Appendix D
Air Quality

This appendix describes the methodology and inputs for the air quality analyses in more detail than was described in Section 3.6 Air Quality. Additionally, technical language that is typically used in IDOT and/or FHWA analyses is included here to more thoroughly describe Transportation Conformity and Mobile Source Air Toxics (MSATs). Following are the topics addressed in this appendix:

- General Conformity
  - Construction Year Analysis
  - Design Year Analysis
- Transportation Conformity
- PM Hot-Spot Analysis
  - Truck/Train Analysis
  - Train Arrival Analysis
- Locomotive Analysis
- MSATs

1.1 General Conformity

A General Conformity analysis was undertaken on this proposed improvement for HC, NO_x, PM_{10} and $PM_{2.5}$. Project related emissions were analyzed for the construction year with the greatest construction emissions, and for the project's design year. The project-related increase in emissions for these two time-frames was then compared to the 100-ton per year per *de minimis* pollutant threshold.

1.1.1 Construction Year Analysis

For the construction year with the greatest construction emissions, construction equipment type and associated operations hours required to accomplish the construction activities in that year were estimated. Equipment types with their associated horsepower were cross-referenced to emission factors generated from USEPA's "NonRoad2008a" model. The emission factors were based on an average fleet age for the specific year being analyzed. Table 1-1 details the estimated construction equipment and the associated emission factors for the construction year assumed to use the most equipment.

In some cases, the equipment's exact horsepower was not included on the emission factor table for that type of equipment. In those cases, the closest horsepower was utilized to obtain emission factors. If the equipment's horsepower was not specified, the horsepower and associated emission factor that would most likely produce the worst case scenario for emissions was utilized.

Table 1-1: Construction Year Equipment, Emission Factors and Calculations

Equipment	HP	# of Units	Total Hours	HC Emissions		NOx Emissions		PM10 Emissions		PM2.5 Emissions	
				EF/HP	Tons/ Year	EF/HP	Tons/ Year	EF/HP	Tons/ Year	EF/HP	Tons/ Year
Grading for Track Work - 2 months, 2 crews, 5 days/wk, 8 hr/day, 320 hours at site											
Excavators (2/crew)	300	4	1280	0.153	0.065	1.070	0.452	0.057	0.024	0.055	0.023
Roller	175	2	640	0.187	0.023	1.735	0.214	0.177	0.022	0.172	0.021
Off Road Truck (2/crew)	550	4	1280	0.147	0.114	1.060	0.821	0.056	0.043	0.054	0.042
Rubber Tire Loader	300	2	640	0.175	0.037	1.600	0.338	0.106	0.022	0.103	0.022
Dozer (2/crew)	300	4	1280	0.161	0.068	1.278	0.540	0.078	0.033	0.076	0.032
4 Viaducts w/ Structure Modifications - 10 months, 2 crew, 1600 hours at site											
Crane	400	2	3200	0.186	0.261	2.583	3.637	0.108	0.153	0.105	0.148
Rough Terrain Fork Truck	100	2	3200	0.205	0.072	1.995	0.702	0.191	0.067	0.186	0.065
Skid Steer	75	2	3200	1.055	0.278	5.149	1.359	0.789	0.208	0.765	0.202
JLG	75	2	3200	1.412	0.373	6.216	1.641	1.097	0.290	1.064	0.281
Other	40	2	3200	1.091	0.154	5.444	0.766	0.784	0.110	0.761	0.107
14 Viaducts w/ Underpass Modifications (storm sewer, sidewalk, lighting, paving) 2 week/ viaduct, 1 crew, 1120 hours at site											
Excavator	200	1	1120	0.153	0.038	1.070	0.264	0.057	0.014	0.055	0.014
Roller	175	1	1120	0.187	0.040	1.735	0.374	0.177	0.038	0.172	0.037
Skid Steer	75	1	1120	1.055	0.097	5.149	0.476	0.789	0.073	0.765	0.071
Other	60	1	1120	1.412	0.104	6.216	0.459	1.097	0.081	1.064	0.079
Paving (14 Viaducts) - 2 day/ viaduct, 1 crew, 224 hours at site											
Paver w/ Trucks	400	1	224	0.175	0.017	2.230	0.220	0.134	0.013	0.130	0.013
Track Work - 80th Ave area and Columbus Ave area - 10 Month, 2 crews, 1600 hours at site											
Tie Crane	200	2	3200	0.174	0.123	1.672	1.177	0.077	0.054	0.074	0.052
Rubber Tire Crane	175	2	3200	0.174	0.107	1.672	1.030	0.077	0.047	0.074	0.046
Loader	300	2	3200	0.524	0.554	3.447	3.640	0.337	0.356	0.327	0.346
Threader	100	2	3200	1.464	0.515	6.347	2.234	1.206	0.424	1.169	0.412
Spiker (2/crew)	100	4	6400	1.464	1.030	6.347	4.468	1.206	0.849	1.169	0.823
Anchor Machine (2/crew)	100	4	6400	1.464	1.030	6.347	4.468	1.206	0.849	1.169	0.823
Mark IV Tamper	250	2	3200	0.965	0.849	6.037	5.313	0.656	0.577	0.637	0.560
Back-up Tamper	150	2	3200	1.059	0.559	6.337	3.346	0.759	0.401	0.736	0.389
Ballast Regulator	300	2	3200	0.965	1.019	6.037	6.375	0.656	0.693	0.637	0.672
Misc. Trucks	100	2	3200	0.144	0.051	0.675	0.237	0.040	0.014	0.039	0.014
General Equipment (Delivery Trucks and Low Boys) - 4 Delivery/week, 4 hours/delivery, 40 weeks, 640 hours at site											
Misc Trucks	200	1	640	0.142	0.020	0.633	0.089	0.021	0.003	0.021	0.003
Drainage - 4 Months, 1 crew, 640 hours at site											
Trencher	175	1	640	0.223	0.028	2.242	0.276	0.205	0.025	0.198	0.024
Excavator	200	1	640	0.153	0.022	1.070	0.151	0.057	0.008	0.055	0.008
Loader	300	1	640	0.524	0.111	3.447	0.728	0.337	0.071	0.327	0.069
Roller	175	1	640	0.187	0.023	1.735	0.214	0.177	0.022	0.172	0.021
Misc. Equipment	100	1	640	1.464	0.103	6.347	0.447	1.206	0.085	1.169	0.082
Construction Year 1 assumed to be year using most equipment. Work is assumed to consist of: Columbus Ave and 80th St. track improvements including 14 viaduct improvements, 4 viaducts with structure modification, 14 with underpass modifications											

