Appendix K

Air Quality and Climate Analysis

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APPENDIX K
AIR QUALITY AND CLIMATE ANALYSIS

K.1 Background

The Canadian National Railway Company and Grand Trunk Corporation (collectively, CN or the Applicants) are seeking authorization from the Surface Transportation Board (Board) to acquire control of EJ&E West Company, a wholly owned non-carrier subsidiary of Elgin, Joliet and Eastern Railway Company (EJ&E). Appendix K describes the methods of analysis that the Board's Section of Environmental Analysis (SEA) used to determine potential air quality impacts of the proposed acquisition. The Applicants are proposing to acquire control of EJ&E West Company and to use the EJ&E rail line to connect all five of CN's rail lines in Chicago (the Proposed Action). The SEA has evaluated the potential effects of the Proposed Action and alternatives on air quality. SEA will use the methodology presented herein to estimate the following:

- Air emissions associated with construction and operation
- Air emissions resulting from changes in grade crossing delays
- Air emissions from truck-to-rail diversions, if applicable
- Net air emissions from the Proposed Action and the No Action Alternative

K.2 Air Quality Methodology

The Board's environmental regulations at 49 CFR 1105.7(e)(5) address the factors to consider relating to air quality, and the criteria for determining when air analyses should be completed. Section 1105.79(e)(5)(i)(A) states that if a proposed action will result in "an increase in rail traffic of at least 100 percent (measured in gross ton miles annually) or an increase of at least eight trains a day on any segment of rail line affected by the proposal," the effect on air emissions must be quantified. Additionally, Section 1105.7(e)(5)(ii)(A) states that if a proposed action would affect a nonattainment area under the Clean Air Act, and would result in "an increase in rail traffic of at least 50 percent (measured in gross ton miles annually) or an increase of at least three trains a day on any segment of rail line," SEA will assess whether any expected increased emissions are within the parameters established by the State Implementation Plan under the Clean Air Act. Multiple track segments involved in the Proposed Action meet both of these criteria for a nonattainment area because all or parts of the ten counties in the Study Area are designated nonattainment for one or more pollutants of concern (refer to Section 3.9.1).

SEA's air quality analysis evaluated the direct impacts from locomotive and vehicular emissions within the region that would result from the No Action Alternative, in comparison to emissions associated with the Proposed Action, for the following criteria pollutants: volatile organic compounds (VOC); carbon monoxide (CO); nitrogen oxides (NO_x); sulfur dioxide (SO_2); and two sizes of particulate matter (PM_{10} and $PM_{2.5}$). These pollutants were analyzed because they are EPA's primary indicators of air quality. The region-wide emissions changes are especially relevant to some pollutants, such as ozone, that are affected mostly by regional emissions as opposed to localized emissions. Ozone is affected by emissions of precursor pollutants, especially NO_x and VOC, over a large area. The term "precursor pollutants" refers to pollutants which react with sunlight and other chemicals to form ozone.

This section also includes a discussion of other operations-related air quality issues, including (stratospheric) ozone-depleting materials, which are transported on rail lines that would be affected by the Proposed Action, and hot-spot analyses for carbon monoxide and air toxics.

The air quality analysis also considers the emissions due to construction activities that would potentially occur as a result of the Proposed Action.

K.2.1 Operational Air Emissions Methodology

The operational air quality analysis is provided for 2015, consistent with the timeframe in the traffic analysis. In general, this year is expected to provide a maximum impact scenario for analysis of all emissions related to the Proposed Action for all pollutants of concern. This is primarily because of the rapid decreases in projected emissions from locomotives and other nonroad emissions resulting from EPA emission standards. EPA has promulgated emissions standards for new and rebuilt locomotives which result in progressively reduced emissions over time. Locomotive emissions, which make up the majority of emissions related to the Proposed Action, are expected to decrease in coming decades for the U.S. locomotive fleet (EPA 2008i). This analysis assumes that emissions from the Applicants' locomotive fleet will decrease at the same general rate as the overall U.S. fleet as projected by EPA.

K.2.1.1 Fuel Use Data - Original and Revised Figures

The specific method of calculating the operational air emissions is described in the next subsection. First, however, it is important for the reader to understand the overall operational fuel use data that are used in this analysis, because original, published information was later supplemented and revised by the Applicants.

For some aspects of the air quality analysis, two sets of emissions estimates were made to reflect data originally supplied by the Applicants, as well as to reflect revised data provided at SEA's request which considered fuel-savings benefits to foreign carriers as a result of improved connections and fuel-savings benefits due to less locomotive idling time. SEA initially requested that the Applicants provide fuel use changes based on its Operating Plan (Board 2008c). On March 26, 2008, the Applicants provided the requested fuel use information based on the Applicants' Operating Plan (Applicants 2008b). This is referred to as the "Original CN Fuel Use Estimates." The Applicants calculated the fuel use for the No Action Alternative and the Proposed Action using the Train Performance Calculator (TPC). As part of SEA's review of the Operating Plan as described in Section 4.1, SEA confirmed and validated the fuel use information from the Applicants.

> **What is TPC?**
> A Train Performance Calculator (TPC) is an industry standard model that looks at the performance characteristics of a single train, such as trip duration, speed, fuel use, and fuel efficiency.

However, SEA then determined that the approaches used by the Applicants might not have factored in certain fuel use savings. Specifically, SEA was aware that the TPC did not calculate the reduction in locomotive idle time that would result from implementation of the Operating Plan, and that the Applicants did not estimate fuel savings for other carriers based on the change in the interchange location that would result under the Proposed Action. On April 14, 2008, SEA requested that the Applicants provide a best estimate of the fuel savings attributable to reduced locomotive idle time and foreign carrier savings (Board 2008d). On May 23, 2008, the Applicants provided SEA with the estimates referred to in this analysis as "Revised CN Fuel Use Estimates" (Applicants 2008l).

In addition to providing the fuel savings information, the "Revised CN Fuel Use Estimates" also reflect a change in the original number of active CN trains for the analysis year (2015). The "Original CN Fuel Use Estimates" reflected the Operating Plan submitted by the Applicants with the application, which assumed that CN's Class I partners would negotiate changes in existing routing arrangements. However, one of CN's Class I partners (CSXT) has since informed CN that it is unwilling to change the current arrangement it has with CN regarding the routing of CSXT trains on CN's line in the Chicago area; therefore, the "Revised CN Fuel Use Estimates" reflect an adjustment in fuel consumption because two CSXT trains are now expected to remain on their current route (on segment CN-2) instead of moving on to the EJ&E line.

The emissions due to vehicular traffic delay affected by this change were not calculated in this air quality analysis because the analysis reflecting the Operating Plan is conservative for all public at-grade crossings along the EJ&E line. There are no public at-grade crossings along segment CN-2; therefore, allowing two CSXT trains to remain on this segment would not change the delay emissions analysis of the existing line on which these trains travel, and would slightly reduce the vehicle delay emissions for the EJ&E line.

Throughout this discussion of air quality impacts, where two sets of emissions estimates were made, to reflect both the Original and the Revised CN Fuel Use Estimates, tables are titled "Original Estimates" (for example, Table 4.9-1 in Section 4.9 of the text), and "Revised Estimates" (for example, Table 4.9-2 in Section 4.9 of the text). For some emissions and fuel-use components (i.e., idling fuel-use savings and other carrier fuel savings), there are no "Original" versions of the tables, because these components were not addressed in the original CN fuel use information transmittal.

