

## CCNPP3COLA PEmails

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**From:** Quinn-Willingham, Laura  
**Sent:** Thursday, January 19, 2012 2:19 PM  
**To:** Imboden, Stacey  
**Subject:** FW: UN#11-263 Air Conformity Letter for NRC  
**Attachments:** UN#11-263 -Air Conformity Report R3.pdf

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**From:** Lutchenkov, Dimitri [<mailto:dimitri.lutchenkov@unistarnuclear.com>]  
**Sent:** Friday, September 30, 2011 1:33 PM  
**To:** Quinn-Willingham, Laura  
**Subject:** UN#11-263 Air Conformity Letter for NRC

Laura,

Attached is an advance copy of UniStar letter UN#11-263, "UniStar Nuclear Energy, NRC Docket No. 52-016, Calvert Cliffs Nuclear Power Plant, Unit 3, Calvert County, Maryland, Air Conformity Report, Revision 3". A hard copy of the letter is being send separately to the Document Control Desk.

If you have any questions, please advise.

Regards,

*Dimitri Lutchenkov*

Director | Environmental Affairs |  
UniStar Nuclear Energy  
410-369-1906 | m 410-370-9090

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Greg Gibson  
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10 CFR 50.4  
10 CFR 52.79

September 30, 2011

UN#11-263

ATTN: Document Control Desk  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Subject: UniStar Nuclear Energy, NRC Docket No. 52-016  
Calvert Cliffs Nuclear Power Plant, Unit 3, Calvert County, Maryland  
Air Conformity Report, Revision 3

This letter transmits Revision 3 of "NO<sub>x</sub> and VOC Emissions from Construction Activities and Air Conformity Applicability, Calvert Cliffs Unit 3," (Enclosure 1) as requested by Laura Quinn, NRC Environmental Project Manager. Enclosure 2 contains an analysis of the potential uses of emission reduction credits created in the Baltimore ozone non-attainment area to offset emissions from the construction of Calvert Cliffs Nuclear Power Plant, Unit 3.

This letter contains no new regulatory commitments. This letter does not contain any sensitive or proprietary information.

If there are any questions regarding this transmittal, please contact me at (410) 369-1905, or Mr. Dimitri Lutchenkov at (410) 369-1906.

*I declare under penalty of perjury that the foregoing is true and correct.*

Executed on September 30, 2011



Greg Gibson

- Enclosures – 1) NO<sub>x</sub> and VOC Emissions from Construction Activities and Air Conformity Applicability, Calvert Cliffs Unit 3, Rev. 3, September 2011  
2) Use of Baltimore area NO<sub>x</sub> ERCs in Calvert County, September 22, 2011

cc: Surinder Arora, NRC Project Manager, U.S. EPR Projects Branch  
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U.S. NRC Region I Office

**Enclosure 1**  
**NO<sub>x</sub> and VOC Emissions from Construction Activities and**  
**Air Conformity Applicability,**  
**Calvert Cliffs Unit 3,**  
**Rev. 3,**  
**September 2011**



Environment

Submitted to:  
Calvert Cliffs 3 Nuclear Project, LLC and  
UniStar Nuclear Operating Services, LLC  
Baltimore, MD

Submitted by:  
AECOM  
Chelmsford, MA  
Project No. 60136676  
September 2011

# NO<sub>x</sub> and VOC Emissions from Construction Activities and Air Conformity Applicability Calvert Cliffs Unit 3 Rev. 3



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Submitted to:  
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September 2011

# NO<sub>x</sub> and VOC Emissions from Construction Activities and Air Conformity Applicability Calvert Cliffs Unit 3 Rev. 3

A handwritten signature in cursive script, appearing to read "Ian Miller U. Phaneendra".

Prepared By  
Ian Miller and Phaneendra Uppalapati

A handwritten signature in cursive script, appearing to read "Robert M. Iwanchuk".

Reviewed By  
Robert Iwanchuk

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## 1.0 Introduction

Calvert Cliffs 3 Nuclear Project LLC (“CC3”) and UniStar Nuclear Operating Services, LLC (“UNO”) (Co-Applicants) are proposing to construct and operate a new nuclear power unit on the existing Calvert Cliffs Nuclear Power Plant (CCNPP) site. The new unit will be designated as CCNPP Unit 3 (CC3), and will have a gross electric generation capacity of about 1,710 megawatts.

Pursuant to the General Conformity Requirements under 40 CFR 93.150 et seq, the Nuclear Regulatory Commission (NRC) as the lead federal agency is required to make a conformity determination with regard to the proposed construction and operation of CC3. The General Conformity Rule applies only in locations designated in 40 CFR Part 81 as maintenance or nonattainment areas for any criteria air pollutant. As shown in Figure 1-1, the CC3 project site in Calvert County, Maryland is located within the Washington, DC-MD-VA moderate nonattainment area for the 2008 8-hour ambient ozone standard. As such, construction-related emissions of ozone precursors, i.e., oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOC) from both direct and indirect project-related emissions have been evaluated to determine if annual emissions of these pollutants during the years of construction are above the applicable tonnage thresholds for applicability of General Conformity requirements. The applicable de minimis thresholds are 100 tons per year of NO<sub>x</sub> and 50 tons per year of VOC emissions per 40 CFR 93.153.

Note that operation of CC3 will not result in significant generation of NO<sub>x</sub> emissions, or significant releases of VOCs. Typical sources of NO<sub>x</sub> during operation of CC3 will include vehicle operations (mobile sources) and periodic operation of diesel generators that are used to provide backup power (stationary sources). Potential emissions of NO<sub>x</sub> and VOCs from CC3 stationary source operations will also be subject to restrictions imposed under the Certificate of Public Convenience and Necessity (CPCN) issued by Maryland Public Service Commission for CCNPP Unit 3 effective June 26, 2009. The CPCN constitutes the issuance of the Air Quality Minor New Source Review (NSR) Permit to Construct, and a Major Prevention of Significant Deterioration (PSD) permit that was based on review by the Power Plant Research Program (PPRP) and the Maryland Department of the Environment (MDE). Potential NO<sub>x</sub> and VOC emissions from operations will be below de minimis threshold values listed in 40 CFR 93.153(b). Mobile source emissions from operations were estimated by proportioning the worst case year of on-road emission during construction by the ratio of operational employees to the number of construction workers. Permitted emissions from the CC3 stationary sources are 24 tpy of NO<sub>x</sub> and 4 tpy of VOC but these emissions are specifically excluded from the requirements for a conformity determination per the exclusion found in 40 CFR 93.153(d) for major or minor new stationary sources that require a permit under the NSR program or are subject to PSD.

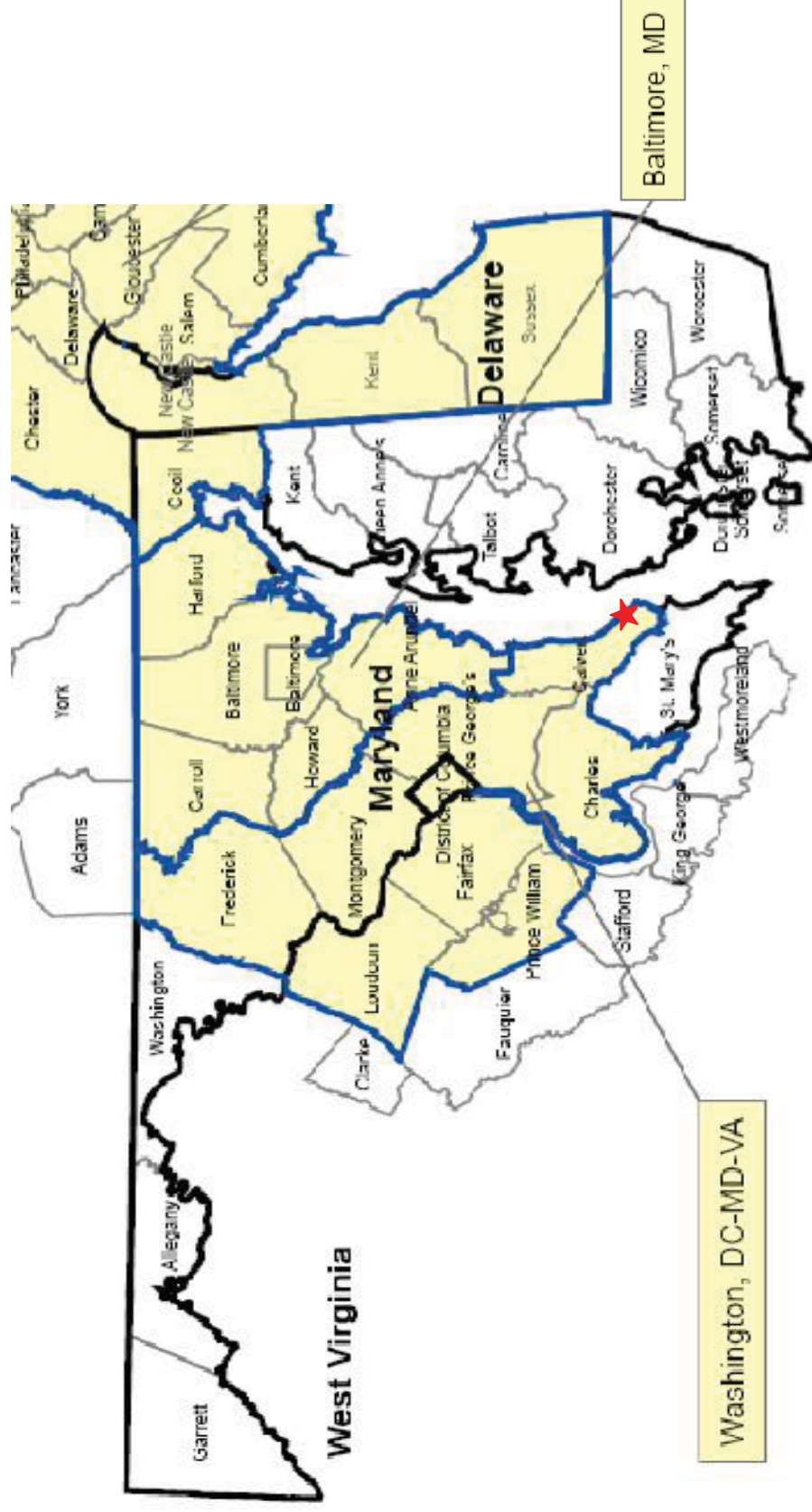
This report documents the NO<sub>x</sub> and VOC emissions associated with the construction of CC3 for purposes of determining applicability to the federal Clean Air Act General Conformity Rule. The first revision of this report was submitted in March 2010 (Rev. 1) which updated the original version of this report filed with the NRC in December 2009 to specifically address NRC’s request for a more detailed breakout of safety-related construction emissions as defined pursuant to 40 CFR Part 50.10. The December 2009 version of this report was submitted to NRC to satisfy the commitment by CC3 and UNO pursuant to CC-09-0002 (dated October 2, 2009) to provide updated construction emissions by December 11, 2009. Prior to the December 2009 submittal, estimates of construction-related emissions were provided in the CPCN Technical Reports filed with the Maryland Public Service Commission (PSC) in November 2007 and later amended in August 2008. These CPCN reports only evaluated onsite NO<sub>x</sub> and VOC emissions related to construction and did not address indirect emissions from activities outside the construction site that are required by EPA in a formal conformity applicability analysis. Indirect activities included in this analysis are employee commuting, commercial deliveries, and emissions from

materials delivered by barge to the on-site dock. The Rev. 2 version of this report was an adjustment of the construction equipment schedule and timeline that has been revised since the earlier filings. There are no substantive changes in the conclusions from the March 2010 submittal in regards to the number of years greater than 100 tons of NO<sub>x</sub>. There is a slight increase in the maximum NO<sub>x</sub> in the peak construction year from 242 to 245.7. Rev. 3 was prepared for the Army Corps of Engineers (ACOE). This version of the report includes emissions specific to ACOE approvals.

## **1.1 Content of the Report**

This report consists of four sections and two appendices. Section 2.1 presents the estimated direct and indirect VOC and NO<sub>x</sub> emissions from construction of the project. Section 2.2 provides estimates of the indirect emissions associated with CC3 operations. Section 3 describes the methodology for the emission inventory. Technical references are provided in section 4. Appendix A contains the projected construction equipment details and hours of use for each year of construction. Appendix B contains detailed emissions calculations for the direct construction equipment and indirect emissions.

**Figure 1-1 Washington, DC-MD-VA and Baltimore, MD 8-hr Ozone Nonattainment Regions**



★ Location of CC3

## 2.0 Emissions Evaluation Approach

### 2.1 Nuclear Regulatory Commission

Per Nuclear Regulatory Commission (NRC) regulations in 10 CFR Part 50, only certain portions of construction are considered to be under the NRC's jurisdiction. In determining the construction emissions as defined in 10 CFR Part 50.2 and Part 50.10, UniStar has developed a "Resource Utilization" approach in consultation with Bechtel. Bechtel North American Power Corporation (Bechtel) is UniStar's current project/construction engineering firm. Bechtel has developed an overall equipment list for construction of CC3 (see Appendix A). This assumption was cross-checked with actual construction schedules from two comparably-sized projects.

In this approach, construction emissions as defined by NRC are measured only from the materials associated with Safety-related structures, systems, or components (SSCs). Bulk commodity materials which are factored into the resource utilization are concrete, large and small bore hangers, small bore piping, scheduled conduit, cable tray, wire & cable, and terminations.

The evaluation of the construction and pre-construction emissions is the aggregate of non-road and on-road emissions associated with the construction of CC3. Non-road emissions are estimated using NONROAD 2008 model and on-road emissions are estimated using MOBILE 6.2 model. AECOM incorporated these two models and applied them mathematically to determine the emissions. Resource utilization is characterized as being associated with the Nuclear Island, the Turbine Island or the Balance of plant. SSC utilization can be defined as that portion of the total devoted to the Nuclear Island. Based upon the schedule, the period of safety-related construction is predicted to be 68 months beginning early in construction year 3. The calculated distribution of resource utilization during that time is distributed as follows:

**Table 2-1 Resource Utilization**

	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Year 6</b>	<b>Year 7</b>	<b>Year 8</b>
<b>Nuclear Island</b>	50.6%	56.1%	67.7%	82.1%	98.8%	100%
<b>Turbine Island</b>	2.6%	16.2%	13.7%	17.2%	1.2%	0%
<b>Balance of Plant</b>	46.8%	27.7%	18.6%	0.7%	0%	0%
	100%	100%	100%	100%	100%	100%

Emissions from equipment associated with safety-related activities are estimated separately from the overall emissions estimate. These are Tables B-1a and B-1b in Appendix B.

### 2.2 U.S. Army Corps of Engineers

Activities which are not part of the NRC-related construction or will precede the NCR related construction activities will include clearing and grubbing, grading, excavating, erection of support buildings and transmission lines, dredging, and other associated activities. These emissions are estimated in Table B-1 in Appendix B and are associated with the first two years of preconstruction.

Dredging associated with CC3 construction are considered to be the result of direct U.S. Army Corps of Engineers (USACE) action. In determining the construction emissions associated with USACE-related

dredging activities, UniStar has estimated separately those emissions from the overall emissions estimate. These are labeled as “dredging” and located in Tables B-1a, B-3b, and B-4 in Appendix B.

## 3.0 Emissions Estimates

### 3.1 Construction/Pre-Construction Emissions

Tables 3-1 and 3-2 present the total VOC and NO<sub>x</sub> emissions estimates over the construction of the project. These are broken up into separate tables for the two ozone nonattainment regions which are affected. As seen in Figure 1-1, CC3 is located in the Washington DC-MD-VA nonattainment area, but is also close to the Baltimore nonattainment area. .

At the request of NRC, Table 3-2 presents a breakout of safety-related construction emissions as defined under 10 CFR Part 50 – Domestic Licensing for Production and Utilization Facilities. The definition of construction under 10 CFR 50.2 reads as follows:

*Construction or constructing* means, for the purposes of §50.55(e), the analysis, design, manufacture, fabrication, quality assurance, placement, erection, installation, modification, inspection, or testing of a facility or activity which is subject to the regulations in this part and consulting services related to the facility or activity that are safety related.

Additional delineation of construction versus “pre-construction” activities is found under 10 CFR 50.10(a)(1) and (2) under limited work authorization. These are paraphrased below.

(1) Activities constituting construction are the driving of piles, subsurface preparation, placement of backfill, concrete, or permanent retaining walls within an excavation, installation of foundations, or in-place assembly, erection, fabrication, or testing, which are for: safety-related structures, systems, or components (SSCs)

(2) Construction does not include: Site exploration, preparation of a site for construction of a facility, including clearing of the site, grading, installation of drainage, erosion and other environmental mitigation measures, and construction of temporary roads and borrow areas; excavation; erection of support buildings building of service facilities

The level of detail to precisely breakout preconstruction and construction activities as defined by NRC is unknown at this time. Emissions reported in Table 3-2 are based on estimated equipment types expected to perform safety-related construction activities as defined in 10 CFR 50. For example groups excluded are direct or indirect emissions from motor vehicles (except concrete trucks), site preparation equipment and dredging equipment. Equipment groups included are earthmoving, compacting, cranes, forklifts, concrete/aggregate equipment, air compressors, manlifts, welding equipment, generating equipment, small capital equipment and concrete equipment.

The equipment groups included in construction-related activities are shown in Appendix B combined with the non-safety related equipment and also separately. Since the labor (and resource) utilization is not assigned to any specific equipment, a breakdown of emissions by equipment group is not possible. Therefore, the resource utilization of the nuclear island was applied to the total estimated emissions from the safety-related construction equipment for the estimates provided in Table 3-2.