Source: IDOT, *CONSTILL11.xls, page "2015 CNAA Diesel Const-RRMaint", EPA's NONROAD Emission Model, Core Model Ver 2008a,* Jacobs 2013.

If the engine type is not specified, and if there were both gas and diesel emission factors available for a specific equipment type for a specific horsepower, the emission factors that would produce the worst case for each pollutant was utilized. In cases where the equipment type was not included in the construction equipment table, emission factors for "other construction equipment" for the specified horsepower were utilized or emission factors from the railroad maintenance equipment table were utilized.

Table 1-2 summarizes the construction year analysis. The analysis demonstrates that the peak construction year emissions for HC, NO_x, PM_{10} or $PM_{2.5}$ are estimated to be less than the 100 ton/year *de minimis* threshold level. For this reason, this project is not required by the Illinois' General Conformity regulations to complete a full General Conformity determination.

Table 1-2: Construction Year Analysis

	HC (tons/year)	NO_x (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
Construction Emissions 2017	7.9	46.5	5.7	5.5
Threshold	*100*	*100*	*100*	*100*
Does Construction Year Total Emissions Exceed Threshold?	No	No	No	No

Source: Jacobs, 2013

1.1.2 Design Year Analysis

Emissions resulting from the change in operations in the design year were determined through obtaining fuel consumption information based on the CTCO Train Model that projects operations for the design year in both the No-Build and Build scenarios (Refer to Table 1-3). The fuel usage is then multiplied by the USEPA emission factors for locomotives, shown in Table 1-4, to determine the total emissions associated with each alternative. Table 1-5 summarizes the General Conformity emissions analysis. The analysis demonstrates that the increase in project-related emissions for HC, NO_x, PM_{10} or $PM_{2.5}$ is less than the 100 ton/year *de minimis* threshold level. For this reason, this project is not required by the Illinois' General Conformity regulations to complete a full General Conformity determination.

Table 1-3: Rail Fuel Usage

Alternative	Fuel Usage (gallons/year)
No -Build	1,978,118
Build	1,573,606
Delta Emissions due to Build	(404,511)

Source: Chicago Transportation Coordination Office. *"75th CIP Air Quality Results". April 28, 2011.*

Table 1-4: USEPA 2029 Emission Factors for Locomotives

HC (grams/gallon)	NO_x (grams/gallon)	PM_{10} (grams/gallon)	$PM_{2.5}$ (grams/gallon)
2.4	64	1.3	1.26

Source: USEPA, April 2009, *Technical Highlights, Emission Factors for Locomotives*, EPA Office of Transportation and Air Quality, EPA-420-F-09-025 and IDOT, April 2011, *Air Quality Methodology CREATE Projects*.

Table 1-5: Design Year Analysis

Alternative	HC (tons/year)	NO_x (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
No-Build	5.22	139.26	2.83	2.74
Build	4.15	110.78	2.25	2.18
Delta Emissions due to Build	-1.07	-28.48	-0.58	-0.56
Threshold	*100*	*100*	*100*	*100*
Does Design Year Delta Exceed Threshold?	No	No	No	No

Source: Jacobs, 2011

1.2 Transportation Conformity

The National Ambient Air Quality Standards (NAAQS), established by the US Environmental Protection Agency, set maximum allowable concentration limits for six criteria air pollutants. Areas in which air pollution levels persistently exceed the NAAQS may be designated as "nonattainment." States where a nonattainment area is located must develop and implement a State Implementation Plan (SIP) containing policies and regulations that will bring about attainment of the NAAQS. Areas that had been designated as nonattainment, but that have attained the NAAQS for the criteria pollutant(s) associated with the nonattainment designation, will be designated as maintenance areas.

All areas of Illinois currently are in attainment of the standards for four of the six criteria pollutants: carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead. The portion of Cook County where the project is located has been designated as attainment for the PM_{10} standards. For the eight-hour ozone and $PM_{2.5}$ standards, all of Cook County has been designated as a nonattainment area.

This project is included in the FY 2010-2015 Transportation Improvement Program (TIP) endorsed by the Metropolitan Planning Organization Policy Committee of the Chicago Metropolitan Agency for Planning (CMAP) for the region in which the project is located. Projects in the TIP are considered to be consistent with the 2010 regional transportation plan endorsed by CMAP (GO TO 2040). Portions of the project are contained in the fiscally constrained TIP; however, the project has funding needs beyond the horizon years of the TIP. Segments of the project will be moved into the TIP as its horizon years are advanced and funding is identified. There are three TIP identification numbers associated with the 75th Street CIP: 01-07-0001 for the passenger corridor from LaSalle Street Station/Union Station to Canal Interlocking/Chicago Ridge Interlocking; 01-06-0058 for the

71st Street/CSX grade separation; and 01-05-0012 for the East-West Corridor, including Belt Junction.