K.2.1.2 Locomotive Emissions Calculations

SEA developed quantitative estimates of operation-related emissions changes associated with the Proposed Action for VOCs, CO, $NO_{x,}$, SO_2, PM_{10}, and $PM_{2.5}$, which are criteria pollutants. SEA estimated emissions based on annual fuel use changes between CN and EJ&E rail line segments projected to occur as a result of the Proposed Action. Additionally, fuel use changes for other carriers operating on CN and EJ&E rail line segments were also considered. Finally, the reduction in fuel use resulting from reduced idling time by CN trains was also considered in the estimate of emissions changes (Applicants 2008j). For these fuel use changes, emission factors were calculated for 2015 based on EPA's nationwide rail emissions inventory (developed in the Regulatory Impact Analysis (RIA) for the 2008 locomotive emissions standards), coupled with Table 9 of a technical highlight document for the 1999 locomotive rule, which provides the expected fleet average emission factors for all locomotives (EPA 2008i and 1997). To update the Table 9 emission factors to fit the 2008 locomotive emission standards, SEA multiplied the emission factors listed in the referenced Table 9 by the yearly emissions from the RIA for the 2008 rule (the control case) and divided by the yearly emissions listed in the RIA for the 1997 rule (the baseline). This process of multiplying by the ratio of control case to baseline emissions, by pollutant, results in an estimate of the year-by-year emission factors in grams per gallon for the entire fleet of locomotives under the 2008 rule (EPA 2008i).

SEA used No Action and Proposed Action fuel use quantities to estimate emissions, using estimated gram/gallon emission factors calculated as described above. SEA used the following equation to estimate emissions from line-haul operations:

$$\textbf{\textit{Annual Emissions (ER) = E x FC}}$$

where:

ER	=	Annual emissions by pollutant, in grams/year, which was then converted to tons/year.
E	=	Estimated fleet-average emission factor, in grams/gallon.
FC	=	Estimated annual fuel consumption for line-haul locomotives during operation, in gallons/year.

K.2.1.3 Vehicle Idling Emissions Calculations

As part of the air quality analysis, SEA developed a quantitative estimate of emissions associated with the combustion of fuel by vehicles delayed at highway/rail at-grade crossings. SEA estimated emissions caused by delayed highway vehicles at all public at-grade crossings potentially affected by the Proposed Action for all criteria pollutants. SEA used the estimated vehicle delay time in combination with the number of days per year, annual average daily traffic volume (AADT), and fleet average emission factors to estimate the increase in air emissions from delayed idling vehicles. The vehicle delay time was estimated as shown in Section 4.3.1 of this document.

The 2015 fleet-average emission factors in grams/vehicle-hour were obtained for this analysis from EPA's MOBILE6.2 emission factor (EF) model (EPA 2003b). SEA used the MOBILE6.2 model to obtain emissions factors in units of grams per vehicle-mile at a speed of 2.5 mph, and then multiplied those numbers by 2.5 mph to produce an emissions factor representative of an idling vehicle in units of grams of pollutant per vehicle-hour of operation. As input to MOBILE6.2, SEA used local average temperatures based on climate data, and local data on Reid Vapor Pressure. For all other MOBILE6.2 inputs, SEA used national default values that have been developed by EPA and which are already incorporated in the MOBILE6.2 input files.

SEA converted values of grams/year (shown as "E" in the following equation) to tons/year as appropriate.

$$E \text{ (grams/yr)} = D_{an} \text{ (vehicle-hours/yr)} \times EF \text{ (grams/vehicle-hour)}$$

K.2.2 Construction-Related Air Emissions Calculations

For its analysis, SEA assumed that construction-related emissions would occur over a three-year period between 2009 and 2011 and would occur evenly across the three-year time frame. SEA developed a quantitative estimate of the emissions associated with the construction phase of the Proposed Action for all criteria pollutants. Information on the duration of the construction activities, hours of use of construction and support equipment, and the surface area that would be disturbed was compiled for use in the estimate of construction emissions. The duration of construction activities was taken from data provided by the Applicants, indicating that construction would occur over multiple construction seasons, which for the purposes of this analysis SEA has assumed would take place between 2009 and 2011. This analysis assumed that the hours of construction would be evenly distributed across all three years. The type, size (horsepower), and hours of equipment operation for SEA's analysis were developed using engineering estimates based on industry experience for the type of construction being proposed. Appendix K shows the total hours of operation for each piece of equipment expected to be used for construction activities. The surface area to be disturbed was estimated using geographic information systems (GIS) mapping of the potential construction areas.

SEA estimated construction-related emissions from off-road equipment and a switch locomotive that would be used for handling construction materials. Off-road diesel equipment was assumed to include ballast compactors, ballast regulators, ballast tampers, portable rail drills, portable rail saws (gasoline), self-propelled anchor applicators, track crane (i.e., speed swing), backhoes/loaders, bulldozers, compactors, excavators, generators, graders, rollers/compactors, construction trucks, and haul trucks.

SEA used emission factors produced by the EPA's NONROAD2005 model (Version 2005.1.0) and graphical user interface. NONROAD2005, which links to information in the NONROAD emission inventory model, is a software tool for predicting emissions from small and large nonroad vehicles, equipment, and engines (EPA 2006a). The various option settings for temperature, Reid Vapor Pressure (RVP), and gasoline and diesel sulfur content within NONROAD2005 can be found in Attachment K1. For fugitive particulate emissions (that is, for dust emissions not coming from a fixed exhaust point), SEA used emission factors taken from documents prepared for the Western Regional Air Partnership (WRAP) (Countess Environmental 2004; Midwest Research Institute 2005).

For activities associated with construction, SEA estimated the annual emissions for all pollutants using the following equation:

Annual Emissions (ER) = H x B x EF

where:

ER	=	Annual emissions by pollutant, in grams/year, which was then converted to tons/year.
H	=	Total annual unit hours of equipment use. Load factors, a fraction of load based on the estimate of hours of usage per year, fuel consumption per year, and fuel consumption rate at rated power for each engine in the field that was surveyed, are included within NONROAD2005. In-use adjustment factors, which represent operational behavior of nonroad equipment unlike the steady-state testing procedures used in emissions testing, are also included.
B	=	Brake horsepower rating, or bhp. The rating is determined by nonroad equipment type.
EF	=	Exhaust emission factor by pollutant, as appropriate, in grams per bhp-hour (g/bhp-hr). For VOCs, the emission factor includes contributions from emissions other than exhaust, including crankcase, diurnal loss, hot soak, running loss, tank and hose permeation, vapor displacement, and spillage emissions. These types of emissions do not exist for other pollutants analyzed.

For fugitive particulate emissions associated with construction, SEA estimated the annual emissions using the following equation:

Annual Emissions (ER) = SA x SF x EF x 12/M

where:

ER	=	Annual emissions by pollutant, in tons/year.
SA	=	Surface area of a given area of anticipated construction, in acres.
SF	=	Scaling factor for each location, in months. This is calculated by dividing SA by the total sum of all SA values to determine a percentage of total construction time required for each location, and multiplied by M.
EF	=	Exhaust emission factor by pollutant, as appropriate, in tons/acre/month.
M	=	Total months estimated to complete construction at all locations. For this project, M is assumed to be 36 months.