**Table 3-1 CC3 Total Construction Emissions within the Washington DC-MD-VA Ozone Nonattainment Area**

Year	Off-Road Diesel VOC	Off-Road Gasoline VOC	On-Road Vehicles VOC	Marine VOC	Boiler VOC	VOC (Tons)	Exceeds Conformity Threshold (Yes/No)	Off-Road Diesel NOx	Off-Road Gasoline NOx	On-Road Vehicles NOx	Marine NOx	Boiler NOx	NOx (Tons)	Exceeds Conformity Threshold (Yes/No)
1	6.0	3.8	9.2	0	0	19.1	No	83.3	0.29	9.1	0	0	92.7	No
2	7.9	3.1	17.2	0	0	28.3	No	110.0	0.3	19.6	0.0	0	129.9	Yes
3	5.3	2.1	21.8	0.45	0.05	29.7	No	79.3	1.0	29.2	8.9	4.6	122.9	Yes
4	10.8	4.1	27.8	0.11	0.05	42.8	No	163.6	2.0	35.8	2.1	4.6	208.2	Yes
5	12.5	4.8	28.7	0.11	0.05	46.1	No	190.4	2.4	46.1	2.1	4.6	245.7	Yes
6	12.4	4.7	24.3	0.11	0.05	41.6	No	188.6	2.4	37.5	2.1	4.6	235.3	Yes
7	9.8	4.7	18.1	0.11	0.00	32.6	No	147.1	2.3	23.2	2.1	0	174.8	Yes
8	5.0	3.2	8.2	0	0	16.5	No	75.7	1.5	10.9	0	0	88.1	No
9	0.6	0.6	1.1	0	0	2.2	No	8.0	0.4	1.4	0	0	9.8	No

Includes activities not defined as construction under 10 CFR 50.



Table 3-2 CC3 10 CFR 50 Construction Emissions within the Washington DC-MD-VA Ozone Nonattainment Area

Year	Off-Road Diesel VOC	Off-Road Gasoline VOC	On-Road Vehicles VOC	Marine VOC	Boiler VOC	Total VOC (Tons)	10 CFR 50 Construction Resource Utilization	10 CFR 50 Construction Emissions VOC (Tons)	Exceeds Conformity Threshold (Yes/No)
1	0	0	0	0	0	0	0.0%	0	No
2	0	0	0	0	0	0	0.0%	0	No
3	4.4	1.83	0.58	0	0	6.8	72.2%	4.9	No
4	9.6	3.59	0.67	0	0	13.9	60.5%	8.4	No
5	11.2	4.24	0.00	0	0	15.5	58.4%	9.0	No
6	11.2	4.16	0.61	0	0	16.0	80.9%	12.9	No
7	9.4	4.10	0.15	0	0	13.6	85.1%	11.6	No
8	4.9	2.71	0	0	0	7.6	100.0%	7.6	No
9	0.5	0.45	0	0	0	1.00	0.0%	0	No
Year	Off-Road Diesel NOx	Off-Road Gasoline NOx	On-Road Vehicles NOx	Marine NOx	Boiler NOx	Total NOx (Tons)	10 CFR 50 Construction Resource Utilization	10 CFR 50 Construction Emissions NOx (Tons)	Exceeds Conformity Threshold (Yes/No)
1	0	0	0	0	0	0	0.0%	0	No
2	0	0	0	0	0	0	0.0%	0	No
3	65.4	0.97	7.8	0	0	74.1	72.2%	53.5	No
4	143.9	2.04	8.1	0	0	154.0	60.5%	93.2	No
5	168.7	2.41	0.0	0	0	171.1	58.4%	99.9	No
6	168.3	2.38	6.1	0	0	176.8	80.9%	143.0	Yes
7	140.5	2.33	1.3	0	0	144.1	85.1%	122.6	Yes
8	73.8	1.50	0	0	0	75.3	100.0%	75.3	No
9	7.9	0.39	0	0	0	8.3	0.0%	0	No

As stated previously, the emissions in Table 3-2 represent the best estimate of "construction" emissions as defined by 10 CFR Part 50 and an estimate of associated resource (labor) utilization. Construction of the reactor and cooling tower are not expected to start in great capacity until Year 3. A detailed plan of construction has not yet been developed in order to specify the start of construction of individual equipment. For example, backfilling and soil compaction are considered construction so the entire group of operating earthmoving and compacting equipment is included in the emissions estimate. Other equipment groups included are compaction, cranes, forklifts, manlifts, welding equipment, concrete equipment, air compressors, pipelaying, cable laying, winches, generation equipment, and small capital equipment. Lists of diesel and gasoline equipment are presented in Appendix B, Tables B-1b and B-2b. These tables exclude some non-road engines which appear in Tables B-1a and B-2a which are not considered to be part of safety-related construction. The only on-road vehicles from Appendix B, Tables B-3a through B-3i which are assumed to be part of construction are associated with concrete/aggregates and the concrete batch plant. No marine or boiler emissions are considered to be part of safety-related construction. This is why the starting emissions of Table 3-2 are less than Table 3-1.

Based on the NRC definition of construction and estimated resource utilization by UniStar, Table 3-3 shows that the exceedances of the conformity threshold for NO<sub>x</sub> for the years 5 through 7. This is one less year than in the previous submittal where Year 4 through Year 7 was over 100 tons of NO<sub>x</sub>. Only non-safety related construction activities are expected to take place in Years 1, 2, and 9.

USACE related emissions are estimated to be those during the first two years of preconstruction as well as the dredging operations. Also, indirect emission from barge deliveries through the dredged areas are included.

**Table 3-3 CC3 USACE Construction Emissions within the Washington DC-MD-VA Ozone Nonattainment Area**

Year	Off-Road Diesel VOC	Off-Road Gasoline VOC	On-Road Vehicles VOC	Marine VOC	Boiler VOC	Total VOC (Tons)	Exceeds Conformity Threshold (Yes/No)
1	6.0	3.8	9.2	0	0	19.1	No
2	7.9	3.1	17.2	0	0	28.3	No
3	0.2	0	3.8	0.5	0	4.4	No
4	0	0	0	0.1	0	0.1	No
5	0	0	0	0.1	0	0.1	No
6	0	0	0	0.1	0	0.1	No
7	0	0	0	0.1	0	0.1	No
8	0	0	0	0	0	0	No
9	0	0	0	0	0	0	No
Year	Off-Road Diesel NOx	Off-Road Gasoline NOx	On-Road Vehicles NOx	Marine NOx	Boiler NOx	Total NOx (Tons)	Exceeds Conformity Threshold (Yes/No)
1	83.3	0.3	9.1	0	0	92.7	No
2	110.0	0.3	19.6	0	0	129.9	Yes
3	2.4	0	3.8	8.9	0	15.1	No
4	0	0	0	2.1	0	2.1	No
5	0	0	0	2.1	0	2.1	No
6	0	0	0	2.1	0	2.1	No
7	0	0	0	2.1	0	2.1	No
8	0	0	0	0	0	0	No
9	0	0	0	0	0	0	No

\* Initial dredging (estimated in Year 3) comprises approximately 13.5 tons NO<sub>x</sub> and 1.2 tons VOC. Future maintenance dredging within a 10 year period is estimated to require approximately ¼ of the original effort (3.4 tons) during any one year which is below the de-minimis threshold.

### 3.2 Operational Emissions

As noted in Section 1, the operational emissions from CC3 stationary sources required a permit under the PSD program. As such, these emissions are specifically excluded from the requirements for a conformity determination per the exclusion found in 40 CFR 93.153(d).

The only other emissions of NO<sub>x</sub> and VOC from CC3 operations are indirect emissions associated with vehicular emissions from employee traffic. As stated in the Phase II traffic study prepared in June 2009 (Reference 10), 363 permanent employees are expected once CC3 begins operations resulting in at most 363 additional round trips. This is very similar to the 379 round trips estimated for the construction workforce in Year 8 but well below the estimated number of peak daily round trips during construction of 3,000.

Using similar assumptions as with the construction workforce, emissions from indirect operational employee commuting are expected to be only 1.4 tons/yr of NO<sub>x</sub> and 2.0 tons/yr of VOC in the Washington DC nonattainment area and 0.2 tons/yr of NO<sub>x</sub> and 0.3 tons/yr of VOC in the Baltimore nonattainment area. These levels are well below the respective applicability thresholds of 100 tons/yr and 50 tons/yr.

## 4.0 Emission Estimation Methodology

Bechtel North American Power Corporation (Bechtel), UniStar's current project/construction engineering firm, was responsible for developing an estimate of fuel-burning equipment (non-road and on-road) needed to construct the proposed Unit 3. Bechtel provided an equipment schedule with equipment sizes and estimated annual hours of operation and as previously mentioned in Section 2, this list was then used to develop a safety-related construction list of equipment. For this revision, the original construction timeline was shifted by six months. Emissions calculations based on this equipment along with indirect NO<sub>x</sub> and VOC emissions are presented in Appendix B.

### 4.1 Emissions from Non-Road Equipment

Emissions from non-road equipment (mobile, portable, and stationary fuel-burning equipment) were estimated using EPA's NONROAD2008 model and methodology. Bechtel provided a study of engines with horsepower and annual hours of operation for construction of CC3. Similar to the previously submitted construction emissions from 2008, AECOM developed a spreadsheet-based approach to estimate non-road engine emissions based on the NONROAD model guidance and NONROAD model data files. This allows the emissions estimates to be thoroughly checked and allows transparency to how emissions are developed.

Applicable engine tiers for this analysis are based on the estimated usage dates and the phase-in years for engine size ranges given in Table 1 of Reference 2 for diesel engines and Tables 1 through 7 of Reference 3 for gasoline engines. The applicable SCC codes for equipment were chosen (based on engine duty and fuel type) from the list in Appendix A of Reference 4. This cross reference allowed AECOM to match equipment from Bechtel's list to the NONROAD data files which contain the steady state pollutant emission factors and load factors. Note that this methodology is slightly different than that submitted in 2008, because the NONROAD 2008 data file used here has the transient adjustment factor (TAF) built into the steady state emission factor.

The Equation involved in determining the non-road construction emissions is as follows (from Page 1 of Reference 4):

$$EF_{adj} = EF_{ss} * DF \dots \text{Equation 1}$$

EF<sub>adj</sub> = Final emission factor used in model after adjustments to account for transient operation and deterioration (g/hp-hr)

EF<sub>ss</sub> = NONROAD 2008 steady state emission factor (g/hp-hr)

DF = Deterioration factor

The deterioration factor (DF) is a function of the technology type and age of the engine.

The NONROAD methodology addresses the effects of deterioration in the engines by multiplying the steady state emission factor for each category of engine by deterioration factor (DF). The following equation (from p 19 of Reference 2 and p 3 of Reference 5) is used to calculate DF as a function of engine age

$$DF = 1 + A * (Age\ factor)^b \quad for\ Age\ Factor \leq 1 \dots \dots \dots Equation\ 2$$

$$DF = 1 + A \quad for\ Age\ Factor > 1 \dots \dots \dots Equation\ 3$$

Where Age factor = fraction of median life expended = (cumulative hours \* load factor) / median life at full load, in hours.

A = constants for a given pollutant / technology type

b ≤ 1, for most engines or 0.5 for 2-stroke engines less than 25 Hp

Deterioration is capped at the end of an engine's median life (age factor = 1), under the assumption that an engine deteriorated to a point where any increased deterioration is offset by maintenance. For this analysis, all age factors were set to 1 ("fully deteriorated") in order to simplify the calculations.

Annual non-road emissions were estimated using the following equation from Page 1 of Reference 4

$$E_{Sta} = EF_{adj} * HP * Hours * Load\ Factor * \frac{Ton}{2000\ lb} * \frac{lb}{453.6\ g} \quad \quad \quad Equation\ 4$$

E<sub>Sta</sub> = Annual stationary source emissions in tons

EF<sub>adj</sub> = Final adjusted emission factor (g/hp-hr)

HP = Rated horsepower hp

Hours = Annual operating hours of the equipment

Load Factor = fraction of available rated power

The load factor is an adjustment included in the model to avoid grossly over counting emissions. It is the average fraction of the rated power of an engine that is expected to be actually used in annual operation. This factor takes into account idling, partial load operation, and transient operation. For instance, a 100 hp diesel powered crane has a load factor of 0.43 from the NONROAD data table based on the SCC code. This means that in normal operation, the crane is expected to use an average of 43 hp for every available 100 hp capacity. These factors are based on surveys of equipment users.

One final adjustment that is special to VOC is the conversion from total hydrocarbons (HC). The NONROAD model steady state emission factors are all in terms of HC. This is so the model has a common basis to output emissions in terms of VOC, total organic gasses (TOG), or non-methane hydrocarbons (NMHC). Reference 6 gives the conversion from HC to VOC as 1.053 for diesel engines, 1.034 for 2-stroke gasoline engines, and 0.933 for 4-stroke gasoline engines.

## 4.2 On-Road Vehicles

Estimation of on-road vehicular emissions was calculated with EPA's MOBILE6.2 Vehicle Emission Modeling Software. MOBILE6.2 is an emission factor model for predicting gram of emissions (VOC, and NO<sub>x</sub>) per mile as well as other criteria and air toxic emissions from cars, trucks, and motorcycles. The MOVES model is now currently available from EPA, however the General Conformity revisions published in the Federal Register April 5, 2010 allow MOBILE6.2 to be used under the provisions of §93.159(b)(1)(ii).

*".... Conformity analyses for which the analysis was begun during the grace period or no more than 3 months before the **Federal Register** notice of availability of the latest emission model may continue to use the previous version of the model specified by EPA."*

The MOVES model was made available by EPA in the Federal Register on March 2, 2010. Since the conformity analysis for CC3 was first submitted in December of 2009, well before MOVES became available, we are continuing to use the MOBILE model,

Mobile 6.2 gives emission rates in terms of grams per vehicle mile traveled. To obtain miles traveled for on-site vehicles, the estimated hours of vehicle use was multiplied by an estimated annual speed in mile/hr. Specific vehicle categories from Mobile6.2 for on-site vehicles are given in Appendix B. For employee commuting, the estimated annual number of construction employees was multiplied by a factor of 1.3 (for estimating carpooling) to get a number of vehicles. This assumption is consistent with the Phase II traffic study prepared in June 2009. Employees are assumed to have a typical daily commute which is constant for 312 working days per calendar year and have vehicles which fall into the LDGV category. The geographic breakdown was assumed to be 10% from St. Mary's County to the south and west (an attainment area for ozone), 25% from the Baltimore nonattainment area to the north, and the rest from the Washington DC-MD-VA ozone nonattainment area. The number of commercial deliveries was determined based on the expected goods to be delivered to the site during construction by truck. For this analysis, commercial deliveries are assumed to be in the HDDV8b category. Thirty percent of the commercial deliveries were assumed to come from the Baltimore nonattainment area with the balance from the Washington DC-MD-VA nonattainment area.

For indirect emissions from employee commuting and commercial deliveries, AECOM assumed a 15 year time span for the vehicle population as a reasonable estimation of typical vehicle ownership. That is, nominally beginning in 2010, the emissions model used a vehicle population mix from model years 1995-2010. This progressively increased by one year until 2018.

Fuel consumption for these vehicles is gasoline and transportation diesel as noted in Appendix B. Emissions from on-road vehicles are estimated using Equation 1.

$$E_{Mob} = VMT * EF * \frac{Ton}{2000 lb} * \frac{lb}{453.6 g} \dots \dots \dots \text{Equation 5}$$

$E_{Mob}$  = On-road vehicle emissions in tons per year

VMT = Vehicle miles travelled in a year

EF = Mobile 6.2 emission factor for on road vehicles in grams/mile.

### 4.3 Marine Equipment

The current Calvert Cliffs Nuclear Plant has an existing barge dock on-site which UniStar plans to use for receipt of some equipment by delivery. Additionally, UniStar will be dredging some off-shore areas during the CC3 construction period. Emissions from marine equipment used in these activities are included in this emissions inventory. Ancillary on-shore equipment (such as dump trucks or cranes) related to dredging and barge deliveries are accounted for in the non-road category.

US EPA has released a final report in April 2009 describing the methodologies used for the preparation of port-related emission inventory. This report is identified as reference number 8. Equations involved in determining the emissions from the marine sources are:

$$E_{Mar} = EF_{Pol} * HP * Hours * Load Factor * \frac{kWh}{1.341 HP-hr} * \frac{Ton}{2000 lb} * \frac{lb}{453.6 g} \dots \dots \dots \text{Equation 6}$$

Where

$E_{Mar}$  = Annual marine emissions in tons

$EF_{pol}$  = Emission factor in (g/kW-hr)

HP = Rated horse power (hp)

Hours = Annual operating hours

Load Factor = Fraction of available operating rated power

Emission factors, load factors, and guidance on typical engine sizes are taken from the referenced port inventory document. All of the marine dredging operations for this project occur during construction year 3 for barge dock preparation. Deliveries of materials by barge are assumed to begin in construction year 3 after dredging is completed. The dredging operations are expected to occur in a three month period, 10 hours per day, 6 days per week. Dredging is assumed to be performed by crane and dredged materials will be disposed of on-site. Deliveries of materials by barge are expected to originate at Harve de Grace, MD which is in the Baltimore nonattainment area. By ship, the distance is approximately 75 nautical miles (nm) with 18 nm assumed to occur within the state maritime zone boundaries of Calvert County and 57 nm occurring within the maritime zone boundaries of the Baltimore nonattainment area. Transportation emissions from barge deliveries were divided accordingly.

