban areas worldwide." To date, the Environmental Protection Agency (EPA) has not established a cancer risk screening level for diesel exhaust*. In its report, HEI's Diesel Epidemiology Panel concluded that "the studies are well prepared and are useful for applying the data to calculate the cancer risk due to exposure to diesel exhaust. The Panel noted, however, that efforts to apply these studies to estimate human risk at today's ambient levels will need to consider the much lower levels of emission pollutants from newer diesel technology as well as the limitations . . . identified in each study." In the Report (page 6), it is stated that "detailed evaluations of these studies . . . lay the groundwork for a systematic characterization of the exposure–response relationship and associated uncertainties in a quantitative risk assessment, should one be undertaken" by the EPA.

*HEI 1999 Diesel Exhaust review identified numerous limitations of epidemiological studies available at that time and did not recommend a cancer risk due to exposure to diesel exhaust be established. See the HEI Diesel Epidemiology Expert Panel. 1999. Diesel Emissions and Lung Cancer: Epidemiology and Quantitative Risk Assessment. Special Report. Cambridge, MA: Health Effects Institute. https://www.healtheffects.org/publication/diesel-emissions-and-lung-cancer-epidemiology-and-quantitative-risk-assessment

https://www.healtheffects.org/publication/executive-summary-advanced-collaborative-emissionsstudy-aces

TRAFFIC-RELATED AIR POLLUTION

Mobile Source Air Toxic Hot Spot

Given concerns about the possibility of MSAT exposure in the near road environment, The Health Effects Institute (HEI) dedicated a number of research efforts at trying to find a MSAT "hotspot." In 2011 three studies were published that tested this hypothesis. In general the authors confirm that while highways are a source of air toxics, they were unable to find that highways were the only source of these pollutants and determined that near road exposures were often no different or no higher than background or ambient levels of exposure, and hence no true hot spots were identified. These studies provide additional information:

- Lioy, P.J., et al (2011). Personal and Ambient Exposures to Air Toxics in Camden, New Jersey, Health Effects Institute No. 160, https://www.healtheffects.org/publication/personal-and-ambient-exposures-air-toxics-camden-new-jersey, page 137
- Spengler, J., et al (2011). Air Toxics Exposure from Vehicle Emissions at a U.S. Border Crossing: Buffalo Peace Bridge Study, Health Effects Institute No. 158, https://www.healtheffects.org/publication/air-toxics-exposure-vehicle-emissions-us-border-crossing-buffalo-peace-bridge-study, page 143
- Fujita, E.M., et al (2011). Concentrations of Air Toxics in Motor Vehicle–Dominated Environments, Health Effects Institute No. 156, https://www.healtheffects.org/publication/concentrations-air-toxics-motor-vehicle-dominated-environments, page 87 - where monitored on-road emissions were higher than emission levels monitored near road residences, but the issue of hot spot was not ultimately discussed.

Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects

In 2010, HEI released Special Report #17, investigating the health effects of traffic related air pollution. The goal of the research was to synthesize available information on the effects of traffic on health. Researchers looked at linkages between: (1) traffic emissions (at the tailpipe) with ambient air pollution in general, (2) concentrations of ambient pollutants with human exposure to pollutants from traffic, (3) exposure to pollutants from traffic with human-health effects and toxicologic data, and (4) toxicologic data with epidemiological associations. Challenges in making exposure assessments, such as quality and quantity of emissions data and models, were investigated, as was the appropriateness of the use of proximity as an exposure-assessment model. Overall, researchers felt that there was "sufficient" evidence for causality for the exacerbation of asthma. Evidence was "suggestive but not sufficient" for other health outcomes such as cardiovascular mortality and others. Study authors also note that past epidemiologic studies may not provide an appropriate assessment of future health associations as vehicle emissions are decreasing overtime. The report is available from HEI's website at https://www.healtheffects.org/publication/traffic-related-air-pollution-critical-review-literature-emissions-exposure-and-health.

HEI SPECIAL REPORT #16

In 2007, the HEI published Special Report #16: Mobile-Source Air Toxics: A Critical Review of the Literature on Exposure and Health Effects. The purpose of this Report was to accomplish the following tasks:

- Use information from the peer-reviewed literature to summarize the health effects of exposure to the 21 MSATs defined by the EPA in 2001;
- Critically analyze the literature for a subset of priority MSAT; and
- Identify and summarize key gaps in existing research and unresolved questions about the priority MSAT.