K.3 Air Toxics, Reference Concentrations and Cancer Risk Factors Methodology

The air toxics analysis performed by SEA evaluates impacts of motor vehicle traffic delayed by trains at public at-grade crossings on the ambient air surrounding the crossing. The dispersion model and meteorological data for this analysis are the same as used for the CO hot-spot analysis described above with a few exceptions. Receptor locations were placed at the corners of structures nearest the roadway and rail crossing in each of the four quadrants surrounding the crossing and at the nearest edges of structures adjacent to the roadway. Structures were chosen to conservatively estimate locations where persons might be present over a 70-year period. The "pollutant type" parameter was set to PM (particulate matter), to give results in units of micrograms per cubic meter ($\mu g/m^3$) for ease of comparison with IRIS thresholds.

The CAL3QHC dispersion model produces results for a 1-hour averaging period. To convert from 1-hour concentrations to 24-hour concentrations, the results were multiplied by 0.6 in accordance with EPA guidance. To convert from 1-hour concentrations to annual concentrations, the results were multiplied by 0.1 (EPA 1992).[1] These factors assumed the more conservative values for each averaging period's factor, to account for the low height of the emission source.

Emission estimates of the five MSATs analyzed were based on emission factors output by EPA's MOBILE6.2 emissions model for on-road sources. Table 4.9-24, in Section 4.9 of the text, lists the MSAT queue (2.5 mph) and free-flow (30 and 45 mph) emission factors for 2015 used in this analysis for the Proposed Action. The free-flow traffic at the Ogden crossing was assumed to travel at 45 mph, and the free-flow traffic at the Washington and Woodruff crossings was assumed to travel at 30 mph. Because MOBILE6.2 emission factors for MSATs are output in milligrams per vehicle-mile, and because of limitations in the number of significant figures calculated by the CAL3QHC model, results from CAL3QHC were divided by 1,000 to determine concentrations in $\mu g/m^3$, because CAL3QHC expects emission rates to be in units of grams per vehicle-mile.

K.4 Climate Change Methodology

SEA qualitatively evaluated the potential effects of the Proposed Action and other alternatives to contribute to local and global changes in the climate.

Local climate effects are discussed in terms of any substantial changes in land use that could affect the radioactive and heat release characteristics of the area, thus contributing to the well-documented urban heat island effect. Presumably, these changes due to the Proposed Action would be quite small in comparison to the existing urban system-wide effects of human activities in the Chicago area.

SEA assessed potential contributions to global climate change based on any estimated change in greenhouse gas (GHG) emissions created through the burning of fossil fuels. To qualitatively assess global impacts, SEA used the same information gathered for the energy analysis portion of this document. If the energy analysis shows that total energy (such as fuel) use decreases under the Proposed Action compared to the No Action alternative, then GHG emissions and their potential impact on global climate would also be reduced relative to the No Action alternative.

On the other hand, if GHG emissions are projected to increase due to the Proposed Action, SEA qualitatively assessed the increase in GHG emissions in comparison to the rate of GHG emissions from fossil fuel activities worldwide. To assess cumulative impacts of any increase in project GHG emissions, SEA discusses the evidence that cumulative GHG emissions globally are, or are not, having a discernable impact on global climate.

[1] EPA, *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised*, EPA0454/R-92-019, October 1992.

Attachment K1

Calculation Spreadsheets

Crossings for Hot Spot Analysis

EJ&E Crossings of Concern for Hot Spot Analysis

Street	2015 ADT	2015 One-way Peak Hour	2015 LOS	D_C	N	Red Time	Max Trains/Hr	Cycle Time
Woodruff	10659	640	F	6.81	42.3	408.6	4.23	851.1
Washington Street	11714	703	F	8.10	28.3	486.0	2.83	1272.1
Ogden Avenue (US 34)	45828	2750	B	2.31	39.5	138.6	3.95	911.4

Construction Emissions

Project	STB - CN/EJ&E Acquisition
Activity	Construction Schedule
Construction Year	2009

Emission Calculations for Volatile Organic Compounds

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	1.654	26437	0.029
Ballast Regulators	200	425	1.120	95196	0.105
Ballast Tampers	250	425	1.120	118995	0.131
Portable Rail Drills	3	850	2.127	5424	0.006
Portable Rail Saws	1	850	23.503	19978	0.022
Self-Propelled Anchor Applicators	47	850	1.568	62648	0.069
Work Trains	1500	170	1.278	325985	0.359
Track crane (speed swing)	300	850	1.120	285587	0.315
General Construction Equipment					
Backhoes/Loaders	250	850	1.028	218374	0.241
Bulldozers	300	1190	0.296	105504	0.116
Compactors	15	850	0.885	11280	0.012
Excavators	300	425	0.284	36148	0.040
Generators	100	850	0.763	64836	0.071
Graders	200	850	0.294	49896	0.055
Rollers/Compactors	350	850	0.305	90643	0.100
Trucks - Construction	400	3400	0.193	261829	0.289
Haul Trucks	330	1700	0.193	108004	0.119
Total Tons/Yr Construction Emissions					**2.080**

[a] Emission factor taken from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project	STB - CN/EJ&E Acquisition
Activity	Construction Schedule
Construction Year	2009

Emission Calculations for Nitrogen Oxides

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	6.850	109467	0.121
Ballast Regulators	200	425	6.704	569823	0.628
Ballast Tampers	250	425	6.704	712278	0.785
Portable Rail Drills	3	850	6.932	17676	0.019
Portable Rail Saws	1	850	2.458	2089	0.002
Self-Propelled Anchor Applicators	47	850	5.775	230708	0.254
Work Trains	1500	170	8.052	2053136	2.263
Track crane (speed swing)	300	850	6.704	1709468	1.884
General Construction Equipment					
Backhoes/Loaders	250	850	6.305	1339868	1.477
Bulldozers	300	1190	3.860	1377918	1.519
Compactors	15	850	5.677	72386	0.080
Excavators	300	425	3.653	465758	0.513
Generators	100	850	5.966	507127	0.559
Graders	200	850	3.829	650980	0.718
Rollers/Compactors	350	850	4.890	1454828	1.604
Trucks - Construction	400	3400	3.583	4872833	5.371
Haul Trucks	330	1700	3.583	2010044	2.216
Total Tons/Yr Construction Emissions					**20.014**

[a] Emission factor taken from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project	STB - CN/EJ&E Acquisition
Activity	Construction Schedule
Construction Year	2009

Emission Calculations for Particulate Matter 10

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	1.296	20707	0.023
Ballast Regulators	200	425	0.778	66095	0.073
Ballast Tampers	250	425	0.778	82619	0.091
Portable Rail Drills	3	850	1.416	3610	0.004
Portable Rail Saws	1	850	0.168	143	0.000
Self-Propelled Anchor Applicators	47	850	1.002	40015	0.044
Work Trains	1500	170	0.790	201439	0.222
Track crane (speed swing)	300	850	0.778	198286	0.219
General Construction Equipment					
Backhoes/Loaders	250	850	0.643	136554	0.151
Bulldozers	300	1190	0.256	91353	0.101
Compactors	15	850	0.542	6912	0.008
Excavators	300	425	0.246	31314	0.035
Generators	100	850	0.621	52780	0.058
Graders	200	850	0.255	43271	0.048
Rollers/Compactors	350	850	0.296	88068	0.097
Trucks - Construction	400	3400	0.213	290005	0.320
Haul Trucks	330	1700	0.213	119627	0.132
Total Tons/Yr Construction Emissions					**1.623**

[a] Emission factor taken from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project	STB - CN/EJ&E Acquisition
Activity	Construction Schedule
Construction Year	2009