#### **4.4 Boiler**

The proposed concrete batch plant will require a small boiler (~ 20 MMBtu/hr) for the winter months to ensure the concrete does not freeze and to maintain consistency in batch preparation. The boiler is assumed to only use distillate oil for fuel. Emission factors for the boiler were taken from EPA's AP-42 document for fuel oil combustion. When operated, the boiler was assumed to operate at maximum capacity.

## 5.0 References

1. EPA's "MOBILE6.2 Vehicle Emission Modeling Software"
2. EPA's "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling—Compression-Ignition" NR-009c April 2004, EPA420-P-04-009.
3. EPA's "Exhaust Emission Factors for Nonroad Engine Modeling: Spark Ignition" NR-010e December 2005, EPA420-R-05-019.
4. EPA's "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling" NR-005c April 2004, EPA420-P-04-005
5. EPA's "Nonroad Spark-Ignition Engine Emission Deterioration Factors" NR-011c December 2005, EPA420-R-05-023.
6. EPA's "Conversion Factors for Hydrocarbon Emission Components" NR-002c December 2005, EPA420-R-05-015
7. EPA's "NONROAD08 Model (nonroad engines, equipment, and vehicles)"
8. US EPA / ICF International "Current Methodologies in Preparing Mobile Source Port-Related Emission inventories" Final Report April 2009.
9. EPA's AP-42 Compilation of Emission Factors, Section 3.1 Fuel Oil Combustion, 9/98
10. Traffic Impact Study at the Calvert Cliffs Nuclear Power Plant Draft Final Report, KLD Engineering, June 13, 2009 Rev. 1



## **Appendix A**

### **Construction Schedule**





## **Appendix B**

### **Emissions Calculations**

Table B-1a Diesel Non-Road Engine Emissions

Equipment category based on NONROAD classification		SCC <sup>1</sup>	Fuel Type	Engine Technology Type	Equipment Horsepower	Year 1 hrs	Year 2 hrs	Year 3 hrs	Year 4 hrs	Year 5 hrs	Year 6 hrs	Year 7 hrs	Year 8 hrs	Year 9 hrs	BSFC <sup>2</sup> lb/hp-hr	EFss (g/hp-hr) <sup>2</sup> HC NOx	Load Factor <sup>2</sup>	Age Factor <sup>3</sup>	"A" <sup>3</sup> HC NOx HC	Deterioration factor <sup>3</sup> HC NOx HC	Adjusted EF (g/hp-hr) <sup>4</sup> HC NOx						
Earthmoving	Sweeper/Scrubber	2270003030	Diesel	T3	85	0	0	469	936	936	936	936	967	515	0.408	0.18	3	0.43	1	0.027	0.008	1.027	1.008	0.185	3.024		
	Crawler Tractor	2270002069	Diesel	T3	105	0	0	1976	5200	5616	4732	2892	125	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631			
	Crawler Tractor	2270002069	Diesel	T3	210	0	0	3848	7488	7696	6760	4732	2704	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631		
	Crawler Tractor	2270002069	Diesel	T3	307	0	0	3848	7488	7696	6760	4732	2704	0	0.371	0.17	2.61	0.59	1	0.027	0.008	1.027	1.008	0.175	2.631		
	Excavator	2270002036	Diesel	T4	30	0	0	1664	4056	4056	3536	2132	0	0	0.412	0.13	3	0.59	1	0.027	0.008	1.027	1.008	0.134	3.024		
	Excavator	2270002036	Diesel	T3	268	0	0	3224	7072	7488	7020	4992	0	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631		
	Excavator	2270002036	Diesel	T4	321	0	0	1664	4056	3552	3276	1716	0	0	0.371	0.13	2.5	0.59	1	0.027	0.008	1.027	1.008	0.134	2.520		
	Crawler Tractor	2270002036	Diesel	T4	424	0	0	936	1872	1872	1872	624	0	0	0.371	0.13	2.5	0.59	1	0.027	0.008	1.027	1.008	0.134	2.520		
	Crawler Tractor	2270002069	Diesel	T4	426	0	0	2059	2246	2246	2246	1123	0	0	0.371	0.13	2.5	0.59	1	0.027	0.008	1.027	1.008	0.134	2.520		
	Grader	2270002048	Diesel	T3	135	0	0	3203	5907	5657	4326	2995	249.8	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631		
Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	2270002066	Diesel	T3	80	0	0	3484	6239	6739	6739	3366	437	0	0.481	0.42	3.04	0.21	1	0.027	0.008	1.027	1.008	0.431	3.693		
	Tractor/Loader/Backhoe	2270002066	Diesel	T3	174	0	0	4367	8049	7612	6739	5429	936	0	0.433	0.42	3.03	0.21	1	0.027	0.008	1.027	1.008	0.431	3.054		
	Skid Steer Loader	2270002072	Diesel	T4	75	0	0	1664	4056	3552	3744	3120	0	0	0.433	0.42	3.03	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024		
	Tractor/Loader/Backhoe	2270002066	Diesel	T3	199	0	0	2080	5408	5616	5616	4056	0	0	0.433	0.42	3.03	0.21	1	0.027	0.008	1.027	1.008	0.431	3.054		
	Tractor/Loader/Backhoe	2270002066	Diesel	T4	349	0	0	1664	4056	3552	3744	2608	0	0	0.433	0.13	2.5	0.21	1	0.027	0.008	1.027	1.008	0.134	2.520		
	Tractor/Loader/Backhoe	2270002066	Diesel	T3	224	0	0	1612	4472	5252	4264	2608	0	0	0.433	0.42	3.03	0.21	1	0.027	0.008	1.027	1.008	0.431	3.054		
	Off-highway truck	2270002051	Diesel	T4	302	0	0	8590	18408	22464	19566	11544	0	0	0.371	0.13	2.5	0.59	1	0.027	0.008	1.027	1.008	0.134	2.520		
	Off-highway Tractor	2270002075	Diesel	T3	115	0	0	2578	5658	5950	5865	4118	0	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631		
	Compaction	Plate Compactor	2270002009	Diesel	T4	339	0	0	1266	2035	2995	2995	1498	0	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520	
		Plate Compactor	2270002009	Diesel	T3	185	0	0	4742	7488	7488	7113	5241	1747	0	0	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520
Cranes		Crane	2270002045	Diesel	T4	510	0	0	3494	5990	5990	5990	3993	0	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520	
		Crane	2270002045	Diesel	T4	340	0	0	4867	9734	9734	9734	8111	2434	0	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520
		Crane	2270002045	Diesel	T4	330	0	0	5990	20634	24793	20966	1497.6	0	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520	
		Crane	2270002045	Diesel	T4	340	0	0	3244	8112	9734	9734	9085	3893	0	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520
		Crane	2270002045	Diesel	T4	340	0	0	5678	19469	24336	24336	22064	8761	0	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520
		Crane	2270002045	Diesel	T4	600	0	0	2163	9649	9734	9734	9085	3893	0	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520
		Crane	2270002045	Diesel	T4	500	0	0	4907	9734	9734	9734	8111	2434	0	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520
		Crane	2270002045	Diesel	T4	600	0	0	10608	21216	22464	22464	20592	11232	0	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520
Forklifts	Crane	2270002045	Diesel	T3	152	0	0	6115	13877	15724	15724	15433	10869	749	0	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520	
	Crane	2270002045	Diesel	T3	174	0	0	6280	9900	10483	10483	10338	7945	0	0	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520	
	Crane	2270002045	Diesel	T3	215	0	0	7425	19279	36891	47610	39457	15517	936	0	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520	
	Crane	2270002045	Diesel	T3	250	0	0	6280	9900	10483	10483	10192	6406	0	0	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520	
	Crane	2270002045	Diesel	T3	250	0	0	2329	6406	10483	10483	7046	6864	561	0	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520	
	Forklifts	Forklift	2270003020	Diesel	T3	142	0	0	3993	10982	13478	13478	13371	11731	2246	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631
		Crane	2270002045	Diesel	T3	290	0	0	2496	6240	7488	6240	3744	936	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
		Forklift	2270003020	Diesel	T3	89	0	0	3993	10982	13478	13478	6739	0	0	0.412	0.19	3.13	0.59	1	0.027	0.008	1.027	1.008	0.195	3.155	
Forklift		2270003020	Diesel	T3	113	0	0	10656	33966	33966	33966	27768	11076	0	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
Forklift		2270003020	Diesel	T3	110	0	0	21372	41808	44928	44928	35880	14664	0	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
Material / Seasonal		Manlift / Scissorlifts																									
		Aerial Lift	2270003010	Diesel	T4	28	0	0	0	6738	19469	22464	17860	4368	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024	
		Aerial Lift	2270003010	Diesel	T4	65	0	0	0	4367	13228	15724	13603	6240	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024	
	Aerial Lift	2270003010	Diesel	T4	48	0	0	0	6739	11232	11232	11045	9359	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024		
	Aerial Lift	2270003010	Diesel	T4	78	0	0	0	2894	4492	4492	4492	4118	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024		
	Aerial Lift	2270003010	Diesel	T4	70	0	0	0	2620	5990	6739	6739	4493	0	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024	
	Aerial Lift	2270003010	Diesel	T4	75	0	0	0	2620	5990	6739	6739	4493	0	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024	
	Aerial Lift	2270003010	Diesel	T4	28	0	0	0	749	2246	2246	2246	749	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024		
Welding Equipment	Aerial Lift	2270003010	Diesel	T4	32	0	0	0	4492	6739	6739	6739	6312	1364	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024	
	Welder	2270006025																									



Table B-1a Diesel Non-Road Engine Emissions

Winches and Tuggers																									
Other Construction Equipment																									
Generation Equipment																									
Generator	2270002081	Diesel	T4	140	0	0	0	0	0	4492	6552	5241	1123	0	0.371	0.13	2.5	0.59	1	0.027	0.008	1.027	1.008	0.134	2.520
	2270006005	Diesel	T3	150	1528	2620	8517	15287	15724	15724	15288	11515	3335	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520	
	2270006005	Diesel	T3	86	0	0	2037	4950	5241	5241	5241	5241	1310	0.408	0.18	3	0.43	1	0.027	0.008	1.027	1.008	0.185	3.024	
	2270006005	Diesel	T4	345	0	0	1601	4950	5241	5241	5241	1310	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520		
	2270006005	Diesel	T4	200	0	0	2184	6989	7862	7862	7862	1591	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520		
	2270006005	Diesel	T3	143	0	0	7131	12852	13104	13104	13104	2621	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.175	2.631		
	2270006005	Diesel	T3	143	0	0	3639	9027	10483	10483	9734	2059	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520		
	2270006005	Diesel	T4	14	0	0	26332	62338	82233	63168	28032	36727	8825	0.408	0.13	4.44	0.43	1	0.027	0.008	1.027	1.008	0.134	4.476	
	Small Capital Equipment																								
Plate Compactor	2270002009	Diesel	T4	8	0	0	21762	33696	33696	33696	33696	29113	4987	0.408	0.13	4.3	0.43	1	0.027	0.008	1.027	1.008	0.134	4.334	
	2270002009	Diesel	T4	15	0	0	6552	14040	16848	16848	15377	3109	0.408	0.13	4.44	0.43	1	0.027	0.008	1.027	1.008	0.134	4.476		
	2270002009	Diesel	T4	19	0	0	8288	18408	22464	22464	22230	21852	5516	0.408	0.13	4.44	0.43	1	0.027	0.008	1.027	1.008	0.134	4.476	
	2270006005	Diesel	T4	11	0	0	17472	39858	50076	50076	49530	42900	8424	0.408	0.13	4.44	0.43	1	0.027	0.008	1.027	1.008	0.134	4.476	
	Pump	2270006010	Diesel	T4	7	0	0	2184	5304	5616	5616	5616	1404	0.408	0.508	4.3	0.43	1	0.027	0.008	1.027	1.008	0.566	4.334	
	Pump	2270006010	Diesel	T4	15	0	0	3184	3328	3616	3616	3616	8424	0.408	0.438	4.439	0.43	1	0.027	0.008	1.027	1.008	0.450	4.475	
	Concrete Saw	2270006039	Diesel	T4	65	0	0	2184	5304	5616	5616	5616	1404	0.408	0.508	4.3	0.43	1	0.027	0.008	1.027	1.008	0.566	4.334	
	Generator/Barber	2270002006	Diesel	T4	3	0	0	7844	17160	22464	22464	21420	18237	4011	0.408	0.13	4.3	0.43	1	0.027	0.008	1.027	1.008	0.134	4.334
	Generator/Barber	2270002006	Diesel	T4	3	0	0	7844	17160	22464	22464	21420	18237	4011	0.408	0.13	4.3	0.43	1	0.027	0.008	1.027	1.008	0.134	4.334
Pump	2270006010	Diesel	T4	24	0	0	10452	21294	33663	36755	30742	27387	5515	0.408	0.438	4.439	0.43	1	0.027	0.008	1.027	1.008	0.450	4.475	
Concrete Batch Plant																									
Generator	2270002081	Diesel	T4	470	0	0	10400	12480	12480	12480	3120	0	0	0.371	0.13	2.5	0.59	1	0.027	0.008	1.027	1.008	0.134	2.520	
	2270002066	Diesel	T3	80	0	0	10400	12480	12480	12480	3120	0	0	0.481	0.42	3.64	0.21	1	0.027	0.008	1.027	1.008	0.431	3.669	
	Site Preparation																								
	Tractor/Loader/Backhoe	2270001030	Diesel	T4	10	5460	8580	0	0	0	0	0	0	0	0.408	0.5508	4.3	0.42	1	0.027	0.008	1.027	1.008	0.566	4.334
		2270002066	Diesel	T3	124	3640	5720	0	0	0	0	0	0	0	0.433	0.42	3.03	0.21	1	0.027	0.008	1.027	1.008	0.431	3.054
		2270004066	Diesel	T4	75	3640	2600	0	0	0	0	0	0	0	0.408	0.1314	3	0.43	1	0.027	0.008	1.027	1.008	0.135	3.024
		2270002009	Diesel	T3	354	10920	17160	0	0	0	0	0	0	0	0.367	0.17	2.5	0.43	1	0.027	0.008	1.027	1.008	0.175	2.520
		2270006015	Diesel	T4	55	5460	6240	0	0	0	0	0	0	0	0.408	0.1314	3	0.43	1	0.027	0.008	1.027	1.008	0.135	3.024
		2270002069	Diesel	T3	96	3640	4160	0	0	0	0	0	0	0	0.412	0.19	3.13	0.59	1	0.027	0.008	1.027	1.008	0.195	3.155
2270002069		Diesel	T3	145	5460	6240	0	0	0	0	0	0	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
2270002036		Diesel	T3	308	10920	12480	0	0	0	0	0	0	0	0.371	0.17	2.61	0.59	1	0.027	0.008	1.027	1.008	0.175	2.631	
2270002036		Diesel	T3	250	10920	12480	0	0	0	0	0	0	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
Excavator	2270002036	Diesel	T3	380	14560	16640	0	0	0	0	0	0	0	0.371	0.17	2.61	0.59	1	0.027	0.008	1.027	1.008	0.175	2.631	
	2270002036	Diesel	T3	513	10920	12480	0	0	0	0	0	0	0	0.371	0.17	2.61	0.59	1	0.027	0.008	1.027	1.008	0.175	2.631	
	2270006005	Diesel	T3	258	3640	4160	0	0	0	0	0	0	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
	2270006005	Diesel	T3	80	7280	11440	0	0	0	0	0	0	0	0.408	0.18	3	0.43	1	0.027	0.008	1.027	1.008	0.185	3.024	
	2270002048	Diesel	T3	259	3640	2080	0	0	0	0	0	0	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
	2270002060	Diesel	T3	168	5460	3120	0	0	0	0	0	0	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
	2270002018	Diesel	T3	181	7280	1040	0	0	0	0	0	0	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
	2270002066	Diesel	T4	75	3640	2600	0	0	0	0	0	0	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024	
	2270002066	Diesel	T3	189	5460	3120	0	0	0	0	0	0	0	0.433	0.42	3.03	0.21	1	0.027	0.008	1.027	1.008	0.431	3.054	
Tractor/Loader/Backhoe	2270002030	Diesel	T3	450	1560	0	0	0	0	0	0	0	0	0.371	0.17	2.61	0.59	1	0.027	0.008	1.027	1.008	0.175	2.631	
	2270002030	Diesel	T3	200	1820	1040	0	0	0	0	0	0	0	0.367	0.1836	2.5	0.43	1	0.027	0.008	1.027	1.008	0.189	2.520	
	2270004066	Diesel	T3	325	5460	9360	1560	0	0	0	0	0	0	0.371	0.17	2.61	0.59	1	0.027	0.008	1.027	1.008	0.175	2.631	
	2270002051	Diesel	T3	459	4040	62920	0	0	0	0	0	0	0	0.371	0.17	2.61	0.59	1	0.027	0.008	1.027	1.008	0.175	2.631	
	Dredging Equipment																								
	Excavator	2270002036	Diesel	T3	345	0	720	0	0	0	0	0	0	0	0.371	0.17	2.61	0.59	1	0.027	0.008	1.027	1.008	0.175	2.631
		2270002036	Diesel	T3	247	0	720	0	0	0	0	0	0	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631
		2270002036	Diesel	T3	200	1440	0	0	0	0	0	0	0	0	0.433	0.42	3.03	0.21	1	0.027	0.008	1.027	1.008	0.431	3.054
		2270002066	Diesel	T3	99	0	720	0	0	0	0	0	0	0	0.408	0.18	3	0.43	1	0.027	0.008	1.027	1.008	0.185	3.024
2270002009		Diesel	T3	99	0	720	0	0	0	0	0	0	0	0.408	0.18	3	0.43	1	0.027	0.008	1.027	1.008	0.185	3.024	
2270002045		Diesel	T3	300	0	1440	0	0	0	0	0	0	0	0.367	0.17	2.5	0.43	1	0.027	0.008	1.027	1.008	0.175	2.520	
2270006025		Diesel	T4	33	0	4320	0	0	0	0	0	0	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024	
2270002081		Diesel	T3	548	0	720	0	0	0	0	0	0	0	0.371	0.17	2.61	0.59	1	0.027	0.008	1.027	1.008	0.175	2.631	
2270001030		Diesel	T4	10	0	2160	0	0	0	0	0	0	0	0.408	0.5508	4.3	0.42	1	0.027	0.008	1.027	1.008	0.566	4.334	
TOTAL (Tons)																									

NOTES:

- Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-005.
- Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EF<sub>ss</sub>, g/Hr), and load factor are from NIMM/NORAD08 model factors dated April 5, 2008.
- Note 3: Age Factor = 1 / (1 + Age Factor<sup>0.5</sup>), where Age Factor is taken from Table A4 from source.
- Note 4: Adjusted Emission Factor = EF<sub>ss</sub> \* TAF \* DF (as stated in Note 2, EPA-420-P-04-005).
- Note 5: Annual VOC Emissions are calculated using the following calculation: (1,059 \* Adj. HC emission factor (g/Hr-hr) \* horsepower \* hours operated) / (2000 lb/ton \* 453.6 g/lb).
- Note 6: Annual NOx Emissions are calculated using the following calculation: (Adj. NOx emission factor (g/Hr-hr) \* horsepower \* hours operated) / (2000 lb/ton \* 453.6 g/lb).

