

APPENDIX B.1.2

1. MOBILE SOURCE AIR TOXICS

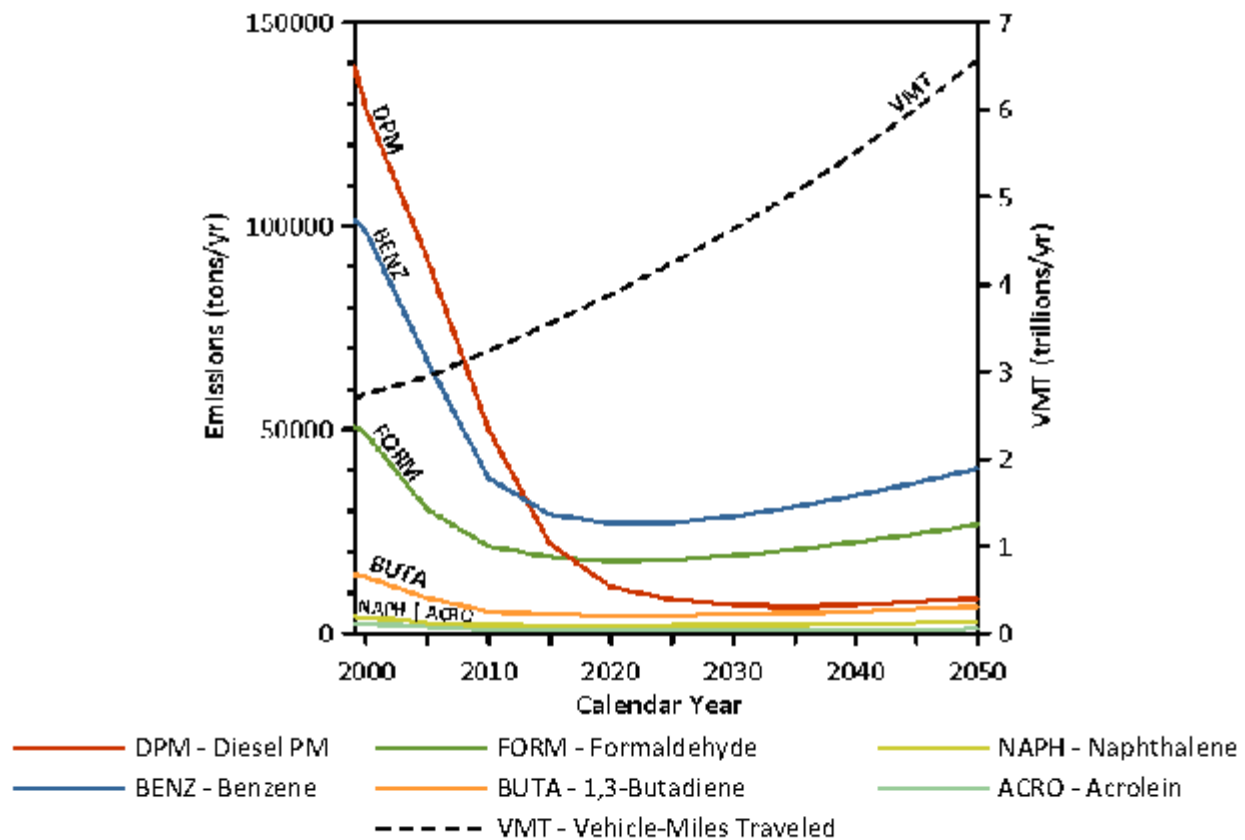
In addition to the criteria pollutants for which there are National Ambient Air Quality Standards (NAAQS), EPA also regulates air toxics. Most air toxics originate from human-made sources including on-road mobile sources, non-road mobile sources (e.g. airplanes) area source (e.g. dry cleaners) and stationary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

Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the Clean Air Act. The 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.

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 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/ncea/iris/index.html>). In addition, EPA 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-butadiene, 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 EPA rules.

The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using EPA's MOBILE6.2 model, even if vehicle activity (vehicle-miles travelled, VMT) increases by 145 percent as assumed, a combined reduction of 72 percent in the total annual emission rate for the priority MSAT is projected from 1999 to 2050, as shown in Figure 1.

**Figure 1 NATIONAL MSAT EMISSION TRENDS 1999 - 2050
FOR VEHICLES OPERATING ON ROADWAYS
USING EPA's MOBILE6.2 MODEL**



Note:

(1) Annual emissions of polycyclic organic matter are projected to be 561 tons/yr for 1999, decreasing to 373 tons/yr for 2050.

