APPENDIX B

Air Quality

How is air quality assessed?

Predicted air quality resulting from a roadway project is often compared to the National Ambient Air Quality Standards (NAAQS). These standards, established for six principal, or "criteria" pollutants, are set at levels designed to protect public health. Sensitive populations, such as asthmatics, children, and the elderly, are taken into account when determining these levels. If these standards are not met, an area is called "non-attainment" and is required to improve its air quality.

The criteria pollutants most often involved with motor vehicles are carbon monoxide (CO), particulate matter (PM), and ozone. Ozone is not emitted directly from vehicles; however, the volatile organic compounds (VOCs) vehicles produce contribute to the creation of ground-level ozone.

NAAQS Standards

Pollutant	Standard	Averaging Period
Carbon Monoxide	9 ppm	8-hour
	35 ppm	1-hour
Lead	0.15 μg/m³	Rolling 3-month average
Nitrogen Dioxide	100 ppb	1-hour
	53 ppb	Annual
Ozone	0.075 ppm	8-hour
Particulate Matter ($PM_{2.5}$)	15.0 μg/m³	Annual
	35 μg/m³	24-hour
Particulate Matter (PM_{10})	150 μg/m³	24-hour
Sulfur Dioxide	75 ppb	1-hour

Note: ppm = parts per million
ppb = parts per billion
μg/m³ = microgram per cubic meter

To estimate emissions from a proposed roadway project, pollutant levels are modeled using one or more of a variety of available modeling software programs. Modeling is dependent on inputs, such as traffic counts, traffic composition (both age and type of vehicles), road geometry, and weather conditions. The modeling determines the concentration and location of worst-case pollutant levels.

What is the air quality in the study area?

No portion of the study area is within a designated non attainment or maintenance area for any of the air pollutants for which the USEPA has established standards. Accordingly, a conformity determination under 40 CFR Part 93 ("Determining Conformity of Federal Actions of Federal Actions to State or federal

What are these units of measurement?

A **ppm** means a "part per million" and a **ppb** means a "part per billion". These are concepts similar to 'percent.' A percent is used to express parts per hundred; one percent equals one part per hundred, and 100 percent is 100 parts per hundred. One ppm means one part per million, and 1,000,000 ppm would be the same as 100 percent. One ppb means one part per billion, and 1,000,000,000 ppb would be the same as 100 percent.. "Parts," as used here for the NAAQS standards, represent equivalently-sized units of volume.

A **μg/m³** is a microgram per cubic meter. This is a slightly different concept than ppm or ppb, since it expresses a ratio of weight to volume. There are 1,000,000 micrograms to a gram, (there are about 454 grams to a pound). A cubic meter is equivalent to a cube of air that is 3.28 feet long on every edge.

Implementation Plans") is not required.

The study area is entirely in attainment for all six pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. McLean County is listed as an attainment area for all criteria pollutants.

How could air quality be affected by the proposed alternatives?

Two variables that typically play the greatest role in determining differences in air quality for various alternatives for a roadway project are vehicles miles traveled (VMT) and congestion. Lower VMT, all other variables equal, leads to less pollutants. Decreasing idle time and braking also leads to less pollutants.

Other variables that affect pollution include how many diesel trucks, which pollute more, compared with passenger cars, how old the average vehicle is (older cars pollute more than newer cars), and types of fuel used. If these variables are consistent throughout various alternatives in a project, then VMT and congestion will determine which alternative results in lower pollutant levels.

How will construction activities affect air quality?

Demolition and construction activities can result in short-term increases in fugitive dust and equipment-related particulate emissions in and around the study area (equipment-related particulate emissions can be minimized if the equipment is well maintained). The potential air quality impacts would be short term, occurring only while demolition and construction work is in progress and local conditions are appropriate.

The potential for fugitive dust emissions typically is associated with building demolition, ground clearing, site preparation, grading, stockpiling of materials, on-site movement of equipment, and transportation of materials. The potential is greatest during dry periods, periods of intense construction activity, and during high wind conditions.

IDOT's Standard Specifications for Road and Bridge Construction include provisions for dust control. Under these provisions, dust and airborne dirt generated by construction activities would be controlled through dust control procedures or a specific dust control plan, when warranted. The contractor and the Department would meet to review the nature and extent of dust-generating activities and would cooperatively develop specific types of control techniques appropriate to the specific situation. Techniques that may warrant consideration include measures such as minimizing track-out of soil onto nearby publicly-traveled roads, reducing speed on unpaved roads, covering haul vehicles, and applying chemical dust suppressants or water to exposed surfaces, particularly those on which construction vehicles travel. With the application of appropriate measures to limit dust emissions during construction, this project would not cause any significant, short-term particulate matter air quality impacts.