Table B-1a Diesel Non-Road Engine Emissions

Winches and Tuggers																			
Other Construction Equipment																			
Generation Equipment																			
0.00	0.00	0.00	0.00	0.00	0.06	0.08	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.03	1.50	1.20	0.28	0.00
0.02	0.04	0.12	0.21	0.22	0.22	0.21	0.16	0.05	0.27	0.47	1.53	2.74	2.82	2.82	2.74	2.06	0.60	0.00	0.00
Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator
0.00	0.00	0.02	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator
0.00	0.00	0.04	0.11	0.12	0.12	0.12	0.12	0.03	0.00	0.00	0.08	0.24	0.16	0.16	0.21	0.16	0.16	0.16	0.16
Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator
0.00	0.00	0.03	0.09	0.10	0.10	0.10	0.10	0.02	0.00	0.00	0.52	1.67	1.88	1.88	1.68	1.76	0.38	0.00	0.00
Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator
0.00	0.00	0.09	0.17	0.17	0.17	0.17	0.16	0.03	0.00	0.00	0.62	2.21	2.24	2.24	2.24	2.08	0.48	0.00	0.00
Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator
0.00	0.00	0.03	0.12	0.14	0.14	0.14	0.14	0.03	0.00	0.00	0.62	2.21	2.24	2.24	2.24	2.08	0.48	0.00	0.00
Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator
0.00	0.00	0.02	0.06	0.06	0.06	0.06	0.03	0.03	0.01	0.00	0.00	0.36	1.56	2.44	1.68	0.63	0.19	0.26	0.00
Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator
Small Capital Equipment																			
0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.36	0.55	0.55	0.55	0.55	0.48	0.08	0.00	0.00
Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor
0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.36	0.55	0.55	0.55	0.55	0.48	0.08	0.00	0.00
Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor
0.00	0.00	0.01	0.03	0.04	0.04	0.04	0.04	0.03	0.01	0.00	0.00	0.53	0.74	0.91	0.91	0.91	0.82	0.22	0.00
Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator
0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.03	0.08	0.17	0.18	0.16	0.10	0.20	0.00
Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump
0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.07	0.17	0.18	0.18	0.18	0.18	0.04	0.00
Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump
0.00	0.00	0.02	0.04	0.05	0.05	0.05	0.05	0.05	0.01	0.00	0.00	0.39	0.96	1.08	1.08	1.08	1.01	0.22	0.00
Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.11	0.14	0.14	0.13	0.11	0.02	0.00
Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.11	0.14	0.14	0.13	0.11	0.02	0.00
Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer	Tamper/Rammer
0.00	0.00	0.06	0.11	0.18	0.20	0.17	0.15	0.03	0.00	0.00	0.53	1.08	1.71	1.87	1.57	1.39	0.27	0.00	0.00
Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump	Pump
Concrete Batch Plant																			
0.00	0.00	0.45	0.54	0.54	0.54	0.54	0.13	0.00	0.00	0.00	8.01	9.61	9.61	2.40	0.00	0.00	0.00	0.00	0.00
Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator	Generator
0.00	0.00	0.09	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.71	0.85	0.85	0.21	0.00	0.00	0.00	0.00	0.00
Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe
Site Preparation																			
0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC	All Terrain Vehicle/MC
0.05	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe
0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder	Chipper/Slump Grinder
0.34	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.82	7.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor	Plate Compactor
0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor	Air Compressor
0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor
0.11	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.35	1.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor
0.40	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.75	6.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor	Crawler Tractor
0.36	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67	5.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	Excavator	Excavator	Excavator	Excavator	Excavator	Excavator	Excavator	Excavator	Excavator	Excavator	Excavator	Excavator	Excavator	Excavator	Excavator	Excavator	Excavator	Excav	

**NOTES:**

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-005.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFs: g/hp-hr), and load factor are from NMIM/NONROAD08 model factors dated April 5, 2009.

EFs from NMIM/NONROAD8 have transient adjustment factors built in.

Note 3: Age factor and Deterioration factors calculated using Equation 4 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition"

Age Factor = LF \* cumulative hours / median life (where Age factor is capped at 1. For this calculation, age factor is as

Deterioration Factor =  $1 + (A * \text{Age Factor}^b)$ , where  $b = 1$  for diesel engines and  $A$  is taken from Table A4 from source

Note 4: Adjusted Emission Factors for HC and NOx are calculated using Equation 1 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", AP-42, Appendix A.

Adjusted EF =  $E_{\text{res}} \cdot \text{TAF} \cdot \text{DF}$  (as stated in Note 2, EFs have TAFs built in)

Note 5: Annual VOC Emissions are calculated using the following calculation (1.053 \* Adj. HC emission factor (g/hp-hr) \* horsepower \* hours operated \* load factor) / (2000 lb/ton \* 453.6 g/lb)

1.053 is the ratio of VOC to HC from "Conversion Factors for Hydrocarbon Components", December 2005, EPA-420-P-05-015.



Table B-1b Diesel Non-Road Engine Emissions included in safety-related construction

Equipment category based on NONROAD classification		SCC <sup>1</sup>	Fuel Type	Engine Technology Type	Equipment Horsepower	Year 1 hrs	Year 2 hrs	Year 3 hrs	Year 4 hrs	Year 5 hrs	Year 6 hrs	Year 7 hrs	Year 8 hrs	Year 9 hrs	BSFC <sup>2</sup> lb/hp-hr	EFss (g/hp-hr) <sup>2</sup> HC NOx	Load Factor <sup>2</sup>	Age Factor <sup>3</sup>	"A" <sup>3</sup> HC NOx	Deterioration factor <sup>3</sup> HC NOx	Adjusted EF (g/hp-hr) <sup>4</sup> HC NOx					
Earthmoving	Crawler Tractor	2270002069	Diesel	T3	105	0	0	1976	5200	5516	5616	4940	2892	125	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
	Crawler Tractor	2270002069	Diesel	T3	210	0	0	3848	7488	7696	6760	4732	2704	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
	Crawler Tractor	2270002069	Diesel	T3	307	0	0	3848	7488	7696	6214	3536	0	0	0.371	0.17	2.61	0.59	1	0.027	0.008	1.027	1.008	0.175	2.631	
	Excavator	2270002036	Diesel	T4	30	0	0	1664	4056	4056	3536	2132	0	0	0.412	0.13	3	0.59	1	0.027	0.008	1.027	1.008	0.134	3.024	
	Excavator	2270002036	Diesel	T3	268	0	0	3224	7072	7488	7020	4992	0	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
	Excavator	2270002036	Diesel	T4	321	0	0	1664	4056	3552	3276	1716	0	0	0.371	0.13	2.5	0.59	1	0.027	0.008	1.027	1.008	0.134	2.520	
	Excavator	2270002036	Diesel	T4	404	0	0	936	1872	1872	1872	624	0	0	0.371	0.13	2.5	0.59	1	0.027	0.008	1.027	1.008	0.134	2.520	
	Crawler Tractor	2270002069	Diesel	T4	426	0	0	2059	2246	2246	2246	1123	0	0	0.371	0.13	2.5	0.59	1	0.027	0.008	1.027	1.008	0.134	2.520	
	Grader	2270002048	Diesel	T3	135	0	0	3203	5907	5657	4246	2995	2995	250	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
	Tractor/Loader/Backhoe	2270002066	Diesel	T3	80	0	0	3484	6239	6739	5739	3369	437	0	0.481	0.42	3.64	0.21	1	0.027	0.008	1.027	1.008	0.431	3.669	
Site Preparation	Tractor/Loader/Backhoe	2270002066	Diesel	T3	174	0	0	4367	8049	7612	6739	3429	936	0	0.433	0.42	3.03	0.21	1	0.027	0.008	1.027	1.008	0.431	3.654	
	Skid Steer Loader	2270002072	Diesel	T4	75	0	0	1664	4056	3552	3744	3120	0	0	0.433	0.42	3.03	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024	
	Tractor/Loader/Backhoe	2270002066	Diesel	T3	199	0	0	2080	5048	5016	5016	4056	0	0	0.433	0.42	3.03	0.21	1	0.027	0.008	1.027	1.008	0.431	3.654	
	Tractor/Loader/Backhoe	2270002066	Diesel	T4	349	0	0	1664	4056	3552	3744	2608	0	0	0.433	0.13	2.5	0.21	1	0.027	0.008	1.027	1.008	0.134	2.520	
	Tractor/Loader/Backhoe	2270002066	Diesel	T3	224	0	0	1612	4472	5252	4264	2608	0	0	0.433	0.42	3.03	0.21	1	0.027	0.008	1.027	1.008	0.431	3.654	
	Off-Highway Tractor	2270002075	Diesel	T3	115	0	0	2578	5658	5950	5865	4118	0	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
	Compaction	Plate Compactor	2270002069	Diesel	T4	339	0	0	1266	2035	2995	2995	1498	0	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520
		Plate Compactor	2270002069	Diesel	T3	185	0	0	4742	7488	7488	7113	5241	1747	0	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520
	Cranes	Crane	2270002045	Diesel	T4	510	0	0	3494	5990	5990	5990	3993	0	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520
		Crane	2270002045	Diesel	T4	340	0	0	5677	9734	9734	9734	8517	2028	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520
Crane		2270002045	Diesel	T4	340	0	0	3244	8112	9734	9734	3245	0	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520	
Crane		2270002045	Diesel	T4	340	0	0	5678	19469	24336	24336	23525	7301	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520	
Crane		2270002045	Diesel	T4	600	0	0	2163	5949	9734	9734	3245	0	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520	
Crane		2270002045	Diesel	T4	600	0	0	4907	9734	9734	9734	8517	2028	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520	
Crane		2270002045	Diesel	T4	500	0	0	10608	21216	22464	22464	20592	11232	0	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520	
Crane		2270002045	Diesel	T3	152	0	0	6115	13977	15724	15433	10899	749	0	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520	
Crane		2270002045	Diesel	T3	174	0	437	6260	9900	10483	10483	10358	7945	936	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520	
Crane		2270002045	Diesel	T3	215	0	437	7425	19219	36891	47610	39457	15517	936	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520	
Material Handling	Crane	2270002045	Diesel	T3	250	0	437	6260	9900	10483	10483	10192	6406	0	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520	
	Crane	2270002045	Diesel	T3	250	0	0	2329	6406	10483	10483	7046	8664	561	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520	
	Forklift	2270003020	Diesel	T3	142	0	0	3993	10982	13478	13478	11731	2246	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
	Crane	2270002045	Diesel	T3	290	0	0	2496	6240	7488	7488	6240	3744	936	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520	
	Forklift	2270003020	Diesel	T3	89	0	0	3993	10982	13478	13478	11731	2246	0	0.412	0.19	3.13	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
	Forklift	2270003020	Diesel	T3	113	0	0	19656	33966	33966	27768	11076	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631		
	Forklift	2270003020	Diesel	T3	110	0	0	21372	41808	44928	44928	35890	14654	0	0.371	0.19	2.61	0.59	1	0.027	0.008	1.027	1.008	0.195	2.631	
	Material Handlers	Aerial Lift	2270003010	Diesel	T4	28	0	0	0	6738	19469	22464	17160	4368	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024
		Aerial Lift	2270003010	Diesel	T4	65	0	0	4367	13228	15724	13693	6240	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024	
		Aerial Lift	2270003010	Diesel	T4	48	0	0	6739	11232	11232	11045	9359	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024	
Aerial Lift		2270003010	Diesel	T4	48	0	0	2894	4492	4492	4492	4118	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024		
Aerial Lift		2270003010	Diesel	T4	70	0	0	2620	5990	6739	6739	4493	0	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024	
Aerial Lift		2270003010	Diesel	T4	75	0	0	2620	5990	6739	6739	4493	0	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024	
Aerial Lift		2270003010	Diesel	T4	28	0	0	0	749	2246	2246	2246	749	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024	
Aerial Lift		2270003010	Diesel	T4	32	0	0	0	4492	6739	6739	6739	6312	1364	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024
Welding Equipment		Welding Equipment	2270006025	Diesel	T4	26	0	0	8736	14976	14976	14976	14023	7068	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024
		Welder	2270006025	Diesel	T4	35	0	0	6968	14976	14976	14976	14023	7068	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024
	Welder	2270006025	Diesel	T4	48	0	0	7487	14976	14976	14976	13728	7862	0	0.481	0.13	3	0.21	1	0.027	0.008	1.027	1.008	0.134	3.024	
	Concrete / Aggregate Pump	2270002039	Diesel	T4	80	0	0	0	3893	4990	3294	998	0	0	0.412	0.13	3	0.59	1	0.027	0.008	1.027	1.008	0.134	3.024	
Air Compressors	Air Compressor	2270006015	Diesel	T3	80	0	624	7020	8424	9360	9360	9308	8454	1738	0.408	0.3672	4.7	0.43	1	0.027	0.00					