On October 25, 2010[1], the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) determined that the 2010 regional transportation plan conforms with the State Implementation Plan (SIP) and the transportation-related requirements of the 1990 Clean Air Act Amendments. On August 7, 2013[2], the FHWA and the FTA determined that the updated TIP also conforms with the SIP and the Clean Air Act Amendments. These findings were in accordance with 40 CFR Part 93, "Determining Conformity of Federal Actions to State or Federal Implementation Plans."

The scope of the project has not changed significantly from what was reflected in the TIP. Therefore, this project conforms to the existing SIP and the transportation-related requirements of the 1990 Clean Air Act Amendments.

1.3 PM Hot-Spot Analysis

A Hot-Spot Analysis is required only if the passenger rail portion of the project is deemed to be a project of air quality concern (with regards to PM_{10} and $PM_{2.5}$). The *Transportation Conformity Guidance for Qualitative Hot-spot Analysis in* $PM_{2.5}$ *and* PM_{10} *Non-Attainment and Maintenance Areas* (EPA 420-B-06-902) document has been released to assist with determining projects of air quality concern (Cook County is in a $PM_{2.5}$ non-attainment area). The CREATE team then developed the "Methodology for Determining if CREATE Passenger Rail Projects are "Projects of Air Quality Concern" in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas" for use with CREATE rail projects. The CREATE methodology identifies two conditions which are applicable to this type of project that would allow determination of whether this project is a "project of air quality concern":

- An increase of emissions similar to that of 10,000 trucks, referred to below as a "truck/train analysis".
- The new construction of a large terminal or station, referred to below as a "train arrival analysis".

1.3.1 Truck/Train Analysis

The 2029 $PM_{2.5}$ emission rate for heavy-duty diesel vehicles is 0.06854 grams/vehicle-mile.[3] Total $PM_{2.5}$ emissions for 10,000 trucks per day for one mile would be 685.4 grams.

The 2029 $PM_{2.5}$ emission rate for locomotives is 1.26 grams/gallon.[4] The increase in passenger locomotives between the No-Build and Build Alternatives is 6 per day (refer to Table 1-6). At a fuel consumption rate of 2.8 gallons/mile[5], the emissions per day for one mile would be 21.2 grams.

Table 1-6: Passenger Train Locomotive Volumes within 75th Street CIP

Passenger Service	Existing	No-Build	Build
Metra Southwest Service (1 locomotive per train)	30	32	34
Metra Rock Island District (1 locomotive per train)	78	78	78
Amtrak (2 locomotives per train)	4	8	12
Total	*112*	*118*	*124*

Source: CTCO, 2011

The net increase in emissions of PM2.5 from CREATE 75th Street CIP trains (21.2 grams/day) does not closely approach or exceed the PM2.5 emissions for 10,000 trucks (685.4 grams/day) during the Build year of 2029. Under this criterion the 75th Street CIP would not be a "project of air quality concern."

1.3.2 Train Arrival Analysis

The only potential change affecting the number of passenger train arrivals would result from shifting the terminus of the Southwest Service from Union Station to LaSalle Street Station by connecting the Metra Southwest Service (SWS) Line to the Rock Island District (RID) Line. Although this would not be a new bus or rail terminal, the project would cause increase use of a terminal, thus possibly expanding it to be considered a large terminal. A small terminal is considered a facility with 10 buses in the peak hour. From the CTCO data, the peak number of trains during the peak hour would be 11 in the build year (2029). To ensure a worst-case analysis of potential impacts, LaSalle Street Station is assumed not to be small terminal for the purposes of this analysis.

The rules then consider the increase in service at the terminal. If the increase closely approaches or exceeds 50%, it is an indication that the project is one of air quality concern. This shift would cause the passenger trains at LaSalle Street Station to increase from 78 in the existing conditions (2009) to 112 in the build conditions (2029). The net increase would be 34 trains, which is a 44% increase (Refer to Table 1-7). As this increase does not closely approach or exceed 50%, under this criterion, the 75th Street CIP would not be a "project of air quality concern."

Table 1-7: Train Arrival Analysis at LaSalle Street Station

Daily Passenger Trains Arrivals at LaSalle Street Station	Rock Island District	SWS	Total
Existing	78	0	78
Build	78	34	112
Increase	0	34	34
% increase of Build over Existing			*44%*

Source: CTCO, 2011

1.3.3 Conclusion

The project does not meet the definition of a project of air quality concern as defined in 40 CFR 93.123(b)(1). Because 75th Street CIP would not exceed the particulate-emission equivalent of 10,000 trucks and would not increase passenger trains by 50% or more, it has been determined that the project will not cause or contribute to any new localized $PM_{2.5}$ and PM_{10} violations or increase the frequency or severity of any $PM_{2.5}$ and PM_{10} violations. USEPA has determined that such projects meet the Clean Air Act's requirements without any further Hot-Spot analysis.

1.4 Locomotive Analysis

For the locomotive emissions analysis, the fuel consumption data from the CTCO Train Model were multiplied by the emission factors for HC, NO_x, PM_{10}, $PM_{2.5}$, and SO_2 (refer to Table 1-8) to estimate the annual emissions associated with each alternative (refer to Table 1-9). Table 1-9 compares the No-Build and Build emission levels with existing emission levels. While the number of train movements in 2029 with either the Build or No-Build Alternatives would increase substantially over existing conditions, improvements in fuel composition and engine emission controls will substantially reduce future total emissions below current levels for all criteria pollutants except CO, a benefit of the project. While total annual emissions of CO increase over the 2009 Existing Conditions, the emissions of CO would be lower for the Build Alternative than for the No-Build Alternative. The elimination of most train delays and locomotive idling with the Build Alternative are the principal reason for this improvement. Additionally, current and future USEPA locomotive regulations, as well as improvements in fuel composition, will continue to perpetuate better emissions performance.