(2) 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: U.S. Environmental Protection Agency. MOBILE6.2 Model run 20 August 2009.

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 the potential health risks posed by MSAT exposure should be factored into project-level decision-making within the context of the National Environmental Policy Act (NEPA).

Nonetheless, air toxics concerns continue to be raised on highway projects during the NEPA process. Even as the science emerges, we are duly expected by the public and other agencies to address MSAT impacts in our 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 emerging field.

1.1 Mobile Source Air Toxic (MSAT) Health Impacts

The NEPA documentation for the Louisville-Southern Indiana Ohio River Bridges Project (LSIORB) includes a basic qualitative analysis of the likely MSAT emission impacts of the FEIS Selected Alternative and the Modified Selected Alternative and a quantitative regional MSAT emissions inventory. However, available technical tools do not enable prediction of project-specific health impacts of the emission changes associated with the alternatives for the Louisville Metropolitan Area (LMA). Due to these limitations, the following discussion is included in accordance with CEQ regulations (40 CFR 1502.22(b)) regarding incomplete or unavailable information.

Information that is Unavailable or Incomplete: *According to FHWA's Interim Guidance Update on Mobile source Air Toxic Analysis in NEPA Documents;* information is currently 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.

The U.S. 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, <http://www.epa.gov/ncea/iris/index.html>). 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). 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, with 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. The results produced by the EPA's MOBILE6.2 model, the California EPA's Emfac2007 model, and the EPA's DraftMOVES2009 model in forecasting MSAT emissions are highly inconsistent. Indications from the development of the MOVES model are that MOBILE6.2 significantly underestimates diesel particulate matter (PM) emissions and significantly overestimates benzene emissions.

Regarding air dispersion modeling, an extensive evaluation of EPA's guideline CAL3QHC model was conducted in an NCHRP study (http://www.epa.gov/scram001/dispersion_alt.htm#hyroad), which documents poor model performance at ten sites across the country, three where intensive monitoring was conducted plus an additional seven with less intensive monitoring. The study indicates a bias of the CAL3QHC model to overestimate concentrations near highly congested intersections and underestimate concentrations near uncongested intersections. The consequence of this is a tendency to overstate the air quality benefits of mitigating congestion at intersections. Such poor model performance is less difficult to manage for demonstrating compliance with National Ambient Air Quality Standards for relatively short time frames than it is for forecasting individual exposure over an entire lifetime, especially given that some information needed for estimating 70 year lifetime exposure is unavailable. It is particularly difficult to reliably forecast MSAT exposure near roadways, and to determine the portion of time that people are actually exposed at a specific location.

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 EPA (<http://www.epa.gov/risk/basicinformation.htm#g>) and the HEI (<http://pubs.healtheffects.org/getfile.php?u=395>) 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 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 a "safe" or "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 safe or 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.

Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATS: Research into the health impacts of MSATs is ongoing. For different emissions 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.

Exposures to toxics have 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 seven 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.

- **Naphthalene** is a probable human carcinogen but the carcinogenic potential cannot be determined.
- **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.
- **Polycyclic Organic Matter** is a class of compounds that have characterizations that include: probable human carcinogen - based on sufficient evidence of carcinogenicity in animals, not classifiable as to human carcinogenicity, and not assessed under the IRIS program.

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 studies 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 a more comprehensive evaluation of the health impacts specific to this project.

Relevance of Unavailable or Incomplete Information to Evaluating Reasonably Foreseeable Significant Adverse Impacts on the Environment, and Evaluation of impacts based upon 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 do allow a reasonable prediction of 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. Therefore, the relevance of the unavailable or incomplete information is that a determination of whether any of the alternatives would have “significant adverse impacts on the human environment” is not possible.

In this document, The DOTs have provided a qualitative assessment of MSAT emissions relative to the Build Alternatives and the No-Action Alternative. They have acknowledged that the 2030 No-Action Alternative and the Build Alternatives for the year 2030 may result 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.