Emission Calculations for Particulate Matter 2.5

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	1.257	20086	0.022
Ballast Regulators	200	425	0.754	64113	0.071
Ballast Tampers	250	425	0.754	80141	0.088
Portable Rail Drills	3	850	1.373	3501	0.004
Portable Rail Saws	1	850	0.155	131	0.000
Self-Propelled Anchor Applicators	47	850	0.972	38814	0.043
Work Trains	1500	170	0.766	195396	0.215
Track crane (speed swing)	300	850	0.754	192338	0.212
General Construction Equipment					
Backhoes/Loaders	250	850	0.623	132457	0.146
Bulldozers	300	1190	0.248	88613	0.098
Compactors	15	850	0.526	6704	0.007
Excavators	300	425	0.238	30375	0.033
Generators	100	850	0.602	51197	0.056
Graders	200	850	0.247	41973	0.046
Rollers/Compactors	350	850	0.287	85426	0.094
Trucks - Construction	400	3400	0.207	281305	0.310
Haul Trucks	330	1700	0.207	116038	0.128
Total Tons/Yr Construction Emissions					**1.575**

[a] Emission factor taken from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project	STB - CN/EJ&E Acquisition
Activity	Construction Schedule
Construction Year	2009

Emission Calculations for Carbon Monoxide

Equipment	**HP**	**HR/YR**	**EF g/hp-hr[a]**	**Grams/YR**	**Tons/YR**
Specialized Railroad Equipment					
Ballast Compactors	94	170	8.077	129067	0.142
Ballast Regulators	200	425	4.466	379607	0.418
Ballast Tampers	250	425	4.466	474509	0.523
Portable Rail Drills	3	850	11.018	28096	0.031
Portable Rail Saws	1	850	655.066	556806	0.614
Self-Propelled Anchor Applicators	47	850	6.294	251431	0.277
Work Trains	1500	170	5.392	1374993	1.516
Track crane (speed swing)	300	850	4.466	1138822	1.255
General Construction Equipment					
Backhoes/Loaders	250	850	3.851	818323	0.902
Bulldozers	300	1190	1.256	448465	0.494
Compactors	15	850	3.280	41815	0.046
Excavators	300	425	1.224	156001	0.172
Generators	100	850	3.288	279487	0.308
Graders	200	850	1.248	212228	0.234
Rollers/Compactors	350	850	2.184	649887	0.716
Trucks - Construction	400	3400	1.480	2012700	2.219
Haul Trucks	330	1700	1.480	830239	0.915
Total Tons/Yr Construction Emissions					**10.783**

[a] Emission factor taken from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project	STB - CN/EJ&E Acquisition
Activity	Construction Schedule
Construction Year	2009

Emission Calculations for Sulfur Dioxide

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	0.212	3384	0.004
Ballast Regulators	200	425	0.191	16231	0.018
Ballast Tampers	250	425	0.191	20289	0.022
Portable Rail Drills	3	850	0.211	539	0.001
Portable Rail Saws	1	850	0.053	45	0.000
Self-Propelled Anchor Applicators	47	850	0.212	8462	0.009
Work Trains	1500	170	0.191	48655	0.054
Track crane (speed swing)	300	850	0.191	48693	0.054
General Construction Equipment					
Backhoes/Loaders	250	850	0.191	40596	0.045
Bulldozers	300	1190	0.164	58630	0.065
Compactors	15	850	0.180	2296	0.003
Excavators	300	425	0.164	20941	0.023
Generators	100	850	0.180	15317	0.017
Graders	200	850	0.164	27919	0.031
Rollers/Compactors	350	850	0.164	48856	0.054
Trucks - Construction	400	3400	0.164	223482	0.246
Haul Trucks	330	1700	0.164	92186	0.102
Total Tons/Yr Construction Emissions					**0.746**

[a] Emission factor taken from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project	STB - CN/EJ&E Acquisition
Activity	Construction Schedule
Construction Year	2010

Emission Calculations for Volatile Organic Compounds

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	1.572	25122	0.028
Ballast Regulators	200	425	1.059	90038	0.099
Ballast Tampers	250	425	1.059	112548	0.124
Portable Rail Drills	3	850	1.914	4882	0.005
Portable Rail Saws	1	850	21.319	18121	0.020
Self-Propelled Anchor Applicators	47	850	1.328	53071	0.058
Work Trains	1500	170	1.213	309298	0.341
Track crane (speed swing)	300	850	1.059	270114	0.298
General Construction Equipment					
Backhoes/Loaders	250	850	0.968	205703	0.227
Bulldozers	300	1190	0.278	99284	0.109
Compactors	15	850	0.800	10204	0.011
Excavators	300	425	0.266	33968	0.037
Generators	100	850	0.723	61429	0.068
Graders	200	850	0.276	46944	0.052
Rollers/Compactors	350	850	0.279	83132	0.092
Trucks - Construction	400	3400	0.190	258335	0.285
Haul Trucks	330	1700	0.190	106563	0.117
Total Tons/Yr Construction Emissions					**1.972**

[a] Emission factor take from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project	STB - CN/EJ&E Acquisition
Activity	Construction Schedule
Construction Year	2010

Emission Calculations for Nitrogen Oxides

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	6.591	105318	0.116
Ballast Regulators	200	425	6.409	544750	0.600
Ballast Tampers	250	425	6.409	680937	0.751
Portable Rail Drills	3	850	6.510	16600	0.018
Portable Rail Saws	1	850	2.302	1957	0.002
Self-Propelled Anchor Applicators	47	850	5.602	223803	0.247
Work Trains	1500	170	7.805	1990153	2.194
Track crane (speed swing)	300	850	6.409	1634250	1.801
General Construction Equipment					
Backhoes/Loaders	250	850	6.006	1276306	1.407
Bulldozers	300	1190	3.586	1280195	1.411
Compactors	15	850	5.430	69230	0.076
Excavators	300	425	3.377	430615	0.475
Generators	100	850	5.771	490510	0.541
Graders	200	850	3.555	604311	0.666
Rollers/Compactors	350	850	4.609	1371122	1.511
Trucks - Construction	400	3400	3.347	4552442	5.018
Haul Trucks	330	1700	3.347	1877882	2.070
Total Tons/Yr Construction Emissions					**18.905**

[a] Emission factor take from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project STB - CN/EJ&E Acquisition
Activity Construction Schedule
Construction Year 2010

Emission Calculations for Particulate Matter 10

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	1.242	19840	0.022
Ballast Regulators	200	425	0.716	60860	0.067
Ballast Tampers	250	425	0.716	76075	0.084
Portable Rail Drills	3	850	1.265	3226	0.004
Portable Rail Saws	1	850	0.156	132	0.000
Self-Propelled Anchor Applicators	47	850	0.882	35220	0.039
Work Trains	1500	170	0.727	185430	0.204
Track crane (speed swing)	300	850	0.716	182579	0.201
General Construction Equipment					
Backhoes/Loaders	250	850	0.601	127607	0.141
Bulldozers	300	1190	0.234	83621	0.092
Compactors	15	850	0.483	6162	0.007
Excavators	300	425	0.226	28815	0.032
Generators	100	850	0.586	49775	0.055
Graders	200	850	0.233	39624	0.044
Rollers/Compactors	350	850	0.266	79129	0.087
Trucks - Construction	400	3400	0.205	279450	0.308
Haul Trucks	330	1700	0.205	115273	0.127
Total Tons/Yr Construction Emissions					**1.513**

[a] Emission factor take from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project STB - CN/EJ&E Acquisition
Activity Construction Schedule
Construction Year 2010