Table 1-8: EPA Emission Factors for Locomotives

Year	HC (grams/gallon)	CO (grams/gallon)	NO_x (grams/gallon)	PM_{10} (grams/gallon)	SO_2 (lbs/gallon)
2009	9.1	26.6	172	4.9	0.0360
2029	2.4	26.6	64	1.3	0.000216*

** SO2 fuel content assumed to be 15 ppm, as required by EPA regulations for locomotives by 2012.*

Source: USEPA, April 2009, *Technical Highlights, Emission Factors for Locomotives*, EPA Office of Transportation and Air Quality, EPA-420-F-09-025 and USEPA, December 1992, *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*. EPA-420-R-92-009.

Table 1-9: Annual Locomotive Emissions

	HC (tons/ year)	CO (tons/ year)	NO_x (tons/ year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)*	SO_2 (tons/year)
Existing	11.04	32.27	208.66	5.94	5.77	19.85
Build Alternative	4.15	46.04	110.78	2.25	2.18	0.17
No-Build Alternative	5.22	57.88	139.26	2.83	2.74	0.21

**Per USEPA Publication EPA-420-F-09-025, Emission Factors for Locomotives, (April 2009), "PM2.5 emissions can be estimated as 0.97 times the PM10 emissions…"*

Source: Jacobs, 2011

1.5 Mobile Source Air Toxics

The Clean Air Act identified 188 air toxics, also known as hazardous air pollutants. The USEPA has assessed this expansive list of toxics and identified a group of 93 compounds emitted from mobile sources, listed in the USEPA Integrated Risk Information System (IRIS). The USEPA also identified a subset of this list of 93 that are considered the seven priority Mobile Source Air Toxics (MSATs). These are acrolein, benzene, 1,3-butidiene, diesel particular matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considered these to be the priority MSATs, USEPA stresses that the list is subject to change and may be revised in future rules.

FHWA has identified three levels of analysis required for analyzing MSATs in NEPA projects, depending upon the project circumstances:

- No analysis for projects with no potential for meaningful MSAT effects,
- Qualitative analysis for projects with low potential MSAT effects, or
- Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

Since the 75th Street CIP would improve transit and freight operations while reducing idling times and fuel usage, this project was classified as a project with low potential MSAT effects, requiring a qualitative analysis.[6] The qualitative analysis focuses on what the relative difference would be among the studied alternatives on potential MSAT emissions. Since emissions are related to fuel usage, the annual fuel usage for each alternative will be compared.

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 project. 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 Role

The US Environmental Protection Agency (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.” The IRIS can be accessed through the USEPA website (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.

Role of Other Organizations

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 or in the future as vehicle emissions substantially decrease. See research reports available through the HEI website (http://pubs.healtheffects.org/view.php?id=282 and http://pubs.healtheffects.org/view.php?id=306).

Problems with Modeling Methodologies

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, because such information is unavailable. The results produced by the USEPA’s MOBILE6.2 model, the California EPA's Emfac2007 model, and the USEPA’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.

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.

MSAT Toxicity Estimates

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

Level of Risk

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 (e.g., benzene emissions from refineries). The decision framework is a two-step process. The first step requires USEPA 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 US 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 transportation project would result in levels of risk greater than safe or acceptable.

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.

Qualitative Analysis

For each alternative in this FEIS, the amount of MSAT emitted would be proportional to the amount of rail activity, assuming that other variables (such as travel not associated with the project) are the same for each alternative. The estimated fuel usage for the Build Alternative is lower than that for the No-Build Alternative, because of the reduction in time it would take trains to operate within or traverse the corridor and the reduction in the time trains spend idling, leading to lower MSAT emissions (particularly diesel particulate matter) in the vicinity of the rail corridor.

Also, 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 annual MSAT emissions by over 80 percent from 2010 to 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 EPA-projected reductions are so significant (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future as well.

A Technical Memorandum was prepared for the CREATE Grand Crossing Rail Project (P4), which analyzed emissions specific to Cook County (see Attachment). The study concluded that future region-wide MSA emission levels would be significantly lower than today. Emissions from locomotives were estimated to be reduced by more than 60 percent from 2010 to 2030.

The additional freight activity contemplated as part of the Build Alternative will have the effect of increasing diesel emissions in the vicinity of nearby homes, schools, and businesses; therefore, under the Build Alternative there may be localized areas where ambient concentrations of MSAT would be higher than under the No-Build Alternative. However, as discussed above, the magnitude and the duration of these potential differences cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific health impacts. Even though there may be differences among the Alternatives, on a region-wide basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will cause substantial reductions over time that in almost all cases the MSAT levels in the future will be significantly lower than today.

TECHNICAL MEMORANDUM

Locomotive and On-Road Vehicle Class-Specific MSAT Emissions Trends Data Incorporating County-Specific Baseline Emissions Estimates – CREATE Grand Crossing Rail Project

August 2013

This memorandum documents the development and analysis of Mobile Source Air Toxics (MSAT) emissions for Cook County, Illinois. This data, which is more specific to the project context, is being developed to supplement the national-level trends presented the FHWA's Interim MSAT Guidance (FHWA, 2012). This data will be used as part of the MSAT analysis conducted for the Chicago Region Environmental and Transportation Efficiency (CREATE) Program Grand Crossing Rail Project (CREATE Project P4).