Emissions from construction vehicles also are directly addressed for the project by IDOT requiring use of idling restrictions and cleaner diesel fuel.

How would the proposed project impact Mobile Source Air Toxics (MSATs)?

Mobile source air toxics (MSATs) are a sub-group of the 188 hazardous air pollutants (HAPs) identified in the Clean Air Act. HAPs are air toxins not listed in the six criteria pollutants. MSATs are a group of these air toxins that are emitted from mobile sources, and USEPA has listed seven which are Priority MSATs. These seven compounds are: benzene, formaldehyde, naphthalene, polycyclic organic matter, diesel particulate matter and diesel exhaust organic gases, acrolein, and 1,3-butadiene.

MSATs increase as VMT increases. Greater capacity does tend to increase the VMT, and therefore leads to an increase in MSAT emissions. Increased travel speeds and reduced congestion lead to lower MSAT emissions. Unfortunately, existing modeling capabilities do not allow for determination of how much or at what point increased VMT-related emissions are cancelled out by increased travel speeds.

For each Build Alternative, the amount of MSAT emitted would be proportional to the VMT, assuming that other variables such as fleet mix are the same for each alternative. The VMT estimated for each of the Build Alternatives is slightly higher than that for the No Build Alternative, because the additional capacity increases the efficiency of the roadway and attracts rerouted trips from elsewhere in the transportation network. This increase in VMT would lead to higher MSAT emissions for the Preferred Alternative along the highway corridor, along with a corresponding decrease in MSAT emissions along the parallel routes. The emissions increase is offset somewhat 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 under each of the Alternatives is nearly the same, it is expected there would be no appreciable difference in overall MSAT emissions among the various alternatives. Also, regardless of the alternative chosen, emissions would 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 more than 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.

INCOMPLETE OR UNAVAILABLE INFORMATION FOR PROJECT-SPECIFIC

MSAT HEALTH IMPACTS ANALYSIS

In FHWA's view, current scientific techniques, tools, and data are not sufficient to accurately estimate human health impacts that could result from a transportation project in a way that would be useful to decision makers. 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.

Conclusions

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 (e.g., reducing traffic congestion, crash rates, and fatalities plus improved access for emergency response) that are better suited for quantitative analysis.

What is the impact on greenhouse gas emissions (climate change)?

Climate change is an important national and global concern. While the earth has gone through many natural changes in climate in its history, there is general agreement that the earth's climate is currently changing at an accelerated rate and will continue to do so for the foreseeable future. Anthropogenic (human-caused) greenhouse gas (GHG) emissions contribute to this change. Carbon dioxide (CO_2) makes up the largest component of these GHG emissions. Other prominent transportation GHGs include methane (CH_4) and nitrous oxide (N_2O).

Many GHGs occur naturally. Water vapor is the most abundant GHG and makes up approximately two thirds of the natural greenhouse effect. However, the burning of fossil fuels and other human activities are adding to the concentration of GHGs in the atmosphere. Many GHGs remain in the atmosphere for time periods ranging from decades to centuries. GHGs trap heat in the earth's atmosphere. Because atmospheric concentration of GHGs continues to climb, our planet will continue to experience climate-related phenomena. For example, warmer global temperatures can cause changes in precipitation and sea levels.

The transportation sector is the second largest source of total GHG emissions in the U.S., behind electricity generation. In 2009, it was responsible for approximately 27 percent of all anthropogenic GHG emissions in the U.S. The majority of transportation GHG emissions are the result of fossil fuel combustion. CO_2 makes up the largest component of these GHG emissions. U.S. CO_2 emissions from the consumption of energy accounted for about 18 percent of worldwide energy consumption CO_2 emissions in 2009. U.S. transportation CO_2 emissions accounted for about six percent of worldwide CO_2 emissions.