Table B-1b Diesel Non-Road Engine Emissions inc

Equipment category based on NONROAD classification	Equipment category based on NONROAD classification																																					
	VOC <sup>1</sup> tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons						
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	NOx <sup>6</sup> tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons						
Earthmoving																																						
Crawler Tractor	0.00	0.00	0.03	0.07	0.08	0.08	0.07	0.04	0.00	0.00	0.00	0.36	0.93	1.01	1.01	0.89	0.52	0.02	0.00	0.00	0.36	0.93	1.01	1.01	0.89	0.52	0.02	0.00	0.00	0.36	0.93	1.01	1.01	0.89	0.52	0.02		
Crawler Tractor	0.00	0.00	0.11	0.21	0.22	0.19	0.13	0.08	0.00	0.00	0.00	1.38	2.69	2.77	2.43	1.70	0.97	0.00	0.00	0.00	1.38	2.69	2.77	2.43	1.70	0.97	0.00	0.00	0.00	1.38	2.69	2.77	2.43	1.70	0.97	0.00		
Crawler Tractor	0.00	0.00	0.14	0.27	0.28	0.23	0.13	0.00	0.00	0.00	0.00	0.00	0.02	0.33	4.04	3.26	1.96	0.00	0.00	0.00	0.00	0.02	0.33	4.04	3.26	1.96	0.00	0.00	0.00	0.00	0.02	0.33	4.04	3.26	1.96	0.00	0.00	
Excavator	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.10	0.24	0.24	0.21	0.13	0.00	0.00	0.00	0.00	0.10	0.24	0.24	0.21	0.13	0.00	0.00	0.00	0.10	0.24	0.24	0.21	0.13	0.00	0.00		
Excavator	0.00	0.00	0.12	0.25	0.27	0.25	0.18	0.00	0.00	0.00	0.00	1.48	3.24	3.43	3.22	2.29	0.00	0.00	0.00	0.00	0.00	1.48	3.24	3.43	3.22	2.29	0.00	0.00	0.00	1.48	3.24	3.43	3.22	2.29	0.00	0.00		
Excavator	0.00	0.00	0.05	0.12	0.12	0.10	0.05	0.00	0.00	0.00	0.00	0.88	2.13	2.08	1.72	0.90	0.00	0.00	0.00	0.00	0.00	0.88	2.13	2.08	1.72	0.90	0.00	0.00	0.00	0.88	2.13	2.08	1.72	0.90	0.00	0.00		
Excavator	0.00	0.00	0.03	0.07	0.07	0.07	0.02	0.00	0.00	0.00	0.00	0.62	1.24	1.24	1.24	0.41	0.00	0.00	0.00	0.00	0.00	0.62	1.24	1.24	1.24	0.41	0.00	0.00	0.00	0.62	1.24	1.24	1.24	0.41	0.00	0.00		
Crawler Tractor	0.00	0.00	0.08	0.09	0.09	0.09	0.09	0.04	0.00	0.00	0.00	1.44	1.57	1.57	1.57	1.57	0.78	0.00	0.00	0.00	1.44	1.57	1.57	1.57	1.57	0.78	0.00	0.00	0.00	1.44	1.57	1.57	1.57	0.78	0.00	0.00		
Grader	0.00	0.00	0.06	0.11	0.10	0.08	0.05	0.05	0.00	0.00	0.00	0.74	1.36	1.31	1.00	0.69	0.69	0.06	0.00	0.00	0.00	0.74	1.36	1.31	1.00	0.69	0.69	0.06	0.00	0.00	0.74	1.36	1.31	1.00	0.69	0.69	0.06	0.00
Tractor/loader/Backhoe	0.00	0.00	0.03	0.05	0.06	0.05	0.03	0.00	0.00	0.00	0.00	0.24	0.42	0.45	0.39	0.23	0.03	0.00	0.00	0.00	0.24	0.42	0.45	0.39	0.23	0.03	0.00	0.00	0.24	0.42	0.45	0.39	0.23	0.03	0.00	0.00		
Tractor/loader/Backhoe	0.00	0.00	0.08	0.15	0.14	0.12	0.10	0.02	0.00	0.00	0.00	0.94	1.94	1.94	1.94	0.55	0.12	0.00	0.00	0.00	0.94	1.94	1.94	1.94	0.55	0.12	0.00	0.00	0.94	1.94	1.94	1.94	0.55	0.12	0.00	0.00		
Skid Steer Loader	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.09	0.21	0.21	0.20	0.16	0.00	0.00	0.00	0.00	0.09	0.21	0.21	0.20	0.16	0.00	0.00	0.00	0.09	0.21	0.21	0.20	0.16	0.00	0.00		
Tractor/loader/Backhoe	0.00	0.00	0.04	0.11	0.12	0.12	0.08	0.00	0.00	0.00	0.00	0.29	0.76	0.79	0.79	0.57	0.00	0.00	0.00	0.00	0.29	0.76	0.79	0.79	0.57	0.00	0.00	0.00	0.29	0.76	0.79	0.79	0.57	0.00	0.00			
Tractor/loader/Backhoe	0.00	0.00	0.02	0.05	0.04	0.04	0.03	0.00	0.00	0.00	0.00	0.34	0.83	0.80	0.76	0.57	0.00	0.00	0.00	0.00	0.34	0.83	0.80	0.76	0.57	0.00	0.00	0.00	0.34	0.83	0.80	0.76	0.57	0.00	0.00			
Tractor/loader/Backhoe	0.00	0.00	0.04	0.11	0.12	0.10	0.07	0.00	0.00	0.00	0.00	0.26	0.71	0.83	0.68	0.44	0.00	0.00	0.00	0.00	0.26	0.71	0.83	0.68	0.44	0.00	0.00	0.00	0.26	0.71	0.83	0.68	0.44	0.00	0.00			
Off-Highway Tractor	0.00	0.00	0.04	0.09	0.09	0.09	0.09	0.06	0.00	0.00	0.00	0.51	1.11	1.18	1.15	0.81	0.00	0.00	0.00	0.00	0.51	1.11	1.18	1.15	0.81	0.00	0.00	0.00	0.51	1.11	1.18	1.15	0.81	0.00	0.00			
Construction																																						
Plate Compactor	0.00	0.00	0.03	0.05	0.07	0.07	0.07	0.03	0.00	0.00	0.00	0.51	0.82	1.21	1.21	1.21	0.61	0.00	0.00	0.00	0.51	0.82	1.21	1.21	1.21	0.61	0.00	0.00	0.00	0.51	0.82	1.21	1.21	0.61	0.00	0.00		
Plate Compactor	0.00	0.00	0.08	0.13	0.13	0.12	0.09	0.03	0.00	0.00	0.00	1.05	1.65	1.65	1.57	1.16	0.39	0.00	0.00	0.00	1.05	1.65	1.65	1.57	1.16	0.39	0.00	0.00	0.00	1.05	1.65	1.65	1.57	1.16	0.39	0.00	0.00	
Cranes																																						
Crane	0.00	0.00	0.12	0.20	0.20	0.20	0.14	0.00	0.00	0.00	0.00	2.13	3.65	3.65	3.65	2.43	0.00	0.00	0.00	0.00	2.13	3.65	3.65	3.65	2.43	0.00	0.00	0.00	2.13	3.65	3.65	3.65	2.43	0.00	0.00			
Crane	0.00	0.00	0.11	0.22	0.22	0.22	0.19	0.05	0.00	0.00	0.00	1.98	3.95	3.95	3.95	3.46	0.82	0.00	0.00	0.00	1.98	3.95	3.95	3.95	3.46	0.82	0.00	0.00	1.98	3.95	3.95	3.95	3.46	0.82	0.00	0.00		
Crane	0.00	0.00	0.13	0.45	0.55	0.46	0.03	0.00	0.00	0.00	0.00	0.00	0.00	2.36	8.13	9.77	8.26	0.59	0.00	0.00	0.00	0.00	2.36	8.13	9.77	8.26	0.59	0.00	0.00	0.00	2.36	8.13	9.77	8.26	0.59	0.00	0.00	
Crane	0.00	0.00	0.07	0.18	0.22	0.22	0.07	0.00	0.00	0.00	0.00	1.32	3.29	3.95	3.95	1.32	0.00	0.00	0.00	0.00	1.32	3.29	3.95	3.95	1.32	0.00	0.00	0.00	1.32	3.29	3.95	3.95	1.32	0.00	0.00	0.00		
Crane	0.00	0.00	0.13	0.44	0.55	0.55	0.53	0.17	0.00	0.00	0.00	2.31	7.91	9.88	9.88	9.55	2.97	0.00	0.00	0.00	2.31	7.91	9.88	9.88	9.55	2.97	0.00	0.00	2.31	7.91	9.88	9.88	9.55	2.97	0.00	0.00		
Crane	0.00	0.00	0.09	0.24	0.39	0.39	0.39	0.13	0.00	0.00	0.00	1.55	4.26	6.98	6.98	6.98	2.33	0.00	0.00	0.00	1.55	4.26	6.98	6.98	6.98	2.33	0.00	0.00	1.55	4.26	6.98	6.98	6.98	2.33	0.00	0.00		
Crane	0.00	0.00	0.20	0.39	0.39	0.39	0.34	0.08	0.00	0.00	0.00	3.52	6.98	6.98	6.98	6.10	1.45	0.00	0.00	0.00	3.52	6.98	6.98	6.98	6.10	1.45	0.00	0.00	3.52	6.98	6.98	6.98	6.10	1.45	0.00	0.00		
Crane	0.00	0.00	0.35	0.71	0.75	0.75	0.69	0.37	0.00	0.00	0.00	6.34	12.67	13.42	13.42	12.30	6.71	0.00	0.00	0.00	6.34	12.67	13.42	13.42	12.30	6.71	0.00	0.00	6.34	12.67	13.42	13.42	12.30	6.71	0.00	0.00		
Crane	0.00	0.00	0.09	0.20	0.22	0.22	0.15	0.01	0.00	0.00	0.00	1.11	2.54	2.85	2.85	2.80	1.98	0.14	0.00	0.00	1.11	2.54	2.85	2.85	2.80	1.98	0.14	0.00	0.00	1.11	2.54	2.85	2.85	2.80	1.98	0.14	0.00	
Crane	0.00	0.01	0.10	0.16	0.17	0.17	0.13	0.02	0.00	0.00	0.09	1.30	2.05	2.18	2.18	2.15	1.65	0.19	0.00	0.00	0.09	1.30	2.05	2.18	2.18	2.15	1.65	0.19	0.00	0.09	1.30	2.05	2.18	2.18	2.15	1.65	0.19	0.00
Crane	0.00	0.01	0.15	0.38	0.73	0.94	0.78	0.31	0.02	0.00	0.11	1.91	4.94	9.42	12.23	10.13	3.98	0.24	0.00	0.00	0.11	1.91	4.94	9.42	12.23	10.13	3.98	0.24	0.00	0.11	1.91	4.94	9.42	12.23	10.13	3.98	0.24	0.00
Crane	0.00	0.01	0.14	0.23	0.24	0.24	0.15	0.00	0.00	0.00	0.13	1.87	2.96	3.13	3.13	3.04	1.91	0.00	0.00	0.00	0.13	1.87	2.96	3.13	3.13	3.04	1.91	0.00	0.00	0.13	1.87	2.96	3.13	3.04	1.91	0.00	0.00	
Crane	0.00	0.00	0.05	0.15	0.24	0.24	0.16	0.01	0.00	0.00	0.00	0.70	1.91	3.13	3.13	2.10	2.05	0.17	0.00	0.00	0.70	1.91	3.13	3.13	2.10	2.05	0.17	0.00	0.00	0.70	1.91	3.13	3.13	2.10	2.05	0.17	0.00	
Forklift																																						
Forklift	0.00	0.00	0.08	0.21	0.26	0.26	0.25	0.22	0.04	0.00	0.00	0.97	2.87	3.27	3.27	3.25	2.85	0.55	0.00	0.00	0.97	2.87	3.27	3.27	3.25	2.85	0.55	0.00	0.00	0.97	2.87	3.27	3.27	3.25	2.85	0.55	0.00	
Forklift	0.00	0.00	0.07	0.17	0.20	0.20	0.17	0.10	0.03	0.00	0.00	0.86	2.16	2.59	2.59	2.59	2.16	1.30	0.32	0.00	0.86	2.16	2.59	2.59	2.59	2.16	1.30	0.32	0.00	0.86	2.16	2.59	2.59	2.16	1.30	0.32	0.00	
Forklift	0.00	0.00	0.05	0.13	0.16	0.16	0.16	0.08	0.00	0.00	0.00	0.73	2.01	2.46	2.46	2.46	2.46	1.23	0.00	0.00	0.73	2.01	2.46	2.46	2.46	2.46	1.23	0.00	0.00	0.73	2.01	2.46	2.46	2.46	1.23	0.00	0.0	

Table B-1b Diesel Non-Road Engine Emissions included in safety-related construction

Winches and Tuggers Other Construction Equipment	2270002081	Diesel	T4	140	0	0	0	0	4492	6552	5241	1123	0	0.371	0.13	2.5	0.59	1	0.027	0.008	1.027	1.008	0.134	2.520
	2270006005	Diesel	T3	150	1528	2620	8517	15287	15724	15724	15288	11515	3335	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520
	2270006005	Diesel	T3	86	0	0	2037	4950	5241	5241	5241	5241	1310	0.408	0.18	3	0.43	1	0.027	0.008	1.027	1.008	0.185	3.024
	2270006005	Diesel	T4	345	0	0	1601	4950	5241	5241	5241	1310	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520	
	2270006005	Diesel	T4	200	0	0	2184	6989	7862	7862	7862	7562	1591	0.367	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520
	2270006005	Diesel	T3	143	0	0	7131	12852	13104	13104	13104	12230	2621	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520
	2270006005	Diesel	T3	143	0	0	3639	9027	10483	10483	10483	9734	2059	0.367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520
	2270006005	Diesel	T4	14	0	0	26332	62338	62233	63168	26032	36727	8925	0.408	0.13	4.44	0.43	1	0.027	0.008	1.027	1.008	0.134	4.476
	Small Capital Equipment																							
	2270002009	Diesel	T4	8	0	0	21762	33696	33696	33696	33696	29113	4987	0.408	0.13	4.3	0.43	1	0.027	0.008	1.027	1.008	0.134	4.334
2270002009	Diesel	T4	15	0	0	6552	14040	16948	16948	16948	15377	3109	0.408	0.13	4.44	0.43	1	0.027	0.008	1.027	1.008	0.134	4.476	
2270002009	Diesel	T4	19	0	0	8288	18408	22464	22464	22464	21852	3516	0.408	0.13	4.44	0.43	1	0.027	0.008	1.027	1.008	0.134	4.476	
2270006005	Diesel	T4	11	0	0	17472	39858	50076	50944	49530	42800	8424	0.408	0.13	4.44	0.43	1	0.027	0.008	1.027	1.008	0.134	4.476	
2270006010	Diesel	T4	11	0	0	2184	5304	5616	5616	5616	5616	1404	0.408	0.3508	4.3	0.43	1	0.027	0.008	1.027	1.008	0.386	4.476	
2270006010	Diesel	T4	65	0	0	2184	5304	5616	5616	5616	5616	1404	0.408	0.3508	4.3	0.43	1	0.027	0.008	1.027	1.008	0.386	4.476	
2270002038	Diesel	T4	65	0	0	3042	7488	8424	8424	8424	7889	1705	0.412	0.13	3	0.59	1	0.027	0.008	1.027	1.008	0.134	3.024	
2270002038	Concrete Saw																							
2270002008	Temper/Rammer																							
2270002008	Temper/Rammer																							
2270002008	Temper/Rammer																							
2270006010	Pump																							
TOTAL (Tons)																								



Table B-2a Gasoline Non-Road Engine Emissions

Equipment category based on NONROAD classification	SCC <sup>1</sup>	Fuel Type	Engine Technology Type	Equipment Horsepower	Year 1 hrs	Year 2 hrs	Year 3 hrs	Year 4 hrs	Year 5 hrs	Year 6 hrs	Year 7 hrs	Year 8 hrs	Year 9 hrs	BSFC <sup>2</sup> lb/hp-hr	EFss (g/hp-hr) <sup>2</sup>			Load Factor <sup>2</sup>	Age Factor <sup>3</sup>	"A" <sup>3</sup>			Deterioration factor <sup>3</sup>		Adjusted EF (g/hp-hr) <sup>4</sup>	
															HC	NOx	HC			NOx	HC	NOx	HC	NOx	HC	NOx
Forklift	2265003020	Gasoline	G4GT252	52	0	0	9234	19219	22464	22464	22339	20288	5562	0.484	0.27	0.69	0.3	1	0.64	0.15	1.640	1.150	0.443	0.79		
Aerial Lift	2265003010	Gasoline	G4GT252	75	0	0	0	2994	4492	4492	4492	4493	1498	0.484	0.27	0.69	0.46	1	0.64	0.15	1.640	1.150	0.443	0.79		
Plate Compactor	2260002009	Gasoline	G4N2O2	7	0	0	11466	24726	30332	30088	33765	33434	5315	0.74	4.16	2.77	0.55	1	1.095	0	2.095	1.000	9	2.770		
Chipper/Stump Grinder	2265004066	Gasoline	L4N1	11	0	0	1170	2106	2106	2106	2106	1052	0	0.693	3.91	5.25	0.78	1	1.095	0	2.095	1.000	8	5.250		
Lawn Mower	2265004011	Gasoline	G4N1O2	3	0	0	2808	5616	5616	5616	5616	5616	1404	0.781	6.51	2.446	0.78	1	1.753	0	2.753	1.000	18	2.446		
Cement & Mortar Mixer	2260002042	Gasoline	G4N2O2	13	0	0	3276	7488	8424	8424	8424	7889	1705	0.74	4.16	2.77	0.33	1	1.095	0	2.095	1.000	9	2.770		
Pump	2265006010	Gasoline	G4GT25	6	0	0	8268	18408	22464	22464	21420	6637	4011	0.605	3.85	8.43	0.69	1	1.095	0	2.095	1.000	8	8.430		
Snowblower	2265004036	Gasoline	G4N2O	11	0	0	2184	5304	5616	5616	5616	5616	1404	0.94	5.2	3.5	0.35	1	1.095	0	2.095	1.000	11	3.500		
Cement & Mortar Mixer	2260002042	Gasoline	G4N2O2	6	0	468	11232	16380	16848	15132	11544	5616	0	0.74	4.16	2.77	0.33	1	1.095	0	2.095	1.000	9	2.770		
Cement & Mortar Mixer	2260002042	Gasoline	G4N2O2	8	0	468	11232	16380	16848	15132	11544	5616	0	0.74	4.16	2.77	0.33	1	1.095	0	2.095	1.000	9	2.770		
Concrete Equipment	2260002039	Gasoline	G4N1O2	3	0	0	13806	27066	33540	33696	33415	16427	0	0.921	6.13	2.446	0.63	1	1.753	0	2.753	1.000	17	2.446		
Chain Saw	2260004021	Gasoline	G2H52	3	27300	19500	0	0	0	0	0	0	0	0.608	47.98	0.91	0.59	1	0.266	0	1.266	1.000	61	0.910		
Roller	2265002015	Gasoline	G4N1O2	6	5460	9360	780	0	0	0	0	0	0	0.781	6.51	2.446	0.62	1	1.095	0	2.095	1.000	14	2.446		
Pump	2265006010	Gasoline	G4GT25	4	7280	8320	0	0	0	0	0	0	0	0.605	3.85	8.43	0.69	1	1.753	0	2.753	1.000	11	8.430		
TOTAL (Tons)																										

**NOTES:**

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-005.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss; g/hp-hr), and load factor are from NMM/NONROAD08 model factors dated April 5, 2009. Except forklift, aerial lift and cement/concrete equipment.

EFss from NMM/NONROAD08 have transient adjustment factors built in.

Forklift, aerial lift, and concrete/cement equipment values are from Tables 1-7 of "Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition", December 2005, EPA-420-R-05R-019.

Note 3: Age factor and deterioration factors calculated using Equation 4 from "Nonroad Spark-Ignition Engine Emission Deterioration Factors", December 2005, EPA-420-R-05-023.