1. 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 EPA regulate 188 air toxics, also known as hazardous air pollutants (HAPs). The Environmental Protection Agency (EPA) has assessed this expansive list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (EPA, 2007), and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System, or IRIS (EPA, 2012a). These compounds are commonly referred to as Mobile Source Air Toxics (MSATs). In addition, from their 1999 National Air Toxics Assessment (NATA) the EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers. These are acrolein, benzene, 1,3-butidiene, diesel particulate matter (DPM), formaldehyde, naphthalene, and polycyclic organic matter (POM). The Federal Highway Administration (FHWA) has published updated guidance (*Interim MSAT Guidance*) for analyzing MSAT impacts generated by highway projects (FHWA, 2012). The FHWA identifies the preceding seven compounds as priority MSATs. The following summarizes HAPs of particular concern for which mobile sources make substantial contributions to total emissions. This information is taken from the most recently-released NATA (EPA, 2012b), which uses 2005 as a base analysis year:

National cancer risk driver:

- Formaldehyde

Regional cancer risk drivers:

- Benzene
- Polycyclic Aromatic Hydrocarbons (PAHs), a subset of POM
- Naphthalene

National cancer risk contributors:

- 1,3-Butadiene

- Acetaldehyde

National noncancer hazard drivers:

- Acrolein

Regional noncancer hazard drivers:

- DPM

2. Methodology

The FHWA's Interim MSAT Guidance includes a chart that demonstrates predicted future national trends in vehicle miles traveled (VMT) and emissions of the priority MSATs for the entire on-road vehicle fleet. However, relevant, source category-specific future MSAT emissions predictions for a region-wide superset of the study area (i.e., Cook County) were not available.

To better assess the MSAT implications of the Grand Crossing Rail Project, the Project Team developed Cook County trend data that is more specific to the project context than the national-level trends presented in the FHWA's Interim MSAT Guidance for on-road vehicles as a whole (FHWA, 2012). The benefits of this greater specificity include:

- Provision of a more geographically-specific emissions baseline;
- Inclusion of a key mobile emissions source (locomotives) that is both the subject of this project and an unusually important baseline emissions source within the project study area; and
- Isolation of an on-road vehicle source category – heavy-duty trucks – that is also particularly important within the project study area and whose activity could be affected by CREATE projects that influence freight transportation modes.

These trend data are not intended to represent project- and CREATE Program-specific MSAT emissions predictions; such predictions are beyond the reasonable scope of the air quality assessment conducted as part of the Environmental Impact Statement to fulfill the requirements of the National Environmental Policy Act (NEPA). Rather, they are intended to provide a more appropriate and relevant estimate of baseline and future emissions that takes into account both the geographic context and the type of vehicles affected by the proposed project.

Cook-County-specific Baseline Emissions Estimates

To accomplish this, the Project Team utilized EPA-promulgated predictions of future nationwide trends in emissions (EPA, 2008) to forecast relative changes in predicted 2008 baseline county-wide emissions (EPA, 2013). Predicted changes in emissions over time reflect both anticipated changes in emissions rates per unit of activity (e.g., vehicle miles traveled, gallons of fuel consumed, etc.) and changes in activity rates (e.g., the number of active vehicles and the amount of activity – miles traveled or gallons consumed, etc. – per vehicle). The baseline national data was taken from the most recent (2008) EPA National Emissions Inventory (NEI).

Table 1 presents an excerpt of an emissions data processing spreadsheet that includes Cook-County-specific estimates of locomotive MSAT emissions from that dataset (EPA, 2013). Table 2 presents corresponding data for on-road vehicular emissions.

Incorporation of National-level Predicted Future Emissions Trends

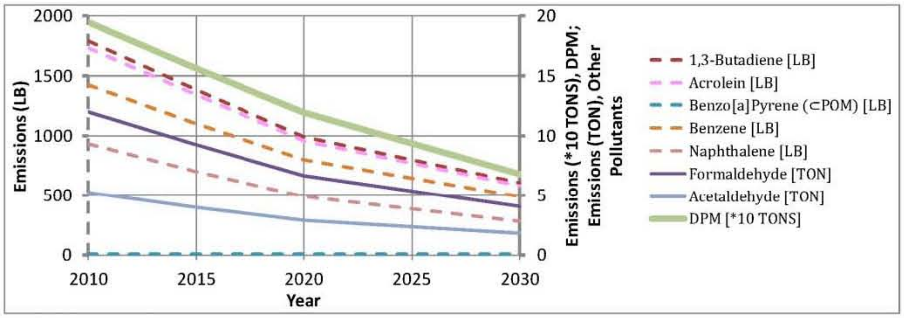
In the absence of identified geographically-specific future MSAT emissions predictions, this assessment applies predicted relative trends in future nationwide MSAT emissions to the aforementioned Cook County baseline emissions data. Table 3 includes relevant EPA-derived (EPA, 2008) predicted future trends in gaseous MSAT emissions from locomotives. Table 4 provides analogous data for particulate matter less than 10 microns in diameter (PM_{10}), the relative trend data for which is applied here as a surrogate for future trends in diesel PM (DPM) emissions. Finally, Table 5 summarizes EPA-promulgated predictions of future nationwide MSAT emissions from on-road vehicles (EPA, 2005 and 2006) and the relative future emissions trends derived from them.

3. Results

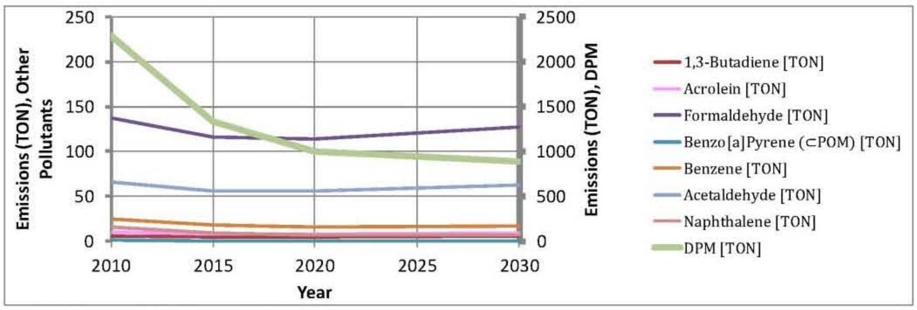
The microscale analysis completed for the Grand Crossing Rail Project showed that the project is predicted (relative to the future No Build alternative) to generate beneficial emissions impacts for CAA criteria pollutants including hydrocarbons (HC) and PM_{10}. MSAT impacts tend to be roughly proportional to exhaust emissions of organic gases (e.g., HC or volatile organic compounds (VOC)) and/or particulate matter (e.g., PM_{10}) depending on the specific toxic compound. Therefore, predicted reductions in HC and PM_{10} emissions with the project indicate that the project would reduce locomotive-generated MSAT emissions. The project has not been linked with any special MSAT concerns that would represent an exception to this assessment.