1.2 LSIORB Assessment of the Potential for MSAT Effects

The MSAT analyses contained in this document consist of a qualitative assessment of the project area (locations of the build alternatives) and a quantitative assessment of the project region. The qualitative assessment evaluates the criteria for the potential impacts of the project on area MSAT and evaluates the traffic projections and the distribution of traffic and heavy trucks throughout the project corridors. The qualitative assessment evaluates the effects of the build alternatives on the composition of the traffic and potential effects/benefits of the project's redistribution of traffic and congestion improvements on project area MSAT. The quantitative assessment is an emissions inventory of the seven priority MSAT pollutants for the region. The quantitative assessment evaluates the emissions from the existing (2010) scenario, the No-Action (2030) scenario, the FEIS Selected Alternative (2030), and the Modified Selected Alternative (2030) and compares emissions amongst the scenarios.

On February 3, 2006, the FHWA released *Interim Guidance on Air Toxic Analysis in NEPA Documents*.¹ This guidance was superseded on September 30, 2009, by FHWA's *Interim Guidance Update on Air Toxic Analysis in NEPA Documents*.² The purpose of FHWA's guidance is to advise on when and how to analyze Mobile Source Air Toxics (MSATs) in the NEPA process for highways. This guidance is interim, because MSAT science is still evolving. As the science progresses, FHWA will update the guidance.

The qualitative analysis presented here provides a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. FHWA's *Interim Guidance* groups projects into the following categories:

- Exempt Projects and Projects with no Meaningful Potential MSAT Effects
- Projects with Low Potential MSAT Effects
- Projects with Higher Potential MSAT Effects

FHWA's guidance on identifying "Projects with Higher Potential MSAT Effects" indicates that this category includes projects that have the potential for meaningful differences in MSAT emissions among project alternatives. To fall into this category, a project must:

- Create or significantly alter a major intermodal freight facility that has the potential to concentrate high levels of diesel particulate matter in a single location; or
- Create new or add significant capacity to urban highways such as interstates, urban arterials, or urban collector-distributor routes with traffic volumes where the average

¹ *Interim Guidance on Air Toxic Analysis in NEPA Documents*, FHWA, February 3, 2006.
<http://www.fhwa.dot.gov/environment/airtoxic/020306guidmem.htm>

² *Interim Guidance Update on Air Toxic Analysis in NEPA Documents*, FHWA, September 30, 2009.
<http://www.fhwa.dot.gov/environment/airtoxic/100109guidmem.htm>

annual daily traffic (AADT) is projected to be in the range of 140,000 to 150,000 or greater by the design year; and

- Also be proposed to be located in proximity to populated areas.

The project's design and scope were evaluated to assess the project's potential, based on the criteria outlined above, for being a "project with a higher potential for MSAT effects."

As previously discussed, the project consists of two corridors: the Downtown Corridor that consists of the reconstruction of the Kennedy Interchange, a new bridge over the Ohio River and associated approach roadways in Kentucky and Indiana; and the East End Corridor that consists of a new Ohio River bridge and associated approach roadways in Kentucky and Indiana.

As a general guide, studies on air toxics have shown that short-term and long-term concentrations of air toxics can be elevated for receptors downwind of and very near roadways (within 330–660 feet) and that outside of these distances there is a rapid reduction in levels, though not necessarily to background concentrations³. This indicates that the area of concern for traffic-induced MSATs is within approximately 660 feet of a roadway.

The distance between the Downtown Corridor and the East End Corridor is 24,000 feet (4.5 miles) or 34,000 feet (6.4 miles) depending on the location. The near-road nature of MSAT emissions and the spatial separation of the Downtown Corridor from the East End Corridor indicate that it would be reasonable to evaluate the potential for MSAT effects individually for each section.

Since the Downtown and East End corridors are both near populated areas (one criterion for "Projects with Higher Potential MSAT Effects"), the areas were evaluated using traffic volume thresholds outlined above to determine whether the project corridors have the potential for meaningful differences in MSAT emissions among the project alternatives.

Table 1 gives the AADT for the Downtown and East End corridors for the current, build, and no-action scenarios.

³ Transportation-Related Air Toxics: Case Study Materials Related to US 95 in Nevada, STI-902370-2308-FFWP (2003) http://www.fhwa.dot.gov/environment/air_quality/air_toxics/research_and_analysis/us_95_nevada_case_study/index.cfm

TABLE 1
AADT PROJECTIONS ON THE ROADWAY NETWORK: MODIFIED SELECTED
ALTERNATIVE

Scenario	Roadway	AADT	Percent Trucks	Average Daily Trucks
2010				
Downtown	I-65	122,300	21.1%	25,800
	U.S. 31	21,900	1.6%	350
East End	No East End River Crossing	0	0	0
	KY 841	16,700	6.3%	1,000
2030 No-Action				
Downtown	I-65	155,000	18.4%	28,500
	U.S. 31	25,000	1.6%	400
East End	No East End River Crossing	0	0	0
	KY 841	17,600	5.9%	1,000
2030 Build				
Downtown	I-65	104,000	19.3%	20,100
	U.S. 31	35,000	1.6%	600
East End	East End River Crossing	52,000	11.6%	6,000
	KY 841	70,800	10.2%	1,000

