

Appendix C. Air Quality Technical Memorandum for Mobile Source Air Toxics

Appendix C. Air Quality Technical Memorandum for Mobile Source Air Toxics

C.1 Background Information

No air quality issues have been identified for the operational aspects of the US 34 project. Similar travel demand and vehicle miles traveled (VMT) are anticipated with the No Action or Action Alternatives. An average increase of 10 percent in VMT (a range of 5 to 16 percent depending on the location) is anticipated for the Action Alternative compared to the No Action Alternative.

C.2 Mobile Source Air Toxics

The Federal Highway Administration (FHWA) Air Toxic Interim Guidance (February 3, 2006) is used for analysis of mobile source air toxics (MSATs) for highway projects. The following discussion is in accordance with the interim guidance.

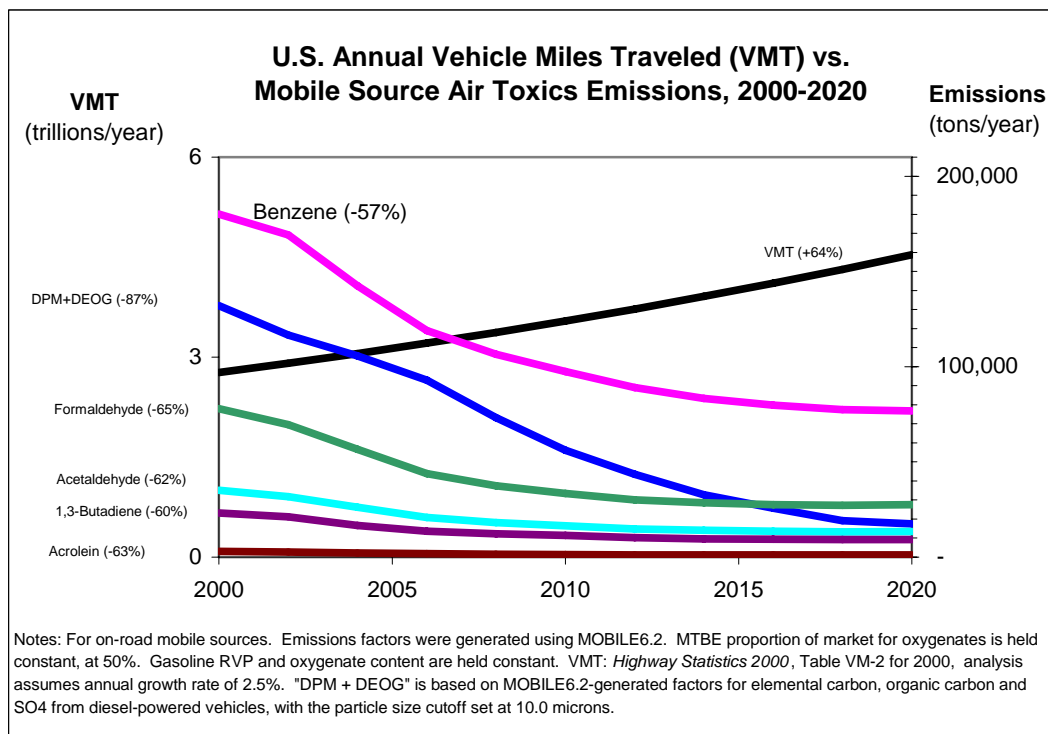
In addition to the “criteria” air pollutants for which there are National Ambient Air Quality Standards (NAAQS), the US Environmental Protection Agency (EPA) also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (for example, airplanes), area sources (for example, dry cleaners) and stationary sources (for example, factories or refineries).

MSATs are a subset of the 188 air toxics defined by the Clean Air Act. MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline. See document No. EPA420-R-00-023 (December 2000).

The EPA is the lead federal agency for administering the Clean Air Act and has certain responsibilities regarding the health effects of MSATs. The EPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources, 66 FR 17229 (March 29, 2001). This rule was issued under the authority in Section 202 of the Clean Air Act. In its rule, EPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline (RFG) program, its national low emission vehicle (NLEV) standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, the Federal Highway Administration (FHWA) projects that even with a 64 percent increase in vehicle miles traveled (VMT), these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 percent to 65 percent, and will reduce on-highway diesel particulate matter (PM) emissions by 87 percent, as shown in Exhibit C-1.