Moreover, adopted EPA regulations for diesel locomotive engine/exhaust systems and fuels are predicted to result in reductions in activity-based emission rates that more than counteract predicted increases in locomotive activity levels throughout the nation. As Figure 1(a) shows, the anticipated result is a decrease in annual MSAT emissions from locomotives despite those projected activity level increases.

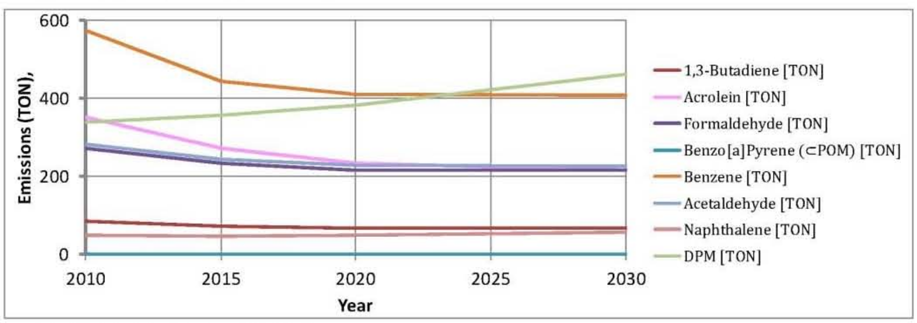
Figures 1(b) and 1(c) demonstrate that MSAT emissions from light- and heavy-duty on-road motor vehicles are expected to decrease or – in the case of DPM for light-duty on-road vehicles – increase slightly over time. In the case of DPM, future reductions in emissions from heavy-duty on-road vehicles are predicted to exceed future increases in emissions from corresponding light-duty vehicles. Given the projected future reductions in DPM emissions from locomotives, the overall national trend for DPM emissions from ground transportation sources is downward for areas influenced by emissions from both on-road vehicles and locomotives. In the case of formaldehyde and acetaldehyde, the corresponding overall nationwide trend for ground transportation sources is a decrease in emissions through 2020 followed by a slight increase in emissions (driven by heavy-duty on-road vehicles) over the subsequent ten years.



(a) Locomotives



(b) Heavy-duty On-road Vehicles



(c) Light-duty On-road Vehicles

Sources: EPA, 2006, 2008, 2012

Figure 1: Predicted Annual Emissions of Priority MSATs within Cook County by Mobile Source Type

Along the proposed project corridor, the magnitude and the duration of these potential increases compared to the No-Build alternative cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts. In sum, the localized level of MSAT emissions for the Build Alternative could be higher relative to the No Build Alternative, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSAT emissions 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 emission levels to be significantly lower than today.

Excerpt of Spreadsheet Used to Process Cook-County-Specific Baseline MSAT Emissions Estimates
:tion of Future MSAT Trends

:misInventory/2008v2/nei2008v2_national_county_level_sector.zip

s	state_abbr	county_name	EI_Sector		description	Representing	Equivalent	uom	2008	Final Units	Poll
31	IL	Cook	Mobile - Locomotives	Locomotives	1,3-Butadiene	1,3-Butadiene	1,3-Butadiene	LB	1936.285422	LB	1,3-
31	IL	Cook	Mobile - Locomotives	Locomotives	Acrolein	Acrolein	Acrolein	LB	1863.572657	LB	Acr
31	IL	Cook	Mobile - Locomotives	Locomotives	Formaldehyde	Formaldehyde	Formaldehyde	LB	25821.69545	TON	For
31	IL	Cook	Mobile - Locomotives	Locomotives	Benzo[a]Pyrene	Benzo[a]Pyrene (IPOM)	POM	LB	1.114772852	LB	Ben
31	IL	Cook	Mobile - Locomotives	Locomotives	Benzene	Benzene	Benzene	LB	1542.21503	LB	Ben
31	IL	Cook	Mobile - Locomotives	Locomotives	Acetaldehyde	Acetaldehyde	Acetaldehyde	LB	11206.51198	TON	Ace
31	IL	Cook	Mobile - Locomotives	Locomotives	Naphthalene	Naphthalene	Naphthalene	LB	1044.725948	LB	Nap
31	IL	Cook	Mobile - Locomotives	Locomotives	PM10 Primary (Filt + Cond)	DPM	POM	TON	202.8152776	*10 TONS	DPI

2013; Parsons, 2013

Excerpt of Spreadsheet Used to Process Cook-County-Specific Baseline MSAT Emissions Estimates
:tion of Future MSAT Trends