Identifying Potential of Corridors as “Projects with Higher Potential MSAT Effects”

Downtown Corridor

The Downtown Corridor (Kennedy Interchange, Kennedy Bridge, and I-65 in downtown Indiana) has a 2010 AADT of 122,300 with 21.1% trucks (25,800 trucks). The No-Action Alternative would have a 2030 AADT of 155,000 with 18.4% trucks (28,500 trucks). The Modified Selected Alternative would have a 2030 AADT of 104,000 with 19.3% trucks (20,100). The Modified Selected Alternative AADT is below the threshold for consideration as a “Project with Higher Potential MSAT Effects.” In fact, the Modified Selected Alternative has a lower AADT than the No-Action Alternative and would remove 8,400 trucks from the Downtown Corridor. In addition, the Modified Selected Alternative has a lower number of trucks using the Downtown Corridor than the existing I-65 crossing (25,800 trucks existing vs. 20,100 for the Modified Selected Alternative).

Considering the proximity (less than 660 feet at one location) of the U.S. 31 crossing of the Ohio River to the project activities in the Kennedy Interchange/downtown Jeffersonville, it was necessary to account for the traffic volumes on this existing facility in assessing the potential for MSAT effects. The U.S. 31 crossing has a 2010 AADT of 21,900 with 1.6% trucks (350 trucks) and a 2030 AADT of 35,000 with 1.6% trucks (600 trucks) for the Modified Selected Alternative. The addition of the U.S. 31 traffic volumes to the Modified Selected Alternative Downtown Corridor yields 139,000 AADT (with 20,700 of that being trucks). While this volume is still under the threshold for consideration as a “Project with Higher Potential MSAT Effects” it approaches the lower limit of the threshold. With the build scenario the combination of the I-65 and U.S. 31 traffic volumes will have 41,000 AADT less than the No-Action Alternative, including a reduction of 8,200 trucks per day. In addition, the combination of U.S. 31 and the Modified Selected Alternative Downtown Corridor has a lower number of trucks than the existing I-65 crossing alone (25,800 trucks existing for I-65 vs. 20,700 for the combination of U.S. 31 and the Modified Selected Alternative). In other words, the combination of the U.S. 31 and I-65 crossings in 2030 will have 4,100 fewer trucks than there are now on the Kennedy Bridge.

East End Corridor

The East End Corridor has a 2010 AADT of 16,700 with 6.3% trucks (1,100 trucks) for the segment of KY 841 between the I-265/I-71 interchange and U.S. 42. The No-Action Alternative would have a 2030 AADT of 17,600 with 5.9% trucks (1,000 trucks) for this segment. The preferred Modified Selected Alternative would have 70,800 AADT with 10.2% trucks (7,200 trucks) for this segment. The remainder of the East End Corridor is on new alignment. The portion on new alignment will have a 2030 AADT of 52,000 with 11.6% trucks (6,000 trucks). The Modified Selected Alternative AADT is well below the threshold for consideration as a “Project with Higher Potential MSAT Effects.”

An assessment of the project traffic volumes, vehicle miles traveled (VMT), and congestion provides information as to the potential effects/benefits of the project alternatives with regard to MSAT emissions, as follows.

Project Area MSAT Effects and Potential Benefits

The AADT for the project is useful for screening the alternatives for the potential to have meaningful MSAT effects. Emissions for the number of vehicles projected is the product of the traffic volume, the vehicle miles traveled (VMT) and the emission factors predicted for the pollutant of interest. For the FEIS Selected Alternative, Modified Selected Alternative, and No-Action Alternative, the amount of MSATs emitted would be proportional to the VMT, assuming that other variables such as fleet mix are the same. The VMTs for the No-Action and the two build alternatives were determined for the entire affected roadway network, consisting of the area from the I-64/Sherman Minton Bridge (which is over 3.5 miles from the Downtown Corridor). The projected VMT total for the No-Action Alternative is 33,081,000 miles. The projected VMT total for the FEIS Selected Alternative is 33,475,000 miles, for an increase of 1.2%, and the Modified Selected Alternative is 35,522,000 miles, for an increase of 1.3%. Because of the minor differences among the alternatives, it is expected that there would be no appreciable difference in overall MSAT emissions among the alternatives, in comparison to the No-Action Alternative.

