Appendix M

Air Quality

QUALITATIVE ANALYSIS FOR MOBILE SOURCE AIR TOXICS (MSAT)

In addition to the criteria air pollutants for which there are National Ambient Air Quality Standards (NAAQS), the US Environmental Protection Agency (USEPA) also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries). Mobile Source Air Toxics (MSAT) are a subset of the 188 air toxics defined by the Clean Air Act. MSAT 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.

A qualitative assessment of the likely impacts of MSAT is presented because the Southeast High Speed Rail (SEHSR) project has been determined to have a potential impact on vehicle miles traveled (VMT) or diesel traffic although not to the extent which would warrant a detailed analysis. This qualitative assessment was prepared using guidance derived in part from an Federal Highway Administration (FHWA) memorandum entitled *INFORMATION: Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPAs*, dated December 6, 2012, found at:
http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/aqintguidmem.cfm

Appendix B in the above guidance includes example language for a qualitative assessment, with specific examples for this type of improvement. The types of projects included in this category are those that serve to improve operations of highway, transit or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase MSAT emissions. This language is included in the NEPA Context section below.

Please note that sensitive receptors along the corridor were not identified for the FEIS as this task is no longer recommended by FHWA for qualitative analyses. Performing the highly intensive task of identifying sensitive sites from Raleigh, NC, to Richmond, VA, and looking at anticipated traffic volume change for each of these sites would not produce meaningful information, especially given the low volumes of the roads along the project and the fact that MSATs are anticipated to decrease throughout the United States based on improvements in vehicle operation standards.

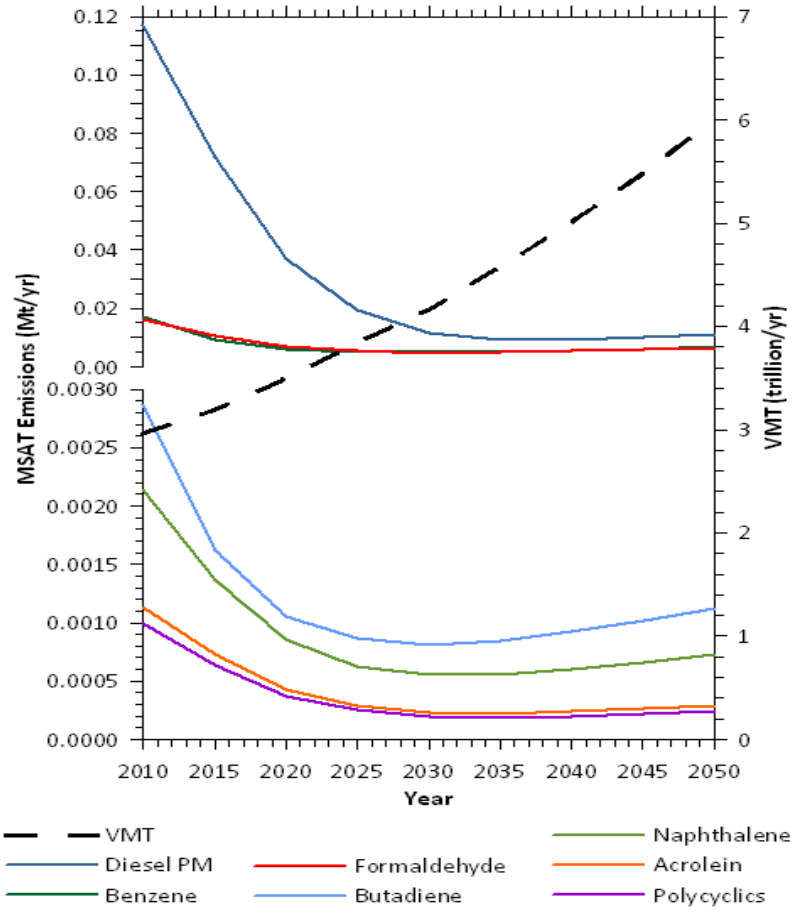
In addition to the qualitative assessment, a National Environmental Policy Act (NEPA) document for this category of project must include a discussion of information that is incomplete or unavailable for a project specific assessment of MSAT impacts, in compliance with the Council on Environmental Quality (CEQ) regulations (40 CFR 1502.22(b)). This discussion should explain how air toxics analysis is an emerging field and current scientific techniques, tools, and data are not sufficient to accurately estimate human health impacts that would result from a transportation project in a way that would be useful to decision-makers. Also in compliance with 40 CFR 150.22(b), it should contain information regarding the health impacts of MSAT. Appendix C of the above guidance includes example language to cover the information. This language is included in the CEQ Provisions section below that covers Incomplete/Unavailable information for project-specific MSAT Health Impacts Analysis.