Age Factor =  $LF^b$  \* cumulative hours / median life (where Age Factor is capped at 1). For this calculation, age factor is assumed to be 1 for simplification purposes).

Deterioration Factor =  $1 + (A * Age Factor^b)$ , where b = 1 for 2-stroke engines and A is taken from Tables 1-7 from source

Note 4: Adjusted Emission Factors for HC and NOx are calculated using Equation 1 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", April 2004, EPA-420-P-04-009.

Adjusted EF =  $EF_{ss} * TAF * DF$  (as stated in Note 2, EFss have TAFs built in)

Note 5: Annual VOC Emissions are calculated using the following calculation

$VOC/HR$  is the ratio of VOC to HC from "Conversion Factors for Hydrocarbon Components", December 2005, EPA-420-P-05-015. \* horsepower \* hours operated \* load factor / (2000 lb/ton \* 453.6 g/lb)

Note 6: Annual NOx Emissions are calculated using the following calculation

(Adj. NOx emission factor (g/lp-hr) \* horsepower \* hours operated \* load factor) / (2000 lb/ton \* 453.6 g/lb)

Table B-2a Gasoline Nonroad Engine Emissions

Equipment category based on NONROAD classification	VOC <sup>5</sup> tons		VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	NOx <sup>6</sup> tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Forklift	0.00	0.00	0.07	0.14	0.16	0.16	0.16	0.14	0.04	0.00	0.00	0.13	0.26	0.31	0.31	0.30	0.28	0.08
Aerial Lift	0.00	0.00	0.00	0.05	0.07	0.07	0.07	0.07	0.02	0.00	0.00	0.00	0.09	0.14	0.14	0.14	0.14	0.05
Plate Compactor	0.00	0.00	0.40	0.85	1.05	1.04	1.17	1.15	0.18	0.00	0.00	0.13	0.29	0.36	0.35	0.40	0.39	0.06
Chipper/Stump Grinder	0.00	0.00	0.08	0.15	0.15	0.15	0.15	0.08	0.00	0.00	0.00	0.06	0.10	0.10	0.10	0.10	0.05	0.00
Lawn Mower	0.00	0.00	0.12	0.24	0.24	0.24	0.24	0.24	0.06	0.00	0.00	0.02	0.04	0.04	0.04	0.04	0.04	0.01
Cement & Mortar Mixer	0.00	0.00	0.13	0.29	0.32	0.32	0.32	0.30	0.07	0.00	0.00	0.04	0.10	0.11	0.11	0.11	0.10	0.02
Pump	0.00	0.00	0.28	0.63	0.77	0.77	0.74	0.23	0.14	0.00	0.00	0.32	0.71	0.86	0.86	0.82	0.26	0.15
Snowblower	0.00	0.00	0.09	0.23	0.24	0.24	0.24	0.24	0.06	0.00	0.00	0.03	0.08	0.08	0.08	0.08	0.08	0.02
Cement & Mortar Mixer	0.00	0.01	0.20	0.29	0.30	0.27	0.20	0.10	0.00	0.00	0.00	0.07	0.10	0.10	0.09	0.07	0.03	0.00
Cement & Mortar Mixer	0.00	0.01	0.27	0.39	0.40	0.36	0.27	0.13	0.00	0.00	0.00	0.09	0.13	0.14	0.12	0.09	0.05	0.00
Concrete Equipment	0.00	0.00	0.45	0.89	1.10	1.11	1.10	0.54	0.00	0.00	0.00	0.07	0.14	0.17	0.17	0.17	0.08	0.00
Chain Saw	3.35	2.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller	0.28	0.49	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Pump	0.22	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL (Tons)	3.85	3.15	2.13	4.15	4.81	4.73	4.66	3.23	0.57	0.29	0.35	0.97	2.04	2.41	2.38	2.33	1.50	0.39
	0	0	0.07	0.18	0.23	0.23	0.23	0.21	0.06	0.00	0	0.13	0.35	0.44	0.44	0.44	0.41	0.12

**NOTES:**

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-005.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EF<sub>ss</sub>; g/hp-hr), and load factor are from NMIM/NONROAD08 model factors dated April 5, 2009. Except forklift, aerial lift and cement/concrete equipment.

EF<sub>ss</sub> from NMIM/NONROAD08 have transient adjustment factors built in.

Forklift, aerial lift, and concrete/cement equipment values are from Tables 1-7 of "Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition", December 2005, EPA-420-R-05-023.

Note 3: Age factor and deterioration factors calculated using Equation 4 from "Nonroad Spark-Ignition Engine Emission Deterioration Factors", December 2005, EPA-420-R-05-023.

Age Factor =  $LF^a$  \* cumulative hours / median life (where Age factor is capped at 1. For this calculation, age factor is assumed to be 1 for simplification purposes).

Deterioration Factor =  $1 + (A * Age Factor^b)$ , where b = 1 for 2-stroke engines and A is taken from Tables 1-7 from source

Note 4: Adjusted Emission Factors for HC and NO<sub>x</sub> are calculated using Equation 1 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", April 2004, EPA-420-P-04-009.

Adjusted EF = EF<sub>ss</sub> \* TAF \* DF (as stated in Note 2, EF<sub>ss</sub> have TAFs built in)

Note 5: Annual VOC Emissions are calculated using the following (VOC/HC \* Adj. HC emission factor (g/hp-hr) \* horsepower \* hours operated \* load factor) / (2000 lb/ton \* 453.6 g/lb)

VOC/HR is the ratio of VOC to HC from "Conversion Factors for Hydrocarbon Components", December 2005, EPA-420-P-05-015. 0.533 for 4-stroke engines and 1.034 for 2-stroke engines

Note 6: Annual NO<sub>x</sub> Emissions are calculated using the following (Adj. NO<sub>x</sub> emission factor (g/hp-hr) \* horsepower \* hours operated \* load factor) / (2000 lb/ton \* 453.6 g/lb)

Table B-2b Gasoline Non-Road Engine Emissions Included in safety-related construction

Equipment category based on NONROAD classification	SCC <sup>1</sup>	Fuel Type	Engine Technology Type	Equipment Horsepower	Year 1 hrs	Year 2 hrs	Year 3 hrs	Year 4 hrs	Year 5 hrs	Year 6 hrs	Year 7 hrs	Year 8 hrs	Year 9 hrs	BSFC <sup>2</sup>		EFss (g/hp-hr) <sup>2</sup>		Load Factor <sub>2</sub>	Age Factor <sup>3</sup>	"A" <sup>3</sup>		Deterioration factor <sup>3</sup>		Adjusted EF (g/hp-hr) <sup>4</sup>	
														HC	NOx	HC	NOx			HC	NOx	HC	NOx	HC	NOx
Forklift	2265003020	Gasoline	G4GT252	52	0	0	9234	19219	22464	22464	22339	20288	5562	0.484	0.27	0.69	0.3	1	0.64	0.15	1.640	1.150	0.443	0.79	
Aerial Lift	2265003010	Gasoline	G4GT252	75	0	0	0	2994	4492	4492	4492	4493	1498	0.484	0.27	0.69	0.46	1	0.64	0.15	1.640	1.150	0.443	0.79	
Plate Compactor	2260002009	Gasoline	G4N2O2	7	0			24726	30332	30088	33765	33434	5315	0.74	4.16	2.77	0.55	1	1.095	0	2.095	1.000	9	2.770	
Cement & Mortar Mixer	2260002042	Gasoline	G4N2O2	11	0			2106	2106	2106	2106	1052	0	0.74	4.16	2.77	0.33	1	1.095	0	2.095	1.000	9	2.770	
Cement & Mortar Mixer	2260002042	Gasoline	G4N2O2	13	0			7488	8424	8424	8424	7869	1705	0.74	4.16	2.77	0.33	1	1.095	0	2.095	1.000	9	2.770	
Pump	2265006010	Gasoline	G4GT25	6	0			8268	18408	22464	22464	6637	4011	0.605	3.85	8.43	0.69	1	1.095	0	2.095	1.000	8	8.430	
Cement & Mortar Mixer	2260002042	Gasoline	G4N2O2	6	0	468	11232	16380	16848	15132	11544	5616	0	0.74	4.16	2.77	0.33	1	1.095	0	2.095	1.000	9	2.770	
Cement & Mortar Mixer	2260002042	Gasoline	G4N2O2	8	0	468	11232	16380	16848	15132	11544	5616	0	0.74	4.16	2.77	0.33	1	1.095	0	2.095	1.000	9	2.770	
Concrete Equipment	2260002039	Gasoline	G4N1O2	3	0	0	13806	27066	33540	33696	33415	16427	0	0.921	6.13	2.446	0.63	1	1.753	0	2.753	1.000	17	2.446	
TOTAL (Tons)																									

**NOTES:**

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-005.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss; g/hp-hr), and load factor are from NMIM/NONROAD08 model factors dated April 5, 2009. Except forklift, aerial lift and cement/concrete equipment.

EFss from NMIM/NONROAD08 have transient adjustment factors built in.

Forklift, aerial lift, and concrete/cement equipment values are from Tables 1-7 of "Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition", December 2005, EPA420-R-05R-019.

Note 3: Age factor and deterioration factors calculated using Equation 4 from "Nonroad Spark-Ignition Engine Emission Deterioration Factors", December 2005, EPA-420-R-05-023.

Age Factor =  $LF \cdot \text{cumulative hours} / \text{median life}$  (where Age factor is capped at 1. For this calculation, age factor is assumed to be 1 for simplification purposes).

Deterioration Factor =  $1 + (A \cdot \text{Age Factor}^b)$ , where  $b = 1$  for 2-stroke engines = 0.5 for 4-stroke engines and A is taken from Tables 1-7 from source

Note 4: Adjusted Emission Factors for HC and NOx are calculated using Equation 1 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", April 2004, EPA-420-P-04-008.

Adjusted EF =  $\text{Emission} \cdot \text{TAF} \cdot \text{DF}$  (as stated in Note 2, EFs have TAFs built in)

Note 5: Annual VOC Emissions are calculated using the following calculation

$\text{VOC}/\text{HR}$  is the ratio of VOC to HC from "Conversion Factors for Hydrocarbon Components", December 2005, EPA-420-P-05-015.  $0.933$  for 4-stroke engines and  $1.034$  for 2-stroke engines

Note 6: Annual NOx Emissions are calculated using the following calculation

(Adj. NOx emission factor (g/hp-hr) \* horsepower \* hours operated \* load factor) / (2000 lb/ton \* 453.6 g/lb)

Total construction sum

## NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling". April 2004. EPA-420-P-04-005.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss: g/hp-hr), and load factor are from NMIM/NONROAD08 model factors dated April 5, 2009. Except forklift, aerial lift and cement/concrete equipment.

EFss from NIM/NONROAD08 have transient adjustment factors built in.

Forklift, aerial lift, and concrete/cement equipment values are from Tables 1-7 of "Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition", December 2005, EPA420-R-05R-019

Note 3: Age factor and Deterioration factors calculated using Equation 4 from "Nonroad Spark-Ignition Engine Emission Deterioration Factors," December 2005. EPA-420-R-05-023

Also  $\text{Factor} = |\text{E}^+ \text{cumulative houses / median life}|$  For this calculation, one factor is assumed to be 4

Age Factor = CF - cumulative hours / median life (where Age factor is capped at 1). For this calculation, age factor is assumed to be 1 for simplicity.

Dateduration Factor =  $1 / (A + \text{Age Factor} \times B)$  where  $b = 4$  for 2 stroke engines and  $A$  is taken from Tables 4-7 from sources

Deterioration Factor =  $1 + (A \cdot \text{Age Factor} \cdot b)$ , where  $b = 1$  for 2-stroke engines and  $A$  is taken from Tables 1-7 from source

Note 4: Adjusted Emission Factors for HC and NOx are calculated using Equation 1 from

Adjusted EF =  $\text{EF}_{\text{ss}} \cdot \text{TAF} \cdot \text{DF}$  (as stated in Note 2, EF<sub>ss</sub> have TAFs built in)

Note 5: Annual VOC Emissions are calculated using the follovi (VOC/HC \* Adj. HC emission factor (g/hp-hr) \* horsepower \* hours operated \* load factor) / (2000 lb/ton \* 453.6 g/lb)

VOC/HR is the ratio of VOC to HC from "Conversion Factors for Hydrocarbon Components", December 2005, EPA-420-P-05-015. 0.933 for 4-stroke engines and



Table B-3a On-Road Vehicle Emissions Year 1

Vehicle Classification	Fuel Type	Vehicle Class	SCC	Year 1 Total operated	Avg. Speed	Vehicular Miles Trav	Mobile 6.2 EFs (g/mi) <sup>1</sup>		Year 1 Emissions (tons)	
				hrs	mph	VMT	VOC	NOx	VOC	NOx
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	0	30.0	0	0.743	0.571	0.00	0.00
Light Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	3276	20.0	65,520	0.827	0.715	0.06	0.05
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	0	20.0	0	0.827	0.715	0.00	0.00
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	0	20.0	0	1.488	1.182	0.00	0.00
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	0	20.0	0	1.488	1.182	0.00	0.00
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	0	20.0	0	1.488	1.182	0.00	0.00
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	0	20.0	0	1.488	1.182	0.00	0.00
Trucks -Heavy Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	15.0	0	0.39	6.593	0.00	0.00
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	0	15.0	0	0.156	2.238	0.00	0.00
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.304	4.409	0.00	0.00
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	0	15.0	0	0.156	2.238	0.00	0.00
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	0	15.0	0	0.156	2.238	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.467	8.081	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.467	8.081	0.00	0.00
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	0	15.0	0	0.156	2.238	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.467	8.081	0.00	0.00
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	0	15.0	0	0.376	5.501	0.00	0.00
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	0	2.0	0	0.241	3.562	0.00	0.00
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	3432	20.0	68,640	2.595	2.727	0.20	0.21
Diesel Commercial Bus	Diesel	HDDBT	2230075	0	35.0	0	0.278	11.752	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	20.0	0	2.595	2.727	0.00	0.00
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.595	2.727	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	20.0	0	0.168	2.329	0.00	0.00
Concrete / Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.467	8.081	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.467	8.081	0.00	0.00
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.304	4.409	0.00	0.00
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	10.0	0	0.467	8.081	0.00	0.00
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	5460	25.0	136,500	0.168	2.329	0.03	0.35
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	5460	20.0	109,200	0.39	6.593	0.05	0.79
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	3640	25.0	91,000	0.168	2.329	0.02	0.23
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	27300	30.0	819,000	2.595	2.727	2.34	2.46
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles <sup>3</sup>	Round-trip Distance	Vehicular Miles Trav	Mobile 6.2 EFs (g/mi) <sup>1</sup>		2010 Emissions (tons) <sup>2</sup>	
					miles	VMT	VOC	NOx	VOC	NOx
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	639	40.0	7974720	0.743	0.571	6.53	5.02
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	0	100.0	0	0.168	2.329	0.00	0.00
DC NA Area onroad vehicle total (direct & indirect)									9.22	9.12
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	160	20.0	998400	0.743	0.571	0.82	0.63
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	0	50.0	0	0.168	2.329	0.00	0.00
Baltimore NA Area onroad vehicle total									0.82	0.63

**Notes**

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation (VMT (miles) \* Emission factor (g/mi)) / (2000 lb/ton \* 453.6 g/lb)

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of Year 1 Onroad Emissions			
	Year 1 Emissions (tons)		
	VOC	NOx	
Total Onroad DC NA Area Emissions(Report in Table 3-1)	9.22	9.12	
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)	0.82	0.63	
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)	0.00	0.00	

Table B-3b On-Road Vehicle Emissions Year 2

Description	Fuel Type	Vehicle Class	SCC	Year 2 Total operated	Avg.	Vehicular Miles Trav	Mobile 6.2 EFs (g/mi) <sup>1</sup>		Year 2 Emissions (tons)	
				hrs	mph	VMT	HC	NOx	HC	NOx
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	62	30.0	1,860	0.612	0.47	0.00	0.00
Light Duty					0	0	0	0		
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	6552	20.0	131,040	0.666	0.611	0.10	0.09
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	0	20.0	0	0.666	0.611	0.00	0.00
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	0	20.0	0	1.243	1.234	0.00	0.00
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	0	20.0	0	1.243	1.234	0.00	0.00
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	156	20.0	3,120	1.187	0.961	0.00	0.00
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	468	20.0	9,360	1.243	1.234	0.01	0.01
Trucks -Heavy Duty					0	0	0	0		
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	1123	15.0	16,845	0.36	5.588	0.01	0.10
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	0	15.0	0	0.146	1.874	0.00	0.00
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.282	3.754	0.00	0.00
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	374	15.0	5,610	0.146	1.874	0.00	0.01
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	0	15.0	0	0.146	1.874	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.429	6.98	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.429	6.98	0.00	0.00
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	194	15.0	2,910	0.146	1.874	0.00	0.01
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.429	6.98	0.00	0.00
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	156	15.0	2,340	0.349	4.705	0.00	0.01
Trailers					0	0	0	0		
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072		2.0	0	0.232	3.132	0.00	0.00
Personnel Carrier					0	0	0	0		
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	7488	20.0	149,760	2.595	2.727	0.43	0.45
Diesel Commercial Bus	Diesel	HDDBT	2230075	0	35.0	0	0.264	10.469	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	20.0	0	2.595	2.727	0.00	0.00
Emergency Vehicles					0	0	0	0		
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.595	2.727	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	20.0	0	0.155	1.871	0.00	0.00
Concrete / Aggregate					0	0	0	0		
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	312	15.0	4,680	0.429	6.98	0.00	0.04
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	312	15.0	4,680	0.429	6.98	0.00	0.04
Heavy-Duty Diesel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.282	3.754	0.00	0.00
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	10.0	0	0.429	6.98	0.00	0.00
Site Preparation					0	0	0	0		
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	8580	25.0	214,500	0.155	1.871	0.04	0.44
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	8580	20.0	171,600	0.36	5.588	0.07	1.06
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	5720	25.0	143,000	0.155	1.871	0.02	0.29
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	42900	30.0	1,287,000	2.595	2.727	3.68	3.87
Dredging Equipment										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	18000	30.0	540000	0.36	5.588	0.21	3.33
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	4320	45.0	194400	1.243	1.234	0.27	0.26
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	4320	45.0	194400	0.666	0.611	0.14	0.13
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	720	30.0	21600	0.155	1.871	0.00	0.04
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles <sup>3</sup>	Round-Distance miles	Vehicular Miles Trav VMT	Mobile 6.2 EFs (g/mi) <sup>1</sup> VOC NOx		2010 Emissions (tons) <sup>2</sup> VOC NOx	
Employee Commute/ Delivery					0	0	0	0		
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	1454	40.0	18145920	0.612	0.47	12.24	9.40
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	0	100.0	0	0.429	6.98	0.00	0.00
DC NA Area onroad vehicle total (direct & indirect)									17.24	19.59
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	364	20.0	2271360	0.612	0.47	1.53	1.18
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	0	50.0	0	0.429	6.98	0.00	0.00
Baltimore NA Area onroad vehicle tota									1.53	1.18