:misInventory/2008v2/nei2008v2_national_county_level_sector.zip

s	state_abbr	county_name	EI_Sector		description	Representing	Equivalent	uom	2008	Final Units	Poll
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	HDVs	1,3-Butadiene	1,3-Butadiene	1,3-Butadiene	LB	15385.34198	TON	1,3-
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	HDVs	Acrolein	Acrolein	Acrolein	LB	26305.04471	TON	Acr
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	HDVs	Formaldehyde	Formaldehyde	Formaldehyde	LB	323191.6845	TON	For
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	HDVs	Benzo[a]Pyrene	Benzo[a]Pyrene (IPOM)	POM	LB	2951.345857	TON	Ber
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	HDVs	Benzene	Benzene	Benzene	LB	61622.59152	TON	Ber
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	HDVs	Acetaldehyde	Acetaldehyde	Acetaldehyde	LB	152010.341	TON	Ace
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	HDVs	Naphthalene	Naphthalene	Naphthalene	LB	37446.62871	TON	Nap
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	HDVs	PM10 Primary (Filt + Cond)	DPM	POM	TON	2756.551751	TON	DPI
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	LDVs	1,3-Butadiene	1,3-Butadiene	1,3-Butadiene	LB	215344.8759	TON	1,3-
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	LDVs	Acrolein	Acrolein	Acrolein	LB	39917.19615	TON	Acr
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	LDVs	Formaldehyde	Formaldehyde	Formaldehyde	LB	705186.2426	TON	For
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	LDVs	Benzo[a]Pyrene	Benzo[a]Pyrene (IPOM)	POM	LB	395.1257378	TON	Ber
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	LDVs	Benzene	Benzene	Benzene	LB	1381630.356	TON	Ber
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	LDVs	Acetaldehyde	Acetaldehyde	Acetaldehyde	LB	690511.9775	TON	Ace
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	LDVs	Naphthalene	Naphthalene	Naphthalene	LB	111478.9019	TON	Nap
31	IL	Cook	Mobile - On-Road Diesel Heavy Duty Vehicles	LDVs	PM10 Primary (Filt + Cond)	DPM	POM	TON	395.1257378	TON	DPI

2013; Parsons, 2013

Footnotes are listed at the end of this section

Table 3 – Excerpt of Spreadsheet Deriving Proportional Locomotive Gaseous MSAT Emission Trends from Absolute Trends Predicted by the EPA

EPA420-R-08-001

Table 3-86 Control Case Air Toxic Emissions for Locomotives (short tons)

HAP	2008	2010	2015	2020	2030	*2008*	*2010*	*2015*	*2020*	*2030*
BENZENE	85.5	79	61	44	27	*100%*	*92%*	*71%*	*51%*	*32%*
FORMALDEHYDE	1362.3	1,264	971	698	429	*100%*	*93%*	*71%*	*51%*	*31%*
ACETALDEHYDE	594.2	551	424	305	187	*100%*	*93%*	*71%*	*51%*	*31%*
1,3-BUTADIENE	99.6	92	71	51	31	*100%*	*92%*	*71%*	*51%*	*31%*
ACROLEIN	95.8	89	69	49	30	*100%*	*93%*	*72%*	*51%*	*31%*
NAPHTHALENE	44.9	40	30	21	12	*100%*	*89%*	*67%*	*47%*	*27%*
POM	26.8	25	20	15	8	*100%*	*93%*	*75%*	*56%*	*30%*

Source: EPA, 2008; Parsons, 2013

Table 4 – Excerpt of Spreadsheet Deriving Proportional Locomotive DPM Emission Trends from Absolute PM_{10} Emissions Trends Predicted by the EPA

EPA420-R-08-001

Table 3-81 Control Case PM10 Emissions for Locomotives (short tons)

Calendar Year	Large Line-haul	Large Switch	Small Railroads	Passenger/ Commuter	Total	
2006	28,477	2,304	492	1,023	32,296	
2007	28,401	2,329	500	1,011	32,241	
2008	23,287	2,019	442	822	26,569	*100%*
2009	22,804	2,039	449	807	26,100	*98%*
2010	22,248	2,019	456	774	25,498	*96%*
2011	21,234	2,037	464	741	24,476	*92%*
2012	20,203	1,987	471	701	23,362	*88%*
2013	18,945	1,972	469	647	22,034	*83%*
2014	18,313	1,928	477	611	21,329	*80%*
2015	17,451	1,942	481	574	20,448	*77%*
2016	16,329	1,891	485	532	19,237	*72%*
2017	15,214	1,904	490	490	18,097	*68%*
2018	14,363	1,883	494	448	17,188	*65%*
2019	13,540	1,895	498	407	16,341	*62%*
2020	12,938	1,798	502	375	15,613	*59%*
2021	12,324	1,809	507	350	14,990	*56%*
2022	11,675	1,752	511	325	14,263	*54%*
2023	11,016	1,732	515	300	13,563	*51%*
2024	10,367	1,655	520	275	12,817	*48%*
2025	9,712	1,543	524	250	12,029	*45%*
2026	9,091	1,505	528	227	11,351	*43%*
2027	8,492	1,460	533	207	10,692	*40%*
2028	7,915	1,412	537	188	10,053	*38%*
2029	7,363	1,361	542	172	9,438	*36%*
2030	6,844	1,305	543	157	8,849	*33%*
2031	6,349	1,244	544	144	8,281	*31%*
2032	5,879	1,179	545	132	7,735	*29%*
2033	5,431	1,111	546	121	7,209	*27%*
2034	5,026	1,040	547	111	6,723	*25%*
2035	4,653	969	547	101	6,270	*24%*
2036	4,326	897	548	93	5,864	*22%*
2037	4,033	840	548	86	5,508	*21%*
2038	3,775	801	549	81	5,205	*20%*
2039	3,556	761	549	76	4,941	*19%*
2040	3,375	720	549	72	4,717	*18%*

Source: EPA, 2008; Parsons, 2013

ieet that Distills Predicted Future MSAT Emissions Quantities fi
ıs Trends from those Quantities