Emission Calculations for Particulate Matter 2.5

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	1.204	19245	0.021
Ballast Regulators	200	425	0.695	59034	0.065
Ballast Tampers	250	425	0.695	73792	0.081
Portable Rail Drills	3	850	1.227	3129	0.003
Portable Rail Saws	1	850	0.143	122	0.000
Self-Propelled Anchor Applicators	47	850	0.855	34163	0.038
Work Trains	1500	170	0.705	179867	0.198
Track crane (speed swing)	300	850	0.695	177102	0.195
General Construction Equipment					
Backhoes/Loaders	250	850	0.582	123779	0.136
Bulldozers	300	1190	0.227	81112	0.089
Compactors	15	850	0.469	5977	0.007
Excavators	300	425	0.219	27951	0.031
Generators	100	850	0.568	48281	0.053
Graders	200	850	0.226	38436	0.042
Rollers/Compactors	350	850	0.258	76755	0.085
Trucks - Construction	400	3400	0.199	271067	0.299
Haul Trucks	330	1700	0.199	111815	0.123
Total Tons/Yr Construction Emissions					**1.468**

[a] Emission factor take from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project STB - CN/EJ&E Acquisition
Activity Construction Schedule
Construction Year 2010

Emission Calculations for Carbon Monoxide

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	7.933	126771	0.140
Ballast Regulators	200	425	4.207	357625	0.394
Ballast Tampers	250	425	4.207	447031	0.493
Portable Rail Drills	3	850	10.284	26224	0.029
Portable Rail Saws	1	850	653.548	555516	0.612
Self-Propelled Anchor Applicators	47	850	5.528	220859	0.243
Work Trains	1500	170	5.125	1306837	1.441
Track crane (speed swing)	300	850	4.207	1072875	1.183
General Construction Equipment					
Backhoes/Loaders	250	850	3.618	768814	0.847
Bulldozers	300	1190	1.237	441756	0.487
Compactors	15	850	3.079	39261	0.043
Excavators	300	425	1.222	155856	0.172
Generators	100	850	3.211	272962	0.301
Graders	200	850	1.233	209533	0.231
Rollers/Compactors	350	850	2.037	605910	0.668
Trucks - Construction	400	3400	1.453	1975527	2.178
Haul Trucks	330	1700	1.453	814905	0.898
Total Tons/Yr Construction Emissions					**10.360**

[a] Emission factor take from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project	STB - CN/EJ&E Acquisition
Activity	Construction Schedule
Construction Year	2010

Emission Calculations for Sulfur Dioxide

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	0.006	102	0.000
Ballast Regulators	200	425	0.006	487	0.001
Ballast Tampers	250	425	0.006	609	0.001
Portable Rail Drills	3	850	0.006	16	0.000
Portable Rail Saws	1	850	0.053	45	0.000
Self-Propelled Anchor Applicators	47	850	0.006	254	0.000
Work Trains	1500	170	0.006	1460	0.002
Track crane (speed swing)	300	850	0.006	1461	0.002
General Construction Equipment					
Backhoes/Loaders	250	850	0.006	1218	0.001
Bulldozers	300	1190	0.005	1759	0.002
Compactors	15	850	0.005	69	0.000
Excavators	300	425	0.005	628	0.001
Generators	100	850	0.005	460	0.001
Graders	200	850	0.005	838	0.001
Rollers/Compactors	350	850	0.005	1466	0.002
Trucks - Construction	400	3400	0.005	6705	0.007
Haul Trucks	330	1700	0.005	2766	0.003
Total Tons/Yr Construction Emissions					**0.022**

[a] Emission factor take from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project	STB - CN/EJ&E Acquisition
Activity	Construction Schedule
Construction Year	2011

Emission Calculations for Volatile Organic Compounds

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	1.493	23856	0.026
Ballast Regulators	200	425	0.984	83677	0.092
Ballast Tampers	250	425	0.984	104596	0.115
Portable Rail Drills	3	850	1.714	4370	0.005
Portable Rail Saws	1	850	20.893	17759	0.020
Self-Propelled Anchor Applicators	47	850	1.110	44362	0.049
Work Trains	1500	170	1.144	291791	0.322
Track crane (speed swing)	300	850	0.984	251031	0.277
General Construction Equipment					
Backhoes/Loaders	250	850	0.892	189545	0.209
Bulldozers	300	1190	0.254	90730	0.100
Compactors	15	850	0.723	9215	0.010
Excavators	300	425	0.242	30817	0.034
Generators	100	850	0.684	58156	0.064
Graders	200	850	0.252	42871	0.047
Rollers/Compactors	350	850	0.253	75364	0.083
Trucks - Construction	400	3400	0.182	247928	0.273
Haul Trucks	330	1700	0.182	102270	0.113
Total Tons/Yr Construction Emissions					**1.839**

[a] Emission factor taken from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project STB - CN/EJ&E Acquisition
Activity Construction Schedule
Construction Year 2011

Emission Calculations for Nitrogen Oxides

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	6.347	101419	0.112
Ballast Regulators	200	425	6.037	513146	0.566
Ballast Tampers	250	425	6.037	641432	0.707
Portable Rail Drills	3	850	6.115	15594	0.017
Portable Rail Saws	1	850	2.272	1931	0.002
Self-Propelled Anchor Applicators	47	850	5.444	217471	0.240
Work Trains	1500	170	7.455	1900970	2.095
Track crane (speed swing)	300	850	6.037	1539437	1.697
General Construction Equipment					
Backhoes/Loaders	250	850	5.619	1194013	1.316
Bulldozers	300	1190	3.190	1138962	1.255
Compactors	15	850	5.202	66329	0.073
Excavators	300	425	3.009	383638	0.423
Generators	100	850	5.583	474571	0.523
Graders	200	850	3.160	537120	0.592
Rollers/Compactors	350	850	4.255	1265829	1.395
Trucks - Construction	400	3400	2.975	4045450	4.459
Haul Trucks	330	1700	2.975	1668748	1.839
Total Tons/Yr Construction Emissions					**17.313**

[a] Emission factor taken from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project	STB - CN/EJ&E Acquisition
Activity	Construction Schedule
Construction Year	2011

Emission Calculations for Particulate Matter 10

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	1.206	19264	0.021
Ballast Regulators	200	425	0.656	55780	0.061
Ballast Tampers	250	425	0.656	69724	0.077
Portable Rail Drills	3	850	1.136	2896	0.003
Portable Rail Saws	1	850	0.153	130	0.000
Self-Propelled Anchor Applicators	47	850	0.784	31328	0.035
Work Trains	1500	170	0.674	171922	0.190
Track crane (speed swing)	300	850	0.656	167339	0.184
General Construction Equipment					
Backhoes/Loaders	250	850	0.556	118241	0.130
Bulldozers	300	1190	0.207	73725	0.081
Compactors	15	850	0.441	5627	0.006
Excavators	300	425	0.203	25859	0.029
Generators	100	850	0.565	48020	0.053
Graders	200	850	0.206	34950	0.039
Rollers/Compactors	350	850	0.238	70931	0.078
Trucks - Construction	400	3400	0.188	255581	0.282
Haul Trucks	330	1700	0.188	105427	0.116
Total Tons/Yr Construction Emissions					**1.385**

[a] Emission factor taken from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project STB - CN/EJ&E Acquisition
Activity Construction Schedule
Construction Year 2011