The AADT for the entire affected roadway network (as defined above and spanning approximately eight linear miles) is 374,800 vehicles for the No-Action Alternative and 388,000 vehicles for the Modified Selected Alternative. This indicates that the proposed project would induce fewer than 15,000 additional vehicles per day. The construction of the project will redistribute traffic from the Downtown Corridor to the East End Corridor as is evidenced by the Downtown Corridor volumes being reduced by 41,000 vehicles per day, including the removal of over 8,000 trucks from the Downtown Corridor. This should result in less traffic related MSAT emissions in the Downtown Corridor when compared with the No-Action alternative. In addition to the reduction in traffic volumes in the Downtown Corridor, the following factors would contribute to the reduction in MSAT emissions:

- Emissions increases from the slightly increased VMT may be offset by lower MSAT emission rates due to reduced congestion and increased travel speeds within the Downtown Corridor as a result of reduced congestion. In 2030 the number of Kennedy Interchange segments, for the No-Action Alternative, functioning at a LOS E or F, is projected to be 14 (up from 4 in 2010). (See SFEIS Figure 2.2-7, *2010 and 2030 A.M./P.M. Levels of Service, Kennedy Interchange*). The reduction in congestion and associated delay, which is largely attributable to increased travel speeds, would be a benefit in the Downtown Corridor. As presented in SFEIS Table 3.3-5, the average travel speeds for the Modified Selected Alternative would be 43 mph for the AM peak period and 45 mph for the PM peak period, verses 38 mph and 23 mph, respectively, for the No-Action Alternative. Vehicle hours of delay (VHD) is defined as the difference between vehicle hours traveled under congested conditions and vehicle hours of travel that would otherwise be expected under free flow conditions. Thus, VHD is calculated using travel times and travel speeds. The vehicle hours of delay (VHD) for the No-Action Alternative is projected to be 405,000. The VHD for the FEIS Selected Alternative is projected to be 349,000, for a 13.8% reduction in VHD in comparison to the No-Action Alternative. The VHD for the Modified Selected Alternative is projected to be 362,000, for a 10.6% reduction in VHD in comparison to the No-Action Alternative.

- The combination of improved LOS and reduced VHT would reduce overall MSAT emissions for the project area. According to USEPA's MOBILE6.2 emissions model, emissions of all of the priority MSATs except diesel particulate matter are reduced as speed increases. The extent to which the speed-related emissions reductions will offset VMT-related emissions increases cannot be reliably projected due to the inherent deficiencies of technical models.

The construction of the East End Bridge and approaches will introduce a new interstate facility to the area. Though the 52,000 AADT is well below the threshold for a "Project with Higher Potential MSAT Effects," there would be increased MSAT emissions in the vicinity of the new facility. The neighborhoods along the existing KY 841, from the I-265/I-71 interchange to U.S. 42, currently have 16,700 vehicles per day (with 1,100 trucks) within 330 feet of the nearest residences (see SFEIS Figure 5.4-1). The project would increase the AADT by 53,000 (including an increase of 6,100 trucks) and would introduce additional MSAT emissions to this area that is composed mainly of residential neighborhoods. The remainder of the project is on new alignment and would introduce 52,000 AADT (with 6,000 trucks) to areas that currently only have mobile source emissions from local roads. The project area northwest of U.S. 42 is less densely populated than the area along KY 841. While the introduction of 52,000 AADT will increase MSAT emissions for residents adjacent to the new roadway, the AADT is well below the threshold for consideration as a "Project with Higher Potential MSAT Effects."

A 2,000-foot section of the proposed facility in the east end will be a tunnel under the Drumanard Estate in the vicinity of U.S. 42. The tunnel is below the threshold for requiring vents and therefore would be ventilated using jet fans moving air toward the tunnel portals. This segment of the roadway has 52,000 AADT and less than 20,000 VMT (in comparison to 33,522,000 for the project area) and will not create a localized concern for MSAT emissions.

Regardless of the alternative chosen, 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 MSAT emissions by 72% between 1999 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.