**Notes**

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of Year 2 Onroad Emissions			
		Year 2 Emissions (tons)	
		VOC	NOx
Total Onroad DC NA Area Emissions (Report in Table 3-1)		17.24	19.59
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)		1.53	1.18
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)		0.00	0.07

Table B-3c On-Road Vehicle Emissions Year 3

Description	Fuel Type	Vehicle Class	SCC	Year 3 Total operated	Average Speed	Vehicular Miles Trav	Criteria Pollutants EFs (g/mi) <sup>1</sup>		Year 3 Emissions (tons)	
				hrs	mph	VMT	HC	NOx	HC	NOx
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	1,123	30.0	33,690	0.563	0.428	0.02	0.02
Light Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	9204	20.0	184,080	0.624	0.554	0.13	0.11
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	8580	20.0	171,600	0.624	0.554	0.12	0.10
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	8320	20.0	166,400	1.175	1.158	0.22	0.21
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	5616	20.0	112,320	1.175	1.158	0.15	0.14
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	3432	20.0	68,640	1.12	0.9	0.08	0.07
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	4992	20.0	99,840	1.175	1.158	0.13	0.13
Trucks -Heavy Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	13664	15.0	204,960	0.345	4.764	0.08	1.08
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	4493	15.0	67,395	0.14	1.601	0.01	0.12
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	3182	15.0	47,730	0.268	3.237	0.01	0.17
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	3868	15.0	58,020	0.14	1.601	0.01	0.10
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	3868	15.0	58,020	0.14	1.601	0.01	0.10
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	4446	15.0	66,690	0.41	6.028	0.03	0.44
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	4446	15.0	66,690	0.41	6.028	0.03	0.44
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	3188	15.0	47,820	0.14	1.601	0.01	0.08
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	4326	15.0	64,890	0.41	6.028	0.03	0.43
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	6760	15.0	101,400	0.331	4.054	0.04	0.45
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	0	2.0	0	0.225	2.792	0.00	0.00
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	19139	20.0	382,780	2.595	2.727	1.09	1.15
Diesel Commercial Bus	Diesel	HDDBT	2230075	0	35.0	0	0.258	9.26	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	11492	20.0	229,840	2.595	2.727	0.66	0.69
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	1091	30.0	32,730	2.595	2.727	0.09	0.10
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	187	20.0	3,740	0.148	1.556	0.00	0.01
Concrete / Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	312	15.0	4,680	0.41	6.028	0.00	0.03
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	2548	15.0	38,220	0.41	6.028	0.02	0.25
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	62400	15.0	936,000	0.268	3.237	0.28	3.34
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	62400	10.0	624,000	0.41	6.028	0.28	4.15
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.148	1.556	0.00	0.00
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	20.0	0	0.345	4.764	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.148	1.556	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.595	2.727	0.00	0.00
Summary of Year 3 Onroad Emissions										
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles <sup>3</sup>	Round-Distance miles	Vehicular Miles Trav	Mobile 6.2 EFs (g/mi) <sup>1</sup>		2010 Emissions (tons) <sup>2</sup>	
						VMT	VOC	NOx	VOC	NOx
Employee Commute/ Delivery					0					
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	2354	40.0	29377920	0.563	0.428	18.23	13.86
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	2084	100.0	208400	0.41	6.028	0.09	1.38
DC NA Area onroad vehicle total (direct & indirect)									21.85	29.17
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	589	20.0	3675360	0.563	0.428	2.28	1.73
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	625	50.0	31250	0.41	6.028	0.01	0.21
Baltimore NA Area onroad vehicle total									2.30	1.94

**Notes**

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of Year 3 Onroad Emissions		
	Year 3 Emissions (tons)	
	VOC	NOx
Total Onroad DC NA Area Emissions(Report in Table 3-1)	21.85	29.17
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)	2.30	1.94
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)	0.58	7.77

Table B-3d On-Road Vehicle Emissions Year 4

Description	Fuel Type	Vehicle Class	SCC	Year 4 Total operated	Average Speed	Vehicular Miles Trav	Criteria Pollutants		Year 4 Emissions (tons)	
				hrs	mph	VMT	EFs (g/mi) <sup>1</sup>	HC	NOx	HC
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	1,497	30.0	44,910	0.52	0.391	0.03	0.02
Light Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	9360	20.0	187,200	0.590	0.507	0.12	0.10
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	14352	20.0	287,040	0.590	0.507	0.19	0.16
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	14768	20.0	295,360	1.113	1.092	0.36	0.36
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	10608	20.0	212,160	1.113	1.092	0.26	0.26
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	3744	20.0	74,880	1.06	0.848	0.09	0.07
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	8424	20.0	168,480	1.113	1.092	0.21	0.20
Trucks -Heavy Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	15724	15.0	235,860	0.332	3.998	0.09	1.04
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	8985	15.0	134,775	0.133	1.384	0.02	0.21
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	7113	15.0	106,695	0.254	2.774	0.03	0.33
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	8486	15.0	127,290	0.133	1.384	0.02	0.19
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	7737	15.0	116,055	0.133	1.384	0.02	0.18
Heavy-Duty Deisel Vehicle 8B	Diesel	HDDV8b	2230074	7488	15.0	112,320	0.392	5.122	0.05	0.63
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	7488	15.0	112,320	0.392	5.122	0.05	0.63
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	4492	15.0	67,380	0.133	1.384	0.01	0.10
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	7155	15.0	107,325	0.392	5.122	0.05	0.61
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	12232	15.0	183,480	0.312	3.454	0.06	0.70
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	3181	2.0	6,362	0.213	2.491	0.00	0.02
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	41709	20.0	834,180	2.595	2.727	2.39	2.51
Diesel Commercial Bus	Diesel	HDDBT	2230075	0	35.0	0	0.253	8.118	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	17368	20.0	347,360	2.595	2.727	0.99	1.04
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	1810	30.0	54,300	2.595	2.727	0.16	0.16
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	374	20.0	7,480	0.142	1.309	0.00	0.01
Concrete / Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	1560	15.0	23,400	0.392	5.122	0.01	0.13
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	4004	15.0	60,060	0.392	5.122	0.03	0.34
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	74880	15.0	1,123,200	0.254	2.774	0.31	3.43
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	74880	10.0	748,800	0.392	5.122	0.32	4.23
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.142	1.309	0.00	0.00
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	20.0	0	0.332	3.998	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.142	1.309	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.595	2.727	0.00	0.00
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles <sup>3</sup>	Round-Distance	Vehicular Miles Trav	Mobile 6.2 EFs (g/mi) <sup>1</sup>		2010 Emissions (tons) <sup>2</sup>	
					miles	VMT	VOC	NOx	VOC	NOx
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	3044	40.0	37989120	0.52	0.391	21.78	16.37
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	3117	100.0	311700	0.392	5.122	0.13	1.76
DC NA Area onroad vehicle total (direct & indirect)									27.76	35.80
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	761	20.0	4748640	0.52	0.391	2.72	2.05
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	935	50.0	46750	0.392	5.122	0.02	0.26
Baltimore NA Area onroad vehicle total									2.74	2.31

**Notes**

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of Year 4 Onroad Emissions			
		Year 4 Emissions (tons)	
		VOC	NOx
Total Onroad DC NA Area Emissions(Report in Table 3-1)		27.76	35.80
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)		2.74	2.31
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)		0.67	8.13

Table B-3e On-Road Vehicle Emissions Year 5

Description	Fuel Type	Vehicle Class	SCC	Year 5 Total operated	Average Speed	Vehicular Miles Trav	Criteria Pollutants		Year 5 Emissions (tons)	
				hrs	mph	VMT	HC	NOx	HC	NOx
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	1,497	30.0	44,910	0.483	0.359	0.02	0.02
Light Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	9360	20.0	187,200	0.561	0.468	0.12	0.10
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	15600	20.0	312,000	0.561	0.468	0.19	0.16
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	14976	20.0	299,520	1.056	1.033	0.35	0.34
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	11232	20.0	224,640	1.056	1.033	0.26	0.26
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	3744	20.0	74,880	1.004	0.802	0.08	0.07
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	9360	20.0	187,200	1.056	1.033	0.22	0.21
Trucks -Heavy Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	15724	15.0	235,860	0.316	3.425	0.08	0.89
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	11232	15.0	168,480	0.128	1.188	0.02	0.22
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	8985	15.0	134,775	0.241	2.397	0.04	0.36
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	11232	15.0	168,480	0.128	1.188	0.02	0.22
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	8985	15.0	134,775	0.128	1.188	0.02	0.18
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8424	15.0	126,360	0.37	4.455	0.05	0.62
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8424	15.0	126,360	0.37	4.455	0.05	0.62
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	4636	15.0	69,540	0.128	1.188	0.01	0.09
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8985	15.0	134,775	0.37	4.455	0.05	0.66
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	12048	15.0	180,720	0.297	2.983	0.06	0.59
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	4492	2.0	8,984	0.204	2.183	0.00	0.02
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	54288	20.0	1,085,760	2.595	2.727	3.11	3.26
Diesel Commercial Bus	Diesel	HDDBT	2230075	41588	35.0	1,455,580	0.25	7.082	0.40	11.36
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	18720	20.0	374,400	2.595	2.727	1.07	1.13
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	2246	30.0	67,380	2.595	2.727	0.19	0.20
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	374	20.0	7,480	0.137	1.095	0.00	0.01
Concrete / Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	312	15.0	4,680	0.37	4.455	0.00	0.02
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	4680	15.0	70,200	0.37	4.455	0.03	0.34
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	74880	15.0	1,123,200	0.241	2.397	0.30	2.97
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	74880	10.0	748,800	0.37	4.455	0.31	3.68
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.137	1.095	0.00	0.00
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	20.0	0	0.316	3.425	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.137	1.095	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.595	2.727	0.00	0.00
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles <sup>3</sup>	Round-Distance	Vehicular Miles Trav	Mobile 6.2 EFs (g/mi) <sup>1</sup>		2010 Emissions (tons) <sup>2</sup>	
					miles	VMT	VOC	NOx	VOC	NOx
Employee Commute/ Delivery					0		0	0		
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	3235	40.0	40372800	0.483	0.359	21.50	15.98
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	3071	100.0	307100	0.37	4.455	0.13	1.51
DC NA Area onroad vehicle total (direct & indirect)									28.68	46.09
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	809	20.0	5048160	0.483	0.359	2.69	2.00
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	921	50.0	46050	0.37	4.455	0.02	0.23
Baltimore NA Area onroad vehicle total									2.71	2.22

**Notes**

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of Year 5 Onroad Emissions		
	Year 5 Emissions (tons)	
	VOC	NOx
Total Onroad DC NA Area Emissions(Report in Table 3-1)	28.68	46.09
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)	2.71	2.22
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)	0.63	7.01

Table B-3f On-Road Vehicle Emissions Year 6

Description	Fuel Type	Vehicle Class	SCC	Year 6 Total operated	Average Speed	Vehicular Miles Trav	Criteria Pollutants		Year 6 Emissions (tons)	
				hrs	mph	VMT	HC	NOx	HC	NOx
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	1,497	30.0	44,910	0.453	0.33	0.02	0.02
Light Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	9360	20.0	187,200	0.536	0.431	0.11	0.09
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	17472	20.0	349,440	0.536	0.431	0.21	0.17
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	14976	20.0	299,520	0.997	0.97	0.33	0.32
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	11232	20.0	224,640	0.997	0.97	0.25	0.24
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	3744	20.0	74,880	0.947	0.752	0.08	0.06
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	8840	20.0	176,800	0.997	0.97	0.19	0.19
Trucks -Heavy Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	15662	15.0	234,930	0.308	2.973	0.08	0.77
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	11232	15.0	168,480	0.124	1.019	0.02	0.19
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	8985	15.0	134,775	0.232	2.073	0.03	0.31
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	11232	15.0	168,480	0.124	1.019	0.02	0.19
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	8985	15.0	134,775	0.124	1.019	0.02	0.15
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8424	15.0	126,360	0.359	3.942	0.05	0.55
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8424	15.0	126,360	0.359	3.942	0.05	0.55
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	4922	15.0	73,830	0.124	1.019	0.01	0.08
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8985	15.0	134,775	0.359	3.942	0.05	0.59
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	12048	15.0	180,720	0.286	2.587	0.06	0.52
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	3868	2.0	7,736	0.198	1.957	0.00	0.02
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	56160	20.0	1,123,200	2.595	2.727	3.21	3.38
Diesel Commercial Bus	Diesel	HDDBT	2230075	34920	35.0	1,222,200	0.247	6.117	0.33	8.24
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	18720	20.0	374,400	2.595	2.727	1.07	1.13
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	2246	30.0	67,380	2.595	2.727	0.19	0.20
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	374	20.0	7,480	0.133	0.927	0.00	0.01
Concrete / Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.359	3.942	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	4238	15.0	63,570	0.359	3.942	0.03	0.28
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	74880	15.0	1,123,200	0.232	2.073	0.29	2.57
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	74880	10.0	748,800	0.359	3.942	0.30	3.25
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.133	0.927	0.00	0.00
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	20.0	0	0.308	2.973	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.133	0.927	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.595	2.727	0.00	0.00
Summary of Year 6 Onroad Emissions										
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles <sup>3</sup>	Round-Distance miles	Vehicular Miles Trav VMT	Mobile 6.2 EFs (g/mi) <sup>1</sup>		2010 Emissions (tons) <sup>2</sup>	
							VOC	NOx	VOC	NOx
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	2765	40.0	34507200	0.453	0.33	17.23	12.55
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	2058	100.0	205800	0.359	3.942	0.08	0.89
DC NA Area onroad vehicle total (direct & indirect)									24.32	37.49
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	691	20.0	4311840	0.453	0.33	2.15	1.57
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	617	50.0	30850	0.359	3.942	0.01	0.13
Baltimore NA Area onroad vehicle total									2.17	1.70

**Notes**

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of Year 6 Onroad Emissions		
	Year 6 Emissions (tons)	
	VOC	NOx
Total Onroad DC NA Area Emissions(Report in Table 3-1)	24.32	37.49
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)	2.17	1.70
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)	0.61	6.10

Table B-3g On-Road Vehicle Emissions Year 7

Description	Fuel Type	Vehicle Class	SCC	Year 7 Total operated	Average Speed	Vehicular Miles Trav	Criteria Pollutants		Year 7 Emissions (tons)	
				hrs	mph	VMT	EFs (g/mi) <sup>1</sup>	HC	NOx	HC
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	1,497	30.0	44,910	0.428	0.306	0.02	0.02
Light Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	9360	20.0	187,200	0.514	0.404	0.11	0.08
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	18460	20.0	369,200	0.514	0.404	0.21	0.16
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	14976	20.0	299,520	0.946	0.92	0.31	0.30
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	9984	20.0	199,680	0.946	0.92	0.21	0.20
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	3744	20.0	74,880	0.896	0.712	0.07	0.06
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	6864	20.0	137,280	0.946	0.92	0.14	0.14
Trucks -Heavy Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	13790	15.0	206,850	0.301	2.578	0.07	0.59
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	11169	15.0	167,535	0.121	0.891	0.02	0.16
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	8423	15.0	126,345	0.225	1.817	0.03	0.25
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	10109	15.0	151,635	0.121	0.891	0.02	0.15
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	7862	15.0	117,930	0.121	0.891	0.02	0.12
Heavy-Duty Deisel Vehicle 8B	Diesel	HDDV8b	2230074	8424	15.0	126,360	0.349	3.401	0.05	0.47
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	7488	15.0	112,320	0.349	3.401	0.04	0.42
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	4922	15.0	73,830	0.121	0.891	0.01	0.07
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8599	15.0	128,985	0.349	3.401	0.05	0.48
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	13024	15.0	195,360	0.278	2.261	0.06	0.49
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	2121	2.0	4,242	0.193	1.757	0.00	0.01
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	46176	20.0	923,520	2.595	2.727	2.64	2.78
Diesel Commercial Bus	Diesel	HDDBT	2230075	22256	35.0	778,960	0.24	5.21	0.21	4.47
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	14560	20.0	291,200	2.595	2.727	0.83	0.88
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	2246	30.0	67,380	2.595	2.727	0.19	0.20
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	374	20.0	7,480	0.131	0.794	0.00	0.01
Concrete / Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.349	3.401	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	988	15.0	14,820	0.349	3.401	0.01	0.06
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	18720	15.0	280,800	0.225	1.817	0.07	0.56
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	18720	10.0	187,200	0.349	3.401	0.07	0.70
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.131	0.794	0.00	0.00
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	20.0	0	0.301	2.578	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.131	0.794	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.595	2.727	0.00	0.00
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles <sup>3</sup>	Round-Distance miles	Vehicular Miles Trav VMT	Mobile 6.2 EFs (g/mi) <sup>1</sup>		2010 Emissions (tons) <sup>2</sup>	
Employee Commute/ Delivery							VOC	NOx	VOC	NOx
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	2131	40.0	26594880	0.428	0.306	12.55	8.97
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	1115	100.0	111500	0.349	3.401	0.04	0.42
DC NA Area onroad vehicle total (direct & indirect)									18.06	23.23
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	533	20.0	3325920	0.428	0.306	1.57	1.12
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	335	50.0	16750	0.349	3.401	0.01	0.06
Baltimore NA Area onroad vehicle tota									1.58	1.18