As a result, EPA concluded that no further motor vehicle emissions standards or fuel standards were necessary to further control MSATs. The agency is preparing another rule under authority of the Clean Air Act Section 202(l) that will address these issues and could make adjustments to the full 21 and the primary six MSATs.

**Exhibit C-1
Graph of VMT versus MSAT Emissions**



C.2.1 Unavailable or Incomplete Information for Project-Specific MSAT Impact Analysis

This EA includes a basic analysis of the likely MSAT emission impacts of this project. However, available technical tools do not enable the prediction of project-specific health impacts of the emission changes associated with the alternatives in this EA. Due to these limitations, the following discussion is included in accordance with Council on Environmental Quality (CEQ) regulations (40 CFR 1502.22(b)) regarding incomplete or unavailable information.

Evaluating the environmental and health impacts from MSATs on a proposed highway project would involve several key elements, including emissions modeling, dispersion modeling to estimate ambient concentrations resulting from the estimated emissions, exposure modeling to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure. Each step is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the MSAT health impacts of this project.

Emissions

The EPA tools to estimate MSAT emissions from motor vehicles are not sensitive to key variables determining emissions of MSATs in the context of highway projects. While MOBILE6.2 is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE6.2 is a trip-based model; emission factors are projected based on a typical trip of 7.5 miles and on average speeds for this typical trip. This means that MOBILE6.2 does not have the ability to predict emission factors for a specific vehicle operating condition at a specific location at a specific time. Because of this limitation, MOBILE6.2

can only approximate the operating speeds and levels of congestion likely to be present on the largest scale projects and cannot adequately capture emissions effects of smaller projects. For PM, the model results are not sensitive to average trip speed, although the other MSAT emission rates do change with changes in trip speed. Lastly, in its discussions of PM under the conformity rule, EPA has identified problems with MOBILE6.2 as an obstacle to quantitative analysis.

These deficiencies compromise the capability of MOBILE6.2 to estimate MSAT emissions. MOBILE6.2 is an adequate tool for projecting emissions trends and performing relative analyses among alternatives for very large projects, but it is not sensitive enough to capture the effects of travel changes tied to smaller projects or to predict emissions near specific roadside locations.

Dispersion

The tools to predict how MSATs disperse are also limited. The EPA's current regulatory models, CALINE3 and CAL3QHC, were developed and validated more than a decade ago for the purpose of predicting episodic concentrations of carbon monoxide to determine compliance with the NAAQS. The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at some time at some location within a geographic area. This limitation makes it difficult to predict accurate exposure patterns at specific times at specific highway project locations across an urban area to assess potential health risks. The National Cooperative Highway Research Program (NCHRP) is conducting research on best practices in applying models and other technical methods in the analysis of MSATs. This work also will focus on identifying appropriate methods of documenting and communicating MSAT impacts in the NEPA process and to the general public. Along with these general limitations of dispersion models, FHWA is also faced with a lack of monitoring data in most areas for use in establishing project-specific MSAT background concentrations.

Exposure Levels and Health Effects

Finally, even if emission levels and concentrations of MSATs could be accurately predicted, shortcomings in current techniques for exposure assessment and risk analysis preclude reaching meaningful conclusions about project-specific health impacts. Exposure assessments are difficult because it is difficult to accurately calculate annual concentrations of MSATs near roadways, and to determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are magnified for 70-year cancer assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over a 70-year period. Considerable uncertainties are also associated with the existing estimates of toxicity of the various MSATs because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population. Because of these shortcomings, any calculated difference in health impacts among alternatives is likely to be much smaller than the uncertainties associated with calculating the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against other project impacts that are better suited for quantitative analysis.

C.2.1.1 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, various studies 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 a 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.
- The potential carcinogenicity of **acrolein** 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 noncancer 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.

Other studies have addressed 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.¹ 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 the performance of a more comprehensive evaluation of the health impacts specific to this project.

C.2.1.2 Relevance of Unavailable or Incomplete Information to Evaluating Reasonably Foreseeable Significant Adverse Impacts on the Environment, and Evaluation of Impacts Based on Theoretical Approaches or Research Methods Generally Accepted in the Scientific Community

Because of the uncertainties outlined above, a quantitative assessment of the effects of air toxic emissions impacts on human health cannot be made at the project level. While available tools can reasonably predict relative emissions changes among alternatives for larger projects, the amount of MSAT emissions from each project alternative and MSAT concentrations or exposures created by 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 alternatives would have “significant adverse impacts on the human environment.”