Under the FEIS Selected and Modified Selected alternatives in the design year, it is expected there would be higher MSAT emissions in some areas, relative to the No-Action Alternative, due to the construction of a new facility and the increase in the AADT. There could be elevated changes in MSATs to residents and others in localized areas where the traffic volumes increase, which may be important particularly to any members of sensitive populations. Conversely, lower MSAT emissions would be expected along the existing roadway network in its entirety due to reduced congestion and improved VHD.

Quantitative Assessment of MSAT

Though the project is projected to reduce AADT and the number of trucks in the downtown area and the AADT in the east end is well below the threshold for a “Project with Higher Potential MSAT Effects,” the downtown area has AADT that approaches the threshold of 140,000 AADT. A quantitative assessment, consisting of a project emissions inventory, will be performed to quantify the project roadway network emissions for the existing 2010 scenario and the design year (2030) scenario. The quantitative emissions inventory will provide emissions inventories for the project area roadway network for the No-Action, the FEIS Selected Alternative, and the Modified Selected Alternative.

This analysis area will be representative of the regional scale emission factors predicted by MOBILE6.2. Emission factors will be using MOBILE6.2 and multiplied by VMT data generated for the project area roadway network to generate yearly emissions for MSATs. The results of these analyses will be incorporated in the Record of Decision (ROD) for this project.

MSAT Emissions Inventory Methodologies

MOBILE6.2 will be used to generate annual emission factors for each of the seven priority MSAT pollutants (or pollutant class) and included: acrolein, benzene, 1,3-butadiene, formaldehyde, naphthalene, diesel particulate matter, and polycyclic organic matter (POM). The MOBILE6.2 model will be run using local data for the LMPA. Monthly emission factors will be developed via mathematical interpolation between January and July and averaging the monthly emission results⁴. The monthly models will include temperature and humidity parameters that are applicable to the Louisville area. The emission factors will be generated for a range of speeds from 2.5 mph, 5 mph and each 5 mph interval up to 70 mph. The traffic modeling will provide the VMT, period (in hours) applicable to that VMT and speed for that VMT/period combination. Each roadway link will have VMT totals that covered a 24-hour period. The emission factors, in units of grams per vehicle mile travelled (g/VMT or g/mi), for each MSAT for the speed determined for each link will be multiplied by the VMT to generate the grams of emissions for that period for the individual roadway link. This methodology will be applied to each roadway link such that each roadway link covers the VMT for a 24-hour period and represents varying speeds based on congestion parameters. The emissions for each of the seven MSAT pollutants will be totaled to provide grams per day for each roadway segment. The total for all segments will be summed and multiplied by 365 to provide yearly emissions for each pollutant. The emissions inventories for each pollutant will be calculated for the existing (2010), 2030 No-Action Alternative, and 2030 build alternative scenarios.

1.3 MSAT Mitigation Strategies

Lessening the effects of mobile source air toxics should be considered for projects with the potential for substantial construction-related MSAT emissions that are likely to occur over an extended building period. Such mitigation efforts should be evaluated based on the circumstances associated with individual projects and may not be appropriate in all cases.

⁴ Technical Guidance on the Use of MOBILE6.2 for Emission Inventory Preparation, EPA420-R-04-13, (EPA 2004).

However, there are a number of mitigation strategies and solutions for countering the effects of MSAT emissions.

Mitigating for Construction MSAT Emissions: Construction activity may generate a temporary increase in MSAT emissions. Project-level assignments that render a decision to pursue construction emission mitigation will benefit from a number of technologies and operational practices that should help lower short-term MSATs. In addition, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) has emphasized a host of diesel retrofit technologies in the law's CMAQ provisions-technologies that are designed to lessen a number of MSATs.

Construction mitigation includes strategies that reduce engine activity or reduce emissions per unit of operating time. Operational agreements that reduce or redirect work or shift times to avoid community exposures can have positive benefits when sites are near vulnerable populations. For example, agreements that stress work activity outside normal hours of an adjacent school campus would be operations-oriented mitigation. Also on the construction emissions front, technological adjustments to equipment, such as off-road dump trucks and bulldozers, could be appropriate strategies. These technological fixes could include particulate matter traps, oxidation catalysts, and other devices that provide an after-treatment of exhaust emissions. The use of clean fuels, such as ultra-low sulfur diesel, also can be a very cost beneficial strategy.

The EPA has listed a number of approved diesel retrofit technologies; many of these can be deployed as emissions mitigation measures for equipment used in construction. This listing can be found at: www.epa.gov/otaq/retrofit/retroverifiedlist.htm.

MSAT emission strategies for the project are outlined in Section 5.4 of this FEIS.