Emission Calculations for Particulate Matter 2.5

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	1.169	18686	0.021
Ballast Regulators	200	425	0.637	54106	0.060
Ballast Tampers	250	425	0.637	67633	0.075
Portable Rail Drills	3	850	1.102	2809	0.003
Portable Rail Saws	1	850	0.141	120	0.000
Self-Propelled Anchor Applicators	47	850	0.761	30388	0.033
Work Trains	1500	170	0.654	166764	0.184
Track crane (speed swing)	300	850	0.637	162318	0.179
General Construction Equipment					
Backhoes/Loaders	250	850	0.540	114694	0.126
Bulldozers	300	1190	0.200	71513	0.079
Compactors	15	850	0.428	5458	0.006
Excavators	300	425	0.197	25084	0.028
Generators	100	850	0.548	46579	0.051
Graders	200	850	0.199	33902	0.037
Rollers/Compactors	350	850	0.231	68803	0.076
Trucks - Construction	400	3400	0.182	247913	0.273
Haul Trucks	330	1700	0.182	102264	0.113
Total Tons/Yr Construction Emissions					**1.344**

[a] Emission factor taken from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project	STB - CN/EJ&E Acquisition
Activity	Construction Schedule
Construction Year	2011

Emission Calculations for Carbon Monoxide

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	7.796	124575	0.137
Ballast Regulators	200	425	3.866	328623	0.362
Ballast Tampers	250	425	3.866	410779	0.453
Portable Rail Drills	3	850	9.580	24430	0.027
Portable Rail Saws	1	850	653.250	555262	0.612
Self-Propelled Anchor Applicators	47	850	4.823	192671	0.212
Work Trains	1500	170	4.774	1217384	1.342
Track crane (speed swing)	300	850	3.866	985870	1.087
General Construction Equipment					
Backhoes/Loaders	250	850	3.288	698666	0.770
Bulldozers	300	1190	1.099	392400	0.433
Compactors	15	850	2.894	36894	0.041
Excavators	300	425	1.082	137899	0.152
Generators	100	850	3.138	266697	0.294
Graders	200	850	1.095	186135	0.205
Rollers/Compactors	350	850	1.815	540042	0.595
Trucks - Construction	400	3400	1.273	1731925	1.909
Haul Trucks	330	1700	1.273	714419	0.787
Total Tons/Yr Construction Emissions					**9.419**

[a] Emission factor taken from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Project	STB - CN/EJ&E Acquisition
Activity	Construction Schedule
Construction Year	2011

Emission Calculations for Sulfur Dioxide

Equipment	HP	HR/YR	EF g/hp-hr[a]	Grams/YR	Tons/YR
Specialized Railroad Equipment					
Ballast Compactors	94	170	0.006	102	0.000
Ballast Regulators	200	425	0.006	480	0.001
Ballast Tampers	250	425	0.006	599	0.001
Portable Rail Drills	3	850	0.006	16	0.000
Portable Rail Saws	1	850	0.052	45	0.000
Self-Propelled Anchor Applicators	47	850	0.006	254	0.000
Work Trains	1500	170	0.006	1438	0.002
Track crane (speed swing)	300	850	0.006	1439	0.002
General Construction Equipment					
Backhoes/Loaders	250	850	0.006	1197	0.001
Bulldozers	300	1190	0.005	1698	0.002
Compactors	15	850	0.005	69	0.000
Excavators	300	425	0.005	604	0.001
Generators	100	850	0.005	460	0.001
Graders	200	850	0.005	808	0.001
Rollers/Compactors	350	850	0.005	1435	0.002
Trucks - Construction	400	3400	0.005	6441	0.007
Haul Trucks	330	1700	0.005	2657	0.003
Total Tons/Yr Construction Emissions					**0.022**

[a] Emission factor taken from EPA's NONROAD model.

[b] Emission factors shown here include default input load factors within the NONROAD model for each type of equipment, as specified in Table 4 of EPA Report No. NR-005A (revised June 15, 1998).

Construction-related Fugitive Dust

36 = # of months estimated to complete all construction

	Location	Surface Area (acres)	Scaling Factor (months)	Emission Factor (tons/acre/month)			Emissions (tons/location)			Annual Emissions (tons/location)		
				PM	PM_{10}	$PM_{2.5}$	PM	PM_{10}	$PM_{2.5}$	PM	PM_{10}	$PM_{2.5}$
Anticipated Locations of Construction	Leithton	7.4	1.24	1.2	0.11	0.01	10.9	1.00	0.10	3.6	0.33	0.03
	Matteson	22.0	3.68				97.1	8.90	0.89	32.4	2.97	0.30
	Kirk Yard	4.6	0.77				4.3	0.39	0.04	1.4	0.13	0.01
	Griffith	5.6	0.95				6.4	0.59	0.06	2.1	0.20	0.02
	Walker Siding	16.5	2.77				54.8	5.02	0.50	18.3	1.67	0.17
	Ivanhoe	5.8	0.97				6.8	0.62	0.06	2.3	0.21	0.02
	Diamond Lake to Gilmer	44.2	7.42				394.2	36.14	3.61	131.4	12.05	1.20
	East Joliet to Frankfort	62.7	10.53				792.7	72.67	7.27	264.2	24.22	2.42
	East Siding	36.5	6.13				268.8	24.64	2.46	89.6	8.21	0.82
	Munger	3.7	0.63				2.8	0.26	0.03	0.9	0.09	0.01
	Joliet	5.4	0.90				5.9	0.54	0.05	2.0	0.18	0.02
	Totals	**215**	**36**		**Emission Totals**		**1,644.7**	**150.77**	**15.08**	**548**	**50.26**	**5.03**
Alternate Locations	Matteson (SW&NE Alt)	16.2	2.71	1.2	0.11	0.01	52.6	4.82	0.48	17.5	1.61	0.16
	Munger (Original)	4.9	0.82				4.8	0.44	0.04	1.6	0.15	0.01
	Munger (NW Alt)	4.6	0.78				4.3	0.40	0.04	1.4	0.13	0.01
	Joliet (Alt)	5.6	0.94				6.4	0.58	0.06	2.1	0.19	0.02

NOTES:

(1) PM_{10} emission factor reference taken from WRAP *Fugitive Dust Handbook* , Chapter 3, Construction and Demolition, Table 3-2 Recommended PM_{10} Emission Factors for Construction Operations, Level 1 (November 15, 2004) for "average conditions". These factors were based on a work schedule of 168 hours per month.

(2) AP-42, Section 13.2.3 was utilized for PM General Construction emission factor due to the absence of a similar factor in the WRAP *Fugitive Dust Handbook* .

(3) $PM_{2.5}$ is assumed to be 10% of $PM_{10,}$ taken from WRAP *Analysis of the Fine Fraction of Particulate Matter in Fugitive Dust, Final Report* (October 12, 2005).