To date, no national standards have been established regarding GHGs, nor has USEPA established criteria or thresholds for ambient GHG emissions pursuant to its authority to establish motor vehicle emission standards for CO_2 under the Clean Air Act. However, there is a considerable body of scientific literature addressing the sources of GHG emissions and their adverse effects on climate, including reports from the Intergovernmental Panel on Climate Change, the US National Academy of Sciences, and USEPA and other Federal agencies. GHGs are different from other air pollutants evaluated in Federal environmental reviews because their impacts are not localized or regional due to their rapid dispersion into the global atmosphere, which is characteristic of these gases. The affected environment for CO_2 and other GHG emissions is the entire planet. In addition, from a quantitative perspective, global climate change is the cumulative result of numerous and varied emissions sources (in terms of both absolute numbers and types), each of which makes a relatively small addition to global atmospheric GHG concentrations. In contrast to broad scale actions such as those involving an entire industry sector or very large geographic areas, it is difficult to isolate and understand the GHG emissions impacts for a particular transportation project. Furthermore, presently there is no scientific methodology for attributing specific climatological changes to a particular transportation project's emissions.

While the contribution of GHGs from transportation in the U.S., as a whole, is a large component of U.S. GHG emissions, as the scale of analysis is reduced the GHG contributions become quite small. Table A-1 shows the relationship between existing and projected Illinois' highway GHG emissions and total global GHG emissions. The emissions in Table A-1 are presented as carbon dioxide equivalent (CO_2e) emissions, which take into account the global warming potential of chemical emissions from a source. The combustion of fossil fuels emits small amounts of N_2O and CH_4. The global warming potential of N_2O and CH_4 are 310 and 21 times that of CO_2, respectively.

TABLE A-1
GLOBAL AND ILLINOIS GHG EMISSIONS IN MILLION METRIC TONS CO_2 EQUIVALENT PER YEAR

Pollutant	Global CO_2e[a]	Illinois CO_2e[b]	Illinois % of Global Total
Existing Conditions (2010)	31,305	60.8	0.19%
Future Projections (2040)	46,103	84.0	0.18%

[a] **Global emissions from EIA's International Energy Outlook 2011. The 2040 emissions were estimated by applying 1.3 percent growth rate to 2035 emissions.**

[b] **Illinois emissions from MOVES using Illinois defaults.**

Based on Illinois' emissions estimates, and global CO_2e estimates and projections from the Energy Information Administration, CO_2e emissions from motor vehicles in the entire State of Illinois contributed less than one percent of global emissions in 2010 (0.19 percent), and are projected to contribute an even smaller fraction (0.18) in 2040. Illinois emissions represent a smaller share of global emissions in 2040 because global emissions are expected to increase at a faster rate.

Under the National Environmental Policy Act (NEPA), detailed environmental analysis should be focused on issues that are significant and meaningful to decision-making. FHWA has concluded, based on the nature of GHG emissions and the exceedingly small potential GHG impacts of transportation projects, more detailed information on GHG emissions "is not essential to a reasoned choice among reasonable alternatives" (40 CFR 1502.22(a)) or to making a decision in the best overall public interest based on a balanced consideration of transportation, economic, social, and environmental needs and impacts (23 CFR 771.105(b)). For these reasons, no project-level GHG analysis has been performed for this project.

Mitigation for Global GHG Emissions

Consistent with its view that broad-scale efforts hold the greatest promise for addressing the global climate change problem, FHWA is engaged in developing strategies to reduce transportation's contribution to GHGs—particularly CO_2 emissions—and to assess the risks to transportation systems and services from climate change. FHWA's efforts include research, education, outreach and technical assistance. Additional information on FHWA's climate change activities is available at: http://www.fhwa.dot.gov/hep/climate/.

The IDOT is also committed to reducing GHG emissions and has implemented various statewide roadwork and construction strategies, promoting the use of improved vehicle fuels to reduce overall GHG emissions and encouraging employees to reduce their travel. These strategies include:

1) **Improving system and operational efficiencies**- The Department implements statewide traffic flow improvements on their road network through intelligent transportation systems, route optimization, traffic signal optimization, and improved intermodal links and system continuity;

2) **Reducing growth of vehicle miles traveled**- The Department implements pedestrian and bicycle facilities and promotes travel demand management programs;

3) **Encouraging lower GHG fuels**- The Department uses biodiesel in diesel trucks. In addition, the Department utilizes flexible fueled vehicles in its fleet that run on E-85;

4) **Requiring emission reductions from construction activities**- The Department implemented a statewide idling Special Provision for construction contracts;

5) **Improved operations at truck weight stations**- The Department implemented a PrePass program at various weight stations on Illinois' Interstates; and,

6) **Reducing Travel**- The Department encourages conference calls and videoconferencing whenever possible to reduce travel and greenhouse gas emissions.