APPENDIX D

Air Emission Calculations

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APPENDIX D
AIR EMISSION CALCULATIONS

Air quality impacts were estimated for the various Alternatives within the three Groups of potential Homeporting actions. The following is a discussion of the assumptions, references and methods used to perform the air emission estimate calculations for both construction and operations.

CONSTRUCTION

Air quality impacts from proposed construction activities were estimated from (1) combustion emissions due to the use of fossil fuel-powered equipment; (2) fugitive dust emissions (PM_{10} and $PM_{2.5}$) during demolition activities, earth-moving activities, and the operation of equipment on bare soil; and (3) VOC emissions from application of asphalt materials during paving operations.

Factors needed to derive the construction source emission rates were obtained from *Compilation of Air Pollution Emission Factors, AP-42, Volume I* (USEPA 1995); *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling* (USEPA, 2004); *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling—Compression-Ignition* (USEPA, 2004); *Nonroad Engine and Vehicle Emission Study—Report* (USEPA, 1991); *Conversion Factors for Hydrocarbon Emission Components* (USEPA 2004); *Comparison of Asphalt Paving Emission Factors* (CARB, 2005); *WRAP Fugitive Dust Handbook* (WRAP, 2004); *AP-42, External Fuel Combustion (USEPA 1998); EMFAC 2007 Emission Factors for On-Road Heavy Heavy Duty Diesel Trucks* (CARB 2006); and *EMFAC 2002* (v2.2) *Emission Factors (On-Road)* (CARB 2002).

The analysis assumed that all land-based construction equipment was manufactured before 2000. This approach over-estimates emissions from proposed construction equipment, as the future equipment fleet would include a substantial amount of newer, lower-emitting equipment compared to 2000 vintage equipment. The analysis also inherently reduced PM_{10} fugitive dust emissions from earth-moving activities by 50 percent as this control level is included in the emission factor itself.

Off-Road Equipment Emissions – Land Based

The NONROAD model (EPA 2005) is the EPA standard method for preparing emission inventories for mobile sources that are not classified as being related to on-road traffic, railroads, air traffic, or water-going vessels. As such, it is the starting place for quantifying emissions from construction-related equipment. The NONROAD model uses the following general equation to estimate emissions separately for CO, NOx, PM (essentially all of which is PM2.5 from construction sources), and total hydrocarbons (THC), nearly all of which are $NMHC_1$:

EMS = EF * HP * LF * Act * DF