Air Quality Operations
Original Data

Fuel Use by CN Trains on All Lines	Fuel Use per Day (Imperial Gal)		Total per Day (Imperial Gal)	Fuel Use per Day (US Gal)		Total per Day (US Gal)	Fuel Use per Year (US Gal)		Total per Year (US Gal)
	CN Trains on EJ&E	CN Trains on CN and Other		CN Trains on EJ&E	CN Trains on CN and Other		CN Trains on EJ&E	CN Trains on CN and Other	
No Action (any year)	366	11,317	11,683	439	13,591	14,031	160,377	4,960,826	5,121,203
Action (any year)	15,630	1,704	17,334	18,772	2,046	20,818	6,851,706	746,957	7,598,663
Net Change (any year)	*15,264*	*-9,613*	*5,652*	*18,332*	*-11,545*	*6,788*	*6,691,329*	*-4,213,869*	*2,477,460*

Fuel Use by Other Carriers on All Lines	Fuel Use per Day (Imperial Gal)		Total per Day (Imperial Gal)	Fuel Use per Day (US Gal)		Total per Day (US Gal)	Fuel Use per Year (US Gal)		Total per Year (US Gal)
	Other Trains on EJ&E	Other Trains on CN		Other Trains on EJ&E	Other Trains on CN		Other Trains on EJ&E	Other Trains on CN	
No Action (any year)			0	0	0	0	0	0	0
Action (any year)			0	0	0	0	0	0	0
Net Change (any year)	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*

Idling Fuel Use by CN Trains on All Lines	Idling Fuel Use per Day (Imperial Gal)		Total per Day (Imperial Gal)	Idling Fuel Use per Day (US Gal)		Total per Day (US Gal)	Idling Fuel Use per Day (US Gal)		Total per Year (US Gal)
	CN Trains on EJ&E	CN Trains on CN and Other		CN Trains on EJ&E	CN Trains on CN and Other		CN Trains on EJ&E	CN Trains on CN and Other	
No Action (any year)			0	0	0	0	0	0	0
Action (any year)			0	0	0	0	0	0	0
Net Change (any year)	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*

	Total per Year (US Gal)	2015 Emission Factors (g/gal)						2015 Emissions (tons/yr)					
		VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
No Action (2015)	5,121,203	6.59	27.40	136.73	0.10	4.38	4.25	37.2	154.7	771.8	0.56	24.7	24.0
Action (2015)	7,598,663							55.2	229.5	1145.2	0.84	36.7	35.6
Net Change (2015)	*2,477,460*							*18.0*	*74.8*	*373.4*	*0.27*	*11.96*	*11.61*

SO2 emission rates were estimated as follows:
Fuel density = 7.1 lb per gallon
Molecular weight of sulfur (S) = 32.06
Molecular weight of sulfur dioxide (SO2) = 64.06
Ratio of S:SO2 = 1.998
Fuel sulfur by weight = 3000 ppm (typical upper range for 2006-2007)
Fuel sulfur by weight = 500 ppm (typical upper range for 2008-2012)
Fuel sulfur by weight = 15 ppm (typical upper range for 2013-2040)
(gallons of fuel) (7.1 lb/gal) (S_w) (1.998) = lbs of SO2/2000 = tons per year

Air Quality Operations
Revised Data

Fuel Use by Active CN Trains on All Lines	Fuel Use per Day (Imperial Gal)		Total per Day (Imperial Gal)	Fuel Use per Day (US Gal)		Total per Day (US Gal)	Fuel Use per Year (US Gal)		Total per Year (US Gal)
	Active CN Trains on EJ&E	Active CN Trains on CN and Other		Active CN Trains on EJ&E	Active CN Trains on CN and Other		Active CN Trains on EJ&E	Active CN Trains on CN and Other	
No Action (any year)	366	11,317	11,683	440	13,592	14,031	160,442	4,960,977	5,121,418
Action (any year)	14,133	1,896	16,029	16,974	2,277	19,251	6,195,413	831,140	7,026,553
Net Change (any year)	*13,767*	*-9,421*	*4,346*	*16,534*	*-11,315*	*5,220*	*6,034,971*	*-4,129,837*	*1,905,134*

Fuel Use by Foreign Carriers	(Imperial Gal)		Total per Day (Imperial Gal)	(US Gal)		Total per Day (US Gal)	(US Gal)		Total per Year (US Gal)
	Foreign Trains Active	Foreign Trains Delay		Foreign Trains Active	Foreign Trains Delay		Foreign Trains Active	Foreign Trains Delay	
No Action (any year)	2,803	267	3,070	3,366	321	3,687	1,228,737	117,043	1,345,781
Action (any year)	981	10	991	1,178	12	1,190	430,036	4,384	434,420
Net Change (any year)	*-1,822*	*-257*	*-2,079*	*-2,188*	*-309*	*-2,497*	*-798,701*	*-112,660*	*-911,361*

Idling Fuel Use by Delayed CN Trains on All Lines	Idling Fuel Use per Day (Imperial Gal)		Total per Day (Imperial Gal)	Idling Fuel Use per Day (US Gal)		Total per Day (US Gal)	Idling Fuel Use per Day (US Gal)		Total per Year (US Gal)
	Delayed CN Trains on EJ&E	Delayed CN Trains on CN and Other		Delayed CN Trains on EJ&E	Delayed CN Trains on CN and Other		Delayed CN Trains on EJ&E	Delayed CN Trains on CN and Other	
No Action (any year)	0	1,317	1,317	0	1,582	1,582	0	577,327	577,327
Action (any year)	249	241	490	299	289	588	109,153	105,646	214,799
Net Change (any year)	*249*	*-1,076*	*-827*	*299*	*-1,292*	*-993*	*109,153*	*-471,681*	*-362,528*

Air Quality Operations
Revised Data

Fuel Use by Active CN Trains on All Lines	Total per Year (US Gal)	2015 Emission Factors (g/gal)						2015 Emissions (tons/yr)					
		VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
No Action (2015)	5,121,418	6.59	27.40	136.73	0.10	4.38	4.25	37.2	154.7	771.9	0.56	24.7	24.0
Action (2015)	7,026,553							51.0	212.2	1059.0	0.77	33.9	32.9
Net Change (2015)	*1,905,134*							*13.8*	*57.5*	*287.1*	*0.21*	*9.20*	*8.93*

Fuel Use by Foreign Carriers	Total per Year (US Gal)	2015 Emission Factors (g/gal)						2015 Emissions (tons/yr)					
		VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
No Action (2015)	1,345,781	6.59	27.40	136.73	0.10	4.38	4.25	9.8	40.6	202.8	0.15	6.5	6.3
Action (2015)	434,420							3.2	13.1	65.5	0.05	2.1	2.0
Net Change (2015)	*-911,361*							*-6.6*	*-27.5*	*-137.4*	*-0.10*	*-4.40*	*-4.27*

Idling Fuel Use by Delayed CN Trains on All Lines	Total per Year (US Gal)	2015 Emission Factors (g/gal)						2015 Emissions (tons/yr)					
		VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
No Action (2015)	577,327	6.59	27.40	136.73	0.10	4.38	4.25	4.2	17.4	87.0	0.06	2.8	2.7
Action (2015)	214,799							1.6	6.5	32.4	0.02	1.0	1.0
Net Change (2015)	*-362,528*							*-2.6*	*-10.9*	*-54.6*	*-0.04*	*-1.75*	*-1.70*

TOTAL	Total per Year (US	2015 Emission Factors (g/gal)						2015 Emissions (tons/yr)					
		VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
No Action (2015)	7,044,526	6.59	27.40	136.73	0.10	4.38	4.25	51.2	212.8	1061.7	0.78	34.0	33.0
Action (2015)	7,675,771							55.8	231.8	1156.9	0.85	37.1	36.0
Net Change (2015)	*631,246*							*4.6*	*19.1*	*95.1*	*0.07*	*3.05*	*2.96*

SO2 emission rates were estimated as follows:
Fuel density = 7.1 lb per gallon
Molecular weight of sulfur (S) = 32.06
Molecular weight of sulfur dioxide (SO2) = 64.06
Ratio of S:SO2 = 1.998
Fuel sulfur by weight = 3000 ppm (typical upper range for 2006-2007)
Fuel sulfur by weight = 500 ppm (typical upper range for 2008-2012)
Fuel sulfur by weight = 15 ppm (typical upper range for 2013-2040)
(gallons of fuel) (7.1 lb/gal) (S_w) (1.998) = lbs of SO2/2000 = tons per year