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 USEPA regulate 188 air toxics, also known as hazardous air pollutants. The USEPA has assessed this expansive list in their latest 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 listed in their Integrated Risk Information System (IRIS) (http://www.epa.gov/iris/). In addition, USEPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA) (http://www.epa.gov/ttn/atw/nata1999/). These are acrolein, benzene, 1,3-butidiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), 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 USEPA rules. The 2007 USEPA rule requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines.

Based on an FHWA analysis using USEPA's MOVES2010b model, as shown in Figure 1, even if vehicle-miles travelled (VMT) increases by 102 percent as assumed from 2010 to 2050, a combined reduction of 83 percent in the total annual emissions for the priority MSAT is projected for the same time period.

Figure 1: NATIONAL MSAT EMISSION TRENDS 1999 - 2050
FOR VEHICLES OPERATING ON ROADWAYS USING USEPA's MOVES2010b MODEL



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: USEPA MOVES2010b model runs conducted during May - June 2012 by FHWA.

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 be raised on highway projects during the NEPA process. Even as the science emerges, MSAT impacts are to be addressed in environmental documents. The FHWA, USEPA, the Health Effects Institute (HEI), 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.

The Council On Environmental Quality (CEQ) Provisions Covering 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 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.

USEPA 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 USEPA 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" (USEPA, http://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 HEI. Two HEI studies are summarized in Appendix D of FHWA's Interim Guidance Update 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, http://pubs.healtheffects.org/view.php?id=282) or in the future as vehicle emissions substantially decrease (HEI, http://pubs.healtheffects.org/view.php?id=306).

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 (http://pubs.healtheffects.org/view.php?id=282). 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 USEPA and the HEI (http://www.epa.gov/risk/basicinformation.htm#g) and (http://pubs.healtheffects.org/getfile.php?u=395), respectively, have not established a basis for quantitative risk assessment of diesel PM in ambient settings.

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the USEPA 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 USEPA 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 1:1,000,000 due to source emissions. 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 USEPA'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.

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.

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. The NEPA also requires Federal agencies to use an interdisciplinary approach in planning and decision-making for any action that adversely impacts the environment. The NEPA requires and FHWA is committed to the examination and avoidance of potential impacts to the natural and human environment when considering approval of proposed transportation projects. In addition to evaluating the potential environmental effects, we must also take into account the need for safe and efficient transportation in reaching a decision that is in the best overall public interest. The FHWA policies and procedures for implementing NEPA are contained in regulation at 23 CFR Part 771.

The SEHSR project is considered to be a transit improvement project. (http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/aqintguidapb.cfm APPENDIX B-Examples of Prototype Language for Qualitative Project Level MSAT Discussions).

For the Preferred Alternative presented in this FEIS, the amount of MSAT emitted would be proportional to the vehicle miles traveled, or VMT, assuming that other variables such as fleet mix are the same for each alternative. The VMT estimated for the Preferred Alternative is lower than that for the No Build Alternative because of the removal of highway vehicles that are predicted as a result of the improved transportation system. This decrease in VMT would lead to lower MSAT emissions. The emissions decrease is further enhanced by lower MSAT emission rates due to increased speeds; according to USEPA's MOVES2010b model, emissions of all of the priority MSAT decrease as speed increases. Because the estimated VMT for the Preferred Alternative is less than the No-Build Condition, it is expected there would be a positive impact in overall MSAT emissions. Also, emissions will likely be lower than present levels in the design year as a result of USEPA's national control programs that are projected to reduce annual MSAT emissions by over 80 percent between 2010 and 2050. 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 USEPA-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 in nearly all cases.

Conclusion

MSAT knowledge is still evolving. As the science progresses FHWA will continue to revise and update this guidance. FHWA is working with Stakeholders, USEPA and others to better understand the strengths and weaknesses of developing analysis tools and the applicability on the project level decision documentation process. FHWA wanted to make project sponsors aware of the implications of the transition to the MOVES model and that it will be issuing updates to this interim guidance when necessary. Additional background information on MSAT-related research is provided in *Appendix D-FHWA Sponsored Mobile Source Air Toxics Research Efforts* of the updated interim guidance. (http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/aqintguidapd.cfm). Mitigation strategies are provided in *Appendix E-MSAT Mitigation Strategies* in the same guidance. (http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/aqintguidape.cfm)