The HEI chose to review literature for acetaldehyde, acrolein, benzene, 1,3-butadiene, formaldehyde, naphthalene, and polycyclic organic matter (POM). Diesel exhaust was included, but not reviewed in this study since it had been reviewed by HEI and EPA recently. In general, the Report concluded that the cancer health effects due to mobile sources are difficult to discern since the majority of quantitative assessments are derived from occupational cohorts with high concentration exposures and some cancer potency estimates are derived from animal models. The Report suggested that substantial improvements in analytical sensitively and specificity of biomarkers would provide better linkages between exposure and health effects. Noncancer endpoints were not a central focus of most research, and therefore require further investigation. Subpopulation susceptibility also requires additional evaluation. The study is available from HEI's website at https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects.

Going One Step Beyond: A Neighborhood Scale Air Toxics Assessment in North Denver (The Good Neighbor Project)

In 2007, the Denver Department of Environmental Health (DDEH) issued a technical report entitled *Going One Step Beyond: A Neighborhood Scale Air Toxics Assessment in North Denver (The Good Neighbor Project)*. This research project was funded by FHWA. In this study, DDEH conducted a neighborhood-scale air toxics assessment in North Denver, which includes a portion of the proposed I-70 East project area. Residents in this area have been very concerned about both existing health effects in their neighborhoods (from industrial activities, hazardous waste sites, and traffic) and potential health impacts from changes to I-70.

The study was designed to compare modeled levels of the six priority MSATs identified in FHWA's 2006 guidance with measurements at existing MSAT monitoring sites in the study area. MOBILE6.2 emissions factors and the ISC3ST dispersion model were used (some limited testing of the CALPUFF model was also performed). Key findings include: 1) modeled mean annual concentrations from highways were well below estimated Integrated Risk Information System (IRIS) cancer and non-cancer risk values for all six MSAT; 2) modeled concentrations dropped off sharply within 50 meters of roadways; 3) modeled MSAT concentrations tended to be higher along highways near the Denver

Central Business District (CBD) than along the I-70 East corridor (in some cases, they were higher within the CBD itself, as were the monitored values); and 4) dispersion model results were generally lower than monitored concentrations but within a factor of two at all locations.

KANSAS CITY PM CHARACTERIZATION STUDY (KANSAS CITY STUDY)

This study was initiated by EPA to conduct exhaust emissions testing on 480 light-duty, gasoline vehicles in the Kansas City Metropolitan Area (KCMA). Major goals of the study included characterizing PM emissions distributions of a sample of gasoline vehicles in Kansas City; characterizing gaseous and PM toxics exhaust emissions; and characterizing the fraction of high emitters in the fleet. In the process, sampling methodologies were evaluated. Overall, results from the study were used to populate databases for the MOVES emissions model. The FHWA was one of the research sponsors. This study is available on EPA's website at: https://www3.epa.gov/otaq/emission-factors-research/documents/420r08009.pdf

ESTIMATING THE TRANSPORTATION CONTRIBUTION TO PARTICULATE MATTER POLLUTION (AIR TOXICS SUPERSITE STUDY)

The purpose of this study was to improve understanding of the role of highway transportation sources in particulate matter (PM) pollution. In particular, it was important to examine uncertainties, such as the effects of the spatial and temporal distribution of travel patterns, consequences of vehicle fleet mix and fuel type, the contribution of vehicle speed and operating characteristics, and influences of geography and weather. The fundamental methodology of the study was to combine EPA research-grade air quality monitoring data in a representative sample of metropolitan areas with traffic data collected by State departments of transportation (DOTs) and local governments.

Phase I of the study, the planning and data evaluation stage, assessed the characteristics of EPA's ambient PM monitoring initiatives and recruited State DOTs and local government to participate in the research. After evaluating and selecting potential metropolitan areas based on the quality of PM and traffic monitoring data, nine cities* were selected to participate in Phase II. The goal of Phase II was to determine whether correlations could be observed between traffic on highway facilities and ambient PM concentrations. The Phase I report was published in September 2002. Phase II included the collection of traffic and air quality data and data analysis. Ultimately, six cities participated: New York City (Queens), Baltimore, Pittsburgh, Atlanta, Detroit and Los Angeles.

In Phase II, air quality and traffic data were collected. The air quality data was obtained from the EPA Air Quality System, Supersite personnel, and NARSTO data archive site. Traffic data included intelligent transportation system (ITS) roadway surveillance, coverage counts (routine traffic monitoring) and supplemental counts (specifically for research project). Analyses resulted in the conclusion that only a weak correlation existed between PM2.5 concentrations and traffic activity for several of the sites. The existence of general trends indicates a relationship, which however is primarily unquantifiable.