C.3 Project-Level MSAT Discussion

In this document, FHWA has provided a qualitative analysis of MSAT emissions relative to alternatives and has acknowledged that the No Action and Action alternatives 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.

As discussed above, technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSAT emissions and effects of this project. However, even though reliable methods do not exist to accurately estimate the health impacts of MSATs at the project level, it is possible to qualitatively assess the levels of future MSAT emissions under the project. Although a qualitative analysis cannot identify and measure health impacts from MSATs, it can give a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*, found at www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm.

¹ South Coast Air Quality Management District, Multiple Air Toxic Exposure Study-II (2000); Highway Health Hazards, The Sierra Club (2004) summarizing 24 Studies on the relationship between health and air quality); NEPA's Uncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles, Environmental Law Institute, 35 ELR 10273 (2005) with health studies cited therein.

C.3.1 Applicability of MSATs to US 34 Project Corridor

The VMT estimated for the Action Alternative is slightly higher (approximately 10 percent) than that for the No Action Alternative because the additional capacity increases the efficiency of the highway and attracts some rerouted trips from elsewhere in the transportation network. For US 34 regardless of the alternative selected, the commercial/business center attraction – particularly along the east half of the corridor – is expected to bring in new trips from the entire region. Typically, the amount of MSATs emitted would be proportional to the VMT, assuming that other variables such as fleet mix are the same for each alternative.

The increase in VMT would lead to higher MSAT emissions for the Action Alternative along the highway corridor; together with a corresponding decrease in MSAT emissions along other routes as user habits change. The emissions increase is offset somewhat by lower MSAT emission rates due to increased speeds. According to EPA's MOBILE6 emissions model, emissions of all of the priority MSATs except for diesel PM decrease as speed increases.

For US 34, it is possible that the congestion relief and associated increases in speed as the result of the additional capacity (laneage) will have more of an effect on reducing emissions than the offset due to an increase in VMT. In the case of the proposed improvements, increased capacity will mean the difference between a design year (2030) LOS F for the No Action Alternative versus a range of LOS B to D for the Action Alternative. The extent to which these speed-related emissions decreases will offset VMT-related emissions increases cannot be reliably projected due to the inherent deficiencies of technical models.

The additional travel lanes contemplated as part of the Action Alternative will have the effect of moving some traffic closer to nearby homes, schools, and businesses; therefore, there may be localized areas where ambient concentrations of MSATs could be slightly higher under the Action Alternatives than the No Action Alternative. However, as discussed above, the magnitude and the duration of these potential increases compared to the No Action Alternative cannot be accurately quantified due to the inherent deficiencies of current models. In summary, when a highway is widened and, as a result, moves closer to receptors, the localized level of MSAT emissions for the Action Alternative could be higher relative to the No Action Alternative, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSATs will be lower in other locations when traffic shifts away from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be substantially lower than today.

C.3.2 National Control Programs Will Reduce MSAT Emissions by 2030 Regardless of US 34 Project

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 56 to 81 percent between 2005 and 2030. 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 (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future.

C.4 References Cited

Clagget, Michael and Miller, Terry L. *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*, www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm.

Clean Air Act 42 USC 7401 et seq. 40 CFR Section 202(l). 1970 as amended 1977.

Council on Environmental Quality regulations 40 CFR 1502.22(b)

Environmental Law Institute. *NEPA's Uncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles*, 35 ELR 10273 with health studies cited therein, 2005.

Environmental Protection Agency. *Control of Emissions of Hazardous Air Pollutants from Motor Vehicles and Motor Vehicle Fuels*. Document No. EPA420-R-00-023. December 2000.

Environmental Protection Agency. Integrated Risk Information System (IRIS) www.epa.gov/iris.

Federal Highway Administration. *Interim Guidance on Air Toxic Analysis in NEPA Documents*. February 3, 2006.

Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources. 66 FR 17229 (March 29, 2001)

Sierra Club. *Highway Health Hazards*, summarizing 24 Studies on the Relationship between Health and Air Quality, 2004.

South Coast Air Quality Management District. *Multiple Air Toxic Exposure Study-II*, 2000.