	Emissions (ton/yr)					
	1999	2008	2010	2015	2020	2030
	Base	Base	Vehicle Controls	Fuel and Vehicle Controls	Fuel and Vehicle Controls	Fuel and Vehicle Controls
ƆVs: 1,3-Butadiene: National	2.67E+03	1.39E+03	1.11E+03	8.93E+02	8.67E+02	9.62E+02
ƆVs: Acetaldehyde: National	8.44E+03	5.39E+03	4.71E+03	4.00E+03	3.93E+03	4.42E+03
ƆVs: Acrolein: National	1.54E+03	7.72E+02	6.01E+02	4.80E+02	4.70E+02	5.28E+02
ƆVs: Benzene: National	9.23E+03	4.92E+03	3.96E+03	2.87E+03	2.59E+03	2.61E+03
ƆVs: Formaldehyde: National	2.52E+04	1.52E+04	1.29E+04	1.09E+04	1.07E+04	1.20E+04
ƆVs: Naphthalene: National	9.39E+02	5.51E+02	4.65E+02	2.80E+02	2.14E+02	1.91E+02
ƆVs: POM: National	1.46E+02	8.35E+01	6.96E+01	4.05E+01	3.04E+01	2.69E+01
ıVs: 1,3-Butadiene: National	2.12E+04	1.23E+04	9.67E+03	8.27E+03	7.79E+03	7.74E+03
ıVs: Acetaldehyde: National	2.14E+04	1.41E+04	1.15E+04	9.97E+03	9.29E+03	9.26E+03
ıVs: Acrolein: National	2.30E+03	1.42E+03	1.14E+03	9.79E+02	9.12E+02	9.06E+02
ıVs: Benzene: National	1.74E+05	1.19E+05	9.88E+04	7.62E+04	7.05E+04	7.01E+04
ıVs: Formaldehyde: National	5.52E+04	3.13E+04	2.40E+04	2.06E+04	1.92E+04	1.92E+04
ıVs: Naphthalene: National	3.12E+03	2.04E+03	1.79E+03	1.74E+03	1.77E+03	2.07E+03
ıVs: POM: National	3.51E+02	2.15E+02	1.85E+02	1.94E+02	2.09E+02	2.51E+02

REFERENCES

EPA, 2005. United States Environmental Protection Agency (EPA), 'onroad_pivot_0905.xls', from Docket ID: EPA-HQ-OAR-2005-0036 and referenced in National Scale Modeling of Air Toxics for the Mobile Source Air Toxics Rule (http://www.regulations.gov/#!docketBrowser;rpp=25;po=0;D=EPA-HQ-OAR-2005-0036); Technical Support Document, January 2006 (http://www.regulations.gov/contentStreamer?objectId=09000064801f6f02&disposition=attachment&contentType=pdf). Provided via email from Rich Cook, Environmental Scientist, Office of Transportation and Air Quality (OTAQ) on November 6, 2012.

EPA, 2006. EPA, 'onroad_0906.xls', Ibid.

EPA, 2007. EPA, Control of Hazardous Air Pollutants from Mobile Sources: Final Rule to Reduce Mobile Source Air Toxics, February 26, 2007.

(http://www.epa.gov/otaq/regs/toxics/420f07017.pdf)

EPA, 2008. EPA, Regulatory Impact Analysis: Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression Ignition Engines Less than 30 Liters Per Cylinder, May. (http://nepis.epa.gov/Exe/ZyNET.exe/P10024CN.TXT?ZyActionD=ZyDocument&Client=EPA&Index=2006+Thru+2010&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C06thru10%5CTxt%5C00000005%5CP10024CN.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=p%7Cf&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL#)

EPA, 2012a. EPA, Integrated Risk Information System (IRIS).

(http://www.epa.gov/IRIS/)

EPA, 2012b. EPA, National-Scale Air Toxics Assessment (NATA).

(http://www.epa.gov/nata/)

EPA, 2013. EPA, "The National Emissions Inventory," March 14. (http://www.epa.gov/ttn/chief/net/2008inventory.html)

FHWA, 2012. Federal Highway Administration (FHWA), "Memorandum – From*: Original Signed by*: April Marchese, Director, Office of Natural Environment, To: Division Administrators, Federal Lands Highway Division Engineers, Subject: INFORMATION: Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA," December 6. (http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/aqintguidmem.cfm

Endnotes:

[1]CMAP Annual Report, Fiscal Year 2012-13, http://www.cmap.illinois.gov/annual-reports, accessed 11/5/13.

[2] Donovan, John M. "Transportation Improvement Program Amendment Chicago Metropolitan Area." Letter to Charles Ingersoll. 7 April. 2013. *TIP Schedule and Approvals*. CMAP, http://www.cmap.illinois.gov/documents/20583/1307820/08-02-13_TIP_Approval.pdf/ab713ab3-1a59-4182-9987-56a26e958637, accessed 11/5/13..

[3] Emission factor generated by IDOT using EPA's MOVES model, transmitted in email from Adin McCann, HNTB to Kim Glinkin, Jacobs, November 20, 2012.

[4] USEPA, 2009. *Emission Factors for Locomotives*. EPA Office of Transportation and Air Quality, April, 2009, EPA-420-F-09-025. Per this guidance, the emission rate of 1.3 grams/gallon for PM10 was multiplied by 97% to estimate the emission rate for PM2.5.

[5] Metra, 2004. *CREATE Project P1 Data Request Responses*. Letter from W.K. Tupper, Metra Chief Engineering Officer, to Charles J. Stenzel, TranSystems. Dated December 14, 2004. Transmitted in TranSystems memo to Larry Wilson/Walt Zyznieuski, IDOT, subject: CREATE Project P1 Preliminary Air Quality Hot Spot Analysis, dated February 19, 2008. Confirmed by CTCO on 11/22/11 to continue to use this rate as Metra's fleet has remained unchanged.

[6] FHWA, Air Quality, Transportation & Toxic Air Pollutants, http://www fhwa.dot.gov/environment/air_quality/air_toxics/, accessed 11/5/13.