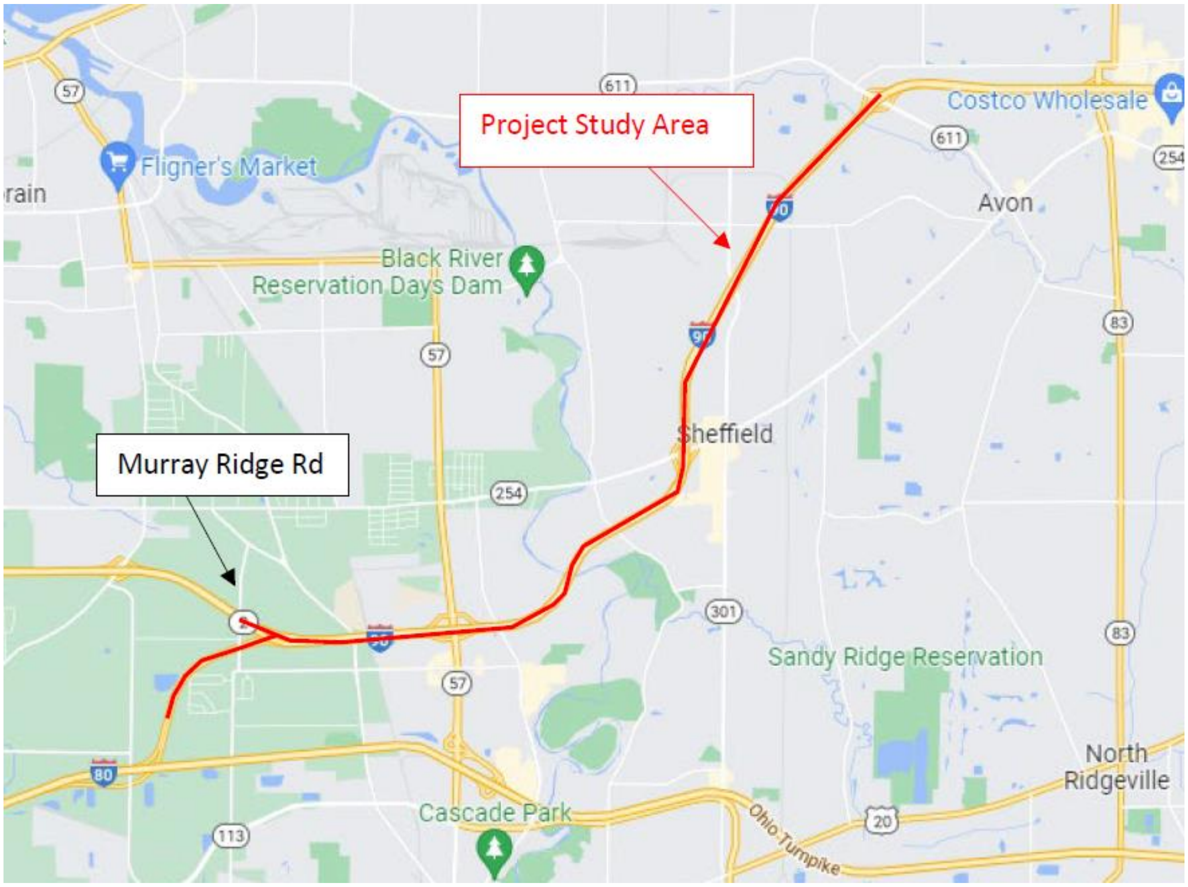
Limitations of the study include the assumption that traffic sources are close enough to ambient monitors to provide sufficiently strong source strength, that vehicle activity is an appropriate surrogate for mobile emissions, and lack of knowledge of other factors such as non-traffic sources of PM and its precursors. A paper documenting the work of Phase II was presented at EPA's 13th International Emissions Inventory Conference and is available at http://www.epa.gov/ttn/chief/conference/ei13/mobile/black.pdf.

Conclusion

In this document, ODOT has provided a qualitative analysis of MSAT emissions relative to the transportation improvement project. No appreciable difference in overall MSAT emissions is anticipated with the Project. ODOT acknowledges that the proposed transportation improvement project may result in increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be estimated.

MSAT Mitigation Strategies

Lessening the effects of mobile source air toxics should be considered for projects with substantial construction-related MSAT emissions that are likely to occur over an extended building period, and for post-construction scenarios where the NEPA analysis indicates potentially meaningful MSAT levels. Such mitigation efforts should be evaluated based on the circumstances associated with individual projects, and they may not be appropriate in all cases. However, there are a number of available mitigation strategies and solutions for countering the effects of MSAT emissions. **This is not a project with substantial construction-related MSAT emissions that are likely to occur over an extended building period or a post-construction scenario where the NEPA analysis indicates potentially meaningful MSAT levels.**


Project Study Area
Murray Ridge Rd
Fligner's Market
Black River Reservation Days Dam
Sheffield
Avon
Costco Wholesale
Sandy Ridge Reservation
North Ridgeville
Cascade Park
Ohio Turnpike