## Notes

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of Year 7 Onroad Emissions		
	Year 7 Emissions (tons)	
	VOC	NOx
Total Onroad DC NA Area Emissions(Report in Table 3-1)	18.06	23.23
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)	1.58	1.18
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)	0.15	1.32



Table B-3h On-Road Vehicle Emissions Year 8

Description	Fuel Type	Vehicle Class	SCC	Year 8 Total operating	Average Speed	Vehicular Miles Trav	Mobile 6.2 EFs (g/mi) <sup>1</sup>		Year 8 Emissions (tons)	
				hrs	mph	VMT	HC	NOx	HC	NOx
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	1,497	30.0	44,910	0.407	0.285	0.02	0.01
Light Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	9360	20.0	187,200	0.494	0.381	0.10	0.08
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	15080	20.0	301,600	0.494	0.381	0.16	0.13
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	14976	20.0	299,520	0.891	0.866	0.29	0.29
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	4368	20.0	87,360	0.891	0.866	0.09	0.08
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	3744	20.0	74,880	0.843	0.669	0.07	0.06
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	4576	20.0	91,520	0.891	0.866	0.09	0.09
Trucks -Heavy Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	9859	15.0	147,885	0.295	2.183	0.05	0.36
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	9930	15.0	148,950	0.115	0.754	0.02	0.12
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	5937	15.0	89,055	0.217	1.577	0.02	0.15
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	7273	15.0	109,095	0.115	0.754	0.01	0.09
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	4599	15.0	68,985	0.115	0.754	0.01	0.06
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	7889	15.0	118,335	0.341	2.843	0.04	0.37
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	4814	15.0	72,210	0.341	2.843	0.03	0.23
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	4351	15.0	65,265	0.115	0.754	0.01	0.05
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	6714	15.0	100,710	0.341	2.843	0.04	0.32
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	11589	15.0	173,835	0.268	1.968	0.05	0.38
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	374	2.0	748	0.181	1.533	0.00	0.00
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	24782	20.0	495,640	2.595	2.727	1.42	1.49
Diesel Commercial Bus	Diesel	HDDBT	2230075	14019	35.0	490,665	0.236	4.41	0.13	2.39
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	4160	20.0	83,200	2.595	2.727	0.24	0.25
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	1978	30.0	59,340	2.595	2.727	0.17	0.18
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	374	20.0	7,480	0.127	0.682	0.00	0.01
Concrete / Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.341	2.843	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.341	2.843	0.00	0.00
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.217	1.577	0.00	0.00
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	10.0	0	0.341	2.843	0.00	0.00
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.127	0.682	0.00	0.00
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	20.0	0	0.295	2.183	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.127	0.682	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.595	2.727	0.00	0.00
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles <sup>3</sup>	Round-Distance	Vehicular Miles Trav	Mobile 6.2 EFs (g/mi) <sup>1</sup>		2010 Emissions (tons) <sup>2</sup>	
					miles	VMT	VOC	NOx	VOC	NOx
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	915	40.0	11419200	0.407	0.285	5.12	3.59
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	395	100.0	39500	0.341	2.843	0.01	0.12
									8.20	10.88
DC NA Area onroad vehicle total (direct & indirect)										
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	229	20.0	1428960	0.407	0.285	0.64	0.45
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	119	50.0	5950	0.341	2.843	0.00	0.02
									0.64	0.47
Baltimore NA Area onroad vehicle total										

**Notes**

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of Year 8 Onroad Emissions			
	Year 8 Emissions (tons)		
	VOC	NOx	
Total Onroad DC NA Area Emissions(Report in Table 3-1)	8.20	10.88	
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)	0.64	0.47	
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)	0.00	0.00	



Table B-3i On-Road Vehicle Emissions Year 9

Description	Fuel Type	Vehicle Class	SCC	Year 9 operating	Average Speed	Vehicular Miles Trav	Mobile 6.2 EFs (g/mi) <sup>1</sup>		Year 9 Emissions (tons)		
				hrs	mph	VMT	HC	NOx	HC	NOx	
Automotive											
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	873	30.0	26,190	0.3607	0.2528	0.01	0.01	
Light Duty											
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	5460	20.0	109,200	0.446	0.3376	0.05	0.04	
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	4680	20.0	93,600	0.446	0.3376	0.05	0.03	
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	2496	20.0	49,920	0.8265	0.8286	0.05	0.05	
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	0	20.0	0	0.8265	0.8286	0.00	0.00	
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	2184	20.0	43,680	0.7758	0.6184	0.04	0.03	
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	936	20.0	18,720	0.8265	0.8286	0.02	0.02	
Trucks -Heavy Duty											
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	2995	15.0	44,925	0.2741	1.8497	0.01	0.09	
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	1925	15.0	28,875	0.1085	0.6416	0.00	0.02	
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	802	15.0	12,030	0.2013	1.3391	0.00	0.02	
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	1524	15.0	22,860	0.1085	0.6416	0.00	0.02	
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	642	15.0	9,630	0.1085	0.6416	0.00	0.01	
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	1705	15.0	25,575	0.315	2.4931	0.01	0.07	
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	802	15.0	12,030	0.315	2.4931	0.00	0.03	
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	802	15.0	12,030	0.1085	0.6416	0.00	0.01	
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	1123	15.0	16,845	0.315	2.4931	0.01	0.05	
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	1203	15.0	18,045	0.2479	1.6683	0.00	0.03	
Trailers											
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	0	2.0	0	0.1754	1.3653	0.00	0.00	
Personnel Carrier											
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	5482	20.0	109,640	0.1085	0.6416	0.01	0.08	
Diesel Commercial Bus	Diesel	HDDBT	2230075	1685	35.0	58,975	0.228	4.012	0.01	0.26	
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	20.0	0	0.1085	0.6416	0.00	0.00	
Emergency Vehicles											
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	361	30.0	10,830	0.1085	0.6416	0.00	0.01	
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	93	20.0	1,860	0.1182	0.682	0.00	0.00	
Concrete / Aggregate											
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.315	2.4931	0.00	0.00	
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.315	2.4931	0.00	0.00	
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.2013	1.3391	0.00	0.00	
Concrete Batch Plant											
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	10.0	0	0.315	2.4931	0.00	0.00	
Site Preparation											
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.1182	0.5499	0.00	0.00	
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	20.0	0	0.2741	1.8497	0.00	0.00	
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.1182	0.5499	0.00	0.00	
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	0.1085	0.6416	0.00	0.00	
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles <sup>3</sup>	Round-Distance miles	Vehicular Miles Trav VMT	Mobile 6.2 EFs (g/mi) <sup>1</sup>		2010 Emissions (tons) <sup>2</sup>		
							VOC	NOx	VOC	NOx	
Employee Commute/ Delivery											
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	163	40.0	2034240	0.3607	0.2528	0.81	0.57	
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	0	100.0	0	0.315	2.4931	0.00	0.00	
DC NA Area onroad vehicle total (direct & indirect)										1.10	1.43
Employee Commute/ Delivery											
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	41	20.0	255840	0.3607	0.2528	0.10	0.07	
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	0	50.0	0	0.315	2.4931	0.00	0.00	
Baltimore NA Area onroad vehicle total										0.10	0.07

**Notes**

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of Year 9 Onroad Emissions			
	Year 9 Emissions (tons)		
	VOC	NOx	
Total Onroad DC NA Area Emissions(Report in Table 3-1)	1.10	1.43	
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)	0.10	0.07	
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)	0.00	0.00	

Table B-4 Marine Engine Emissions

Description	Fuel Type	Equipment Horsepower		Year 2 hrs	Year 3 hrs	Year 4 hrs	Year 5 hrs	Year 6 hrs	Year 7 hrs	Load Factor <sup>1</sup>	Emission Factor (g/kW-hr) <sup>2</sup>		Correction Factor <sup>3</sup>		VOC tons Year		VOC tons Year		VOC tons Year		NOx tons Year		NOx tons Year		NOx tons Year					
		hp									HC (voc)	NOx	HC	NOx	VOC tons	Year	VOC tons	Year	VOC tons	Year	NOx tons	Year	NOx tons	Year	NOx tons	Year				
Barge - in DC-MD-VA nonattainment area	Diesel	2400		0	135	135	135	135	135	0.79	0.50	9.8	1.00	1.00	0.00	0.11	0.11	0.11	0.11	0.00	2.06	2.06	2.06	2.06	0.00	0.09	0.09	0.09	0.09	0.09
Barge Auxiliary - in DC-MD-VA NA area	Diesel	205		0	135	135	135	135	135	0.56	0.27	6.8	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.09	0.09	0.09	0.00	0.00	0.00	0.00	0.00	0.00
TugBoat - for degding activity	Diesel	1200		0	720	0	0	0	0	0.79	0.50	9.8	1.00	1.00	0.00	0.28	0.00	0.00	0.00	0.00	5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TugBoat Auxiliary - for dredging activity	Diesel	100		0	720	0	0	0	0	0.56	0.27	6.8	1.00	1.00	0.00	0.01	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18' Boat - for dredging activity	Gasoline	225		0	720	0	0	0	0	0.79	0.50	9.8	1.00	1.00	0.00	0.05	0.00	0.00	0.00	0.00	1.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL DC area(Tons)												0.00	0.45	0.11	0.11	0.11	0.11	0.11	0.11	0.00	8.90	2.15	2.15	2.15	2.15	2.15	2.15	2.15		

Description	Fuel Type	Equipment Horsepower		Year 2 hrs	Year 3 hrs	Year 4 hrs	Year 5 hrs	Year 6 hrs	Year 7 hrs	Load Factor <sup>1</sup>	Emission Factor (g/kW-hr) <sup>2</sup>		Correction Factor <sup>3</sup>		VOC tons Year		VOC tons Year		VOC tons Year		NOx tons Year		NOx tons Year		NOx tons Year					
		hp									HC (voc)	NOx	HC	NOx	VOC tons	Year	VOC tons	Year	VOC tons	Year	NOx tons	Year	NOx tons	Year						
Barge - in Baltimore nonattainment area	Diesel	2400		0	430	430	430	430	430	0.79	0.50	9.8	1.00	1.00	0.00	0.34	0.34	0.34	0.34	0.00	6.57	6.57	6.57	6.57	0.00	0.28	0.28	0.28	0.28	0.28
Barge Auxiliary - in Baltimore NA area	Diesel	205		0	430	430	430	430	430	0.56	0.27	6.8	1.00	1.00	0.00	0.01	0.01	0.01	0.01	0.00	0.28	0.28	0.28	0.28	0.00	0.28	0.28	0.28	0.28	0.28
TOTAL Baltimore area(Tons)												0.00	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.00	6.84	6.84	6.84	6.84	6.84	6.84	6.84			

**NOTES:**

Note 1: EPA Load Factors for Harbor Crafts from Table 3-3 of "USEPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories Final Report" April 2009

Note 2: Harbor Craft Emission Factors from Table 3-8 of "USEPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories Final Report" April 2009

Note 3: Harbor Craft Fuel Correction Factors from Offroad Diesel Fuel from Table 3-9 of "USEPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories Final Report" April 2009

Note 4: Annual Emissions are calculated using the following equation from Section 3.0 Harbor Craft of "USEPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories Final Report" April 2009

(Emission factor (g/kW-hr) \* horsepower \* hours operated \* load factor/correction factor) / (1,341 hp-hr/kWh\*2000 lb/ton \* 453.59 g/lb)

**Table B-5 Boiler Emissions**

	Year 1 hrs	Year 2 hrs	Year 3 hrs	Year 4 hrs	Year 5 hrs	Year 6 hrs	Year 7 hrs	Year 8 hrs	Year 9 hrs
Concrete Batch Plant	0	0	3120	3120	3120	3120	0	0	0
Auxiliary Oil-fired Boiler									
NOx emissions (tons)	0	0	4.62	4.62	4.62	4.62	0.00	0	0
VOC emissions (tons)	0	0	0.05	0.05	0.05	0.05	0.00	0	0

Boiler Heat Input Rating 20 MMBtu/hr (assumed)  
 Typical Distillate Oil HHV 0.135 MMBtu/gallon

NOx emission factor 20 lb/1,000 gallons AP-42 Section 1.3 9/98, Table 1.3-1  
 VOC emission factor 0.2 lb/1,000 gallons AP-42 Section 1.3 9/98, Table 1.3-3

UN#11-263

**Enclosure 2**  
**Use of Baltimore area NO<sub>x</sub> ERCs in Calvert County,**  
**September 22, 2011**

## Memorandum

To	Dimitri Lutchenkov / UniStar Nuclear	Page	1
CC	Bob Iwanchuk		
Subject	Use of Baltimore area NO <sub>x</sub> ERCs in Calvert County		
From	Ian Miller		
Date	September 22, 2011		

Dimitri,

Here is an analysis for the potential use of NO<sub>x</sub> ERCs created in the Baltimore ozone nonattainment area for compliance with the General Conformity requirement to offset emissions from construction of the CC3 project.

### **CC3 General Conformity Mitigation Measures**

#### **Emission Offsets**

UniStar is proposing to use "Certified"<sup>1</sup> emission reduction credits (ERCs) from the adjacent Baltimore nonattainment area to fully offset emission increases from construction of the CC3 project under the auspices of §93.158(a)(2). The revisions to the General Conformity Regulations published in the April 5, 2010 Federal Register (75 FR 17254) specifically allow the use of emission reduction credits from nonattainment areas outside of the area within which the federal action is occurring. This provision is limited to nonattainment or maintenance areas which are nearby areas of equal or higher (higher meaning worse) classification provided the emissions from that area contribute to the violations, or have contributed to violations in the past, in the area where the Federal action is proposed to occur. In the preamble to the April 5, 2010 General Conformity revisions (75 FR 17266), EPA recommended that Federal agencies show the requirements of §93.158(a)(2) are met using the same techniques EPA has approved by rule or guidance for demonstrating contributing emissions in other SIP-related determinations. Such SIP documents include Reasonable Further Progress, Rate of Progress, or Attainment Demonstrations for a particular pollutant or pollutant precursor (in this case NO<sub>x</sub>).

Evidence that the Baltimore nonattainment area influences the Washington DC-MD-VA nonattainment area is found in SIP documents from the Metropolitan Washington Air Quality Committee which prepares air quality plans for the DC-MD-VA Metropolitan Statistical Area.

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<sup>1</sup> ERCs will be certified by Maryland Department of Environment, in accordance with COMAR 26.11.17.05.

Chapter 11 of the SIP entitled "Plan to Improve Air Quality in the Washington, CD-MD-VA Region" dated February 19, 2004 contains the attainment demonstration for the 1-hour ozone severe nonattainment classification. This chapter describes the modeling demonstration as using "... the same inventories, episodes, base inventories and procedures" for both the Washington DC-MD-VA and Baltimore nonattainment areas. The report goes on to say that the modeling demonstration was performed in this manner because "Observations of wind motions in the region indicate that emissions from one city travel enough to affect air quality in the other, often in one day. Therefore, [several SIP planning organizations]<sup>2</sup> acceded to the U.S. Environmental Protection Agency (EPA) request for a single modeling domain including Baltimore, Washington, and their surrounding nonattainment counties." This decision was made in part because "the Baltimore and the Washington metropolitan areas are in close physical proximity and their suburban communities overlap". A single modeling domain best represents the regional transport between the two metropolitan areas.

In summary, the use of ERCs from the Baltimore nonattainment area to offset emissions increases from construction of the CC3 project is justified based on conformance with the following requirements of §93.158(a)(2).

- The Baltimore 8-hour ozone nonattainment area has the same classification as the Washington DC-MD-VA 8-hour ozone nonattainment area (both moderate) and
- The Baltimore nonattainment area contributes, or has contributed in the past to violations in the Washington DC-MD-VA nonattainment area.

Sincerely yours,



Ian Miller

ian.miller@aecom.com

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<sup>2</sup>The District of Columbia Department of Health (DC DOH), the Virginia Department of Environmental Quality (VADEQ), and the Maryland Department of Environment (MDE), in consultation with the Metropolitan Washington Council of Governments (MWCOC), the Baltimore Metropolitan Council (BMC), and the Tri-County Council for Southern Maryland (TCC)