Climate Change Analysis

354058	2015 Energy MMBtu per yr	Original Estimate
124000	Btu/gal of gasoline	
2855306	equivalent gal gasoline per yr	
8.81E-03	metric tons CO_2 per gal gasoline	
25155.2	net change metric tons CO_2 2015	
0.025	net change MM metric tons CO_2 2015	
0.00009%	percent of total global 2005 CO_2 emissions	

97435	2015 Energy MMBtu per yr	Revised Estimate
124000	Btu/gal of gasoline	
785766	equivalent gal gasoline per yr	
8.81E-03	metric tons CO_2 per gal gasoline	
6922.6	net change metric tons CO_2 2015	
0.0069	net change MM metric tons CO_2 2015	
0.00002%	percent of total global 2005 CO_2 emissions	

http://www.epa.gov/cleanenergy/energy-resources/calculator.html
http://www.eia.doe.gov/environment.html

AQ Delay Summary - for App

	Hours Idling on EJE Lines (D_{an})	Hours Idling on CN Lines (D_{an})	Total Hours Idling on All Lines	Idling Emission Rates (g/hr)						Emissions (tons/yr)					
				VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Existing (2007)	86,610	491,597	578,206												
No Action (2015)	102,103	582,706	684,809	8.46	66.73	3.29	0.023	0.028	0.026	6.4	50.4	2.5	0.017	0.021	0.020
Action (2015)	752,843	116,823	869,666							8.1	64.0	3.2	0.022	0.027	0.025
Net Change (2015)	*650,740*	*-465,882*	*184,857*							*1.7*	*13.6*	*0.7*	*0.005*	*0.006*	*0.005*

PM2.5 is 92% of PM, per IDOT guidance.

NONROAD Options

Historical Climate Data

Temperature Summary
Station 111577 CHICAGO MIDWAY AP 3SW, IL

1971-2000 NCDC Normals

Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
High °F	30.7	36.1	47.4	59.2	71.3	80.8	84.7	82.3	75.1	63.2	48.0	35.6	59.5
Low °F	16.2	21.3	30.6	40.2	50.9	60.7	66.3	65.0	56.7	44.9	33.6	22.2	42.4
Mean °F	23.5	28.7	39.0	49.7	61.1	70.8	75.5	73.7	65.9	54.1	40.8	28.9	51.0

http://www.sws.uiuc.edu/atmos/statecli/summary/111577.htm

TITLE 35: ENVIRONMENTAL PROTECTION
SUBTITLE B: AIR POLLUTION
CHAPTER I: POLLUTION CONTROL BOARD
PART 218 ORGANIC MATERIAL EMISSION STANDARDS AND LIMITATIONS FOR THE CHICAGO AREA
SECTION 218.585 GASOLINE VOLATILITY STANDARDS

Section 218.585 Gasoline Volatility Standards

a) No person shall sell, offer for sale, dispense, supply, offer for supply, or transport for use in Illinois gasoline whose Reid vapor pressure exceeds the applicable limitations set forth in subsections (b) and (c) of this Section during the regulatory control periods, which shall be May 1 to September 15 for retail outlets, wholesale purchaser-consumer, operations, and all other operations.

b) The Reid vapor pressure of gasoline, a measure of its volatility, shall not exceed 9.0 psi (62.07 kPa) during the regulatory control period in 1990 and each year thereafter.

c) The Reid vapor pressure of ethanol blend gasolines shall not exceed the limitations for gasoline set forth in subsection (b) of this Section by more than 1.0 psi (6.9 kPa). Notwithstanding this limitation, blenders of ethanol blend gasolines whose Reid vapor pressure is less than 1.0 psi above the base stock gasoline immediately after blending with ethanol are prohibited from adding butane or any product that will increase the Reid vapor pressure of the blended gasoline.

d) All sampling of gasoline required pursuant to the provisions of this Section shall be conducted by one or more of the following approved methods or procedures which are incorporated by reference in Section 215.105.

1) For manual sampling, ASTM D4057;

2) For automatic sampling, ASTM D4177;

3) Sampling procedures for Fuel Volatility, 40 CFR 80, Appendix D.

e) The Reid vapor pressure of gasoline shall be measured in accordance with either test method ASTM D323 or a modification of ASTM D323 known as the "dry method" as set forth in 40 CFR 80, Appendix E, incorporated by reference in 35 Ill. Adm. Code 218.112 of this Part. For gasoline-oxygenate blends which contain water-extractable oxygenates, the Reid vapor pressure shall be measured using the dry method test.

f) The ethanol content of ethanol blend gasolines shall be determined by use of one of the approved testing methodologies specified in 40 CFR 80, Appendix F, incorporated by reference in 35 Ill. Adm. Code 218.112 of this Part.

g) Any alternate to the sampling or testing methods or procedures contained in subsections (d), (e), and (f) of this Section must be approved by the Agency, which shall consider data comparing the performance of the proposed alternative to the performance of one or more approved test methods or procedures. Such data shall accompany any request for Agency approval of any alternate test procedure. If the Agency determines that such data demonstrates that the proposed alternative will achieve results equivalent to the approved test methods or procedures, the Agency shall approve the proposed alternative.

h) Each refiner or supplier that distributes gasoline or ethanol blends shall:

1) During the regulatory control period, state that the Reid vapor pressure of all gasoline or ethanol blends leaving the refinery or distribution operation for use in Illinois complies with the Reid vapor pressure limitations set forth in 35 Ill. Adm. Code 218.585(b) and (c). Any operation receiving this gasoline shall be provided with a copy of an invoice, bill of lading, or other documentation used in normal business practice stating that the Reid vapor pressure of the gasoline complies with the State Reid vapor pressure standard.

2) Maintain records for a period of one year on the Reid vapor pressure, quantity shipped and date of delivery of any gasoline or ethanol blends leaving the refinery or distribution operation for use in Illinois. The Agency shall be provided with copies of such records if requested.

(Source: Amended at 17 Ill. Reg. 16636, effective September 27, 1993)

NONROAD Options

Gasoline Sulfur Standards

Beginning in 2004, the nation's refiners and importers of gasoline will have the flexibility to manufacture gasoline with a range of sulfur levels as long as all of their production is capped at 300 parts per million (ppm) and their annual corporate average sulfur levels are 120 ppm. In 2005, the refinery average will be set at 30 ppm, with a corporate average of 90 ppm and a cap of 300 ppm. Both of the average standards can be met with use of credits generated by other refiners who reduce sulfur levels early. **Finally, in 2006, refiners will meet a 30 ppm average sulfur level with a maximum cap of 80 ppm.** Gasoline produced for sale in parts of the Western U.S. will be allowed to meet a 150 ppm refinery average and a 300 ppm cap through 2006 but will have to meet the 30 ppm average/80 ppm cap by 2007.

Small refiners (those who employ no more than 1,500 employees and have a corporate crude oil capacity of no more than 155,000 barrels per day) will be able to comply with less stringent interim standards through 2007, when they must meet the final sulfur standards. If necessary, small refiners that demonstrate a severe economic hardship can apply for an additional extension of up to two years.

http://www.epa.gov/tier2/frm/f99051.pdf

Diesel Sulfur Standards

The sulfur reductions to land-based nonroad diesel fuel will be accomplished in two steps, with an interim step from **currently uncontrolled levels to a 500 ppm cap starting in June, 2007 and the final step to 15 ppm in June, 2010.**

http://www.epa.gov/otaq/url-fr/fr29jn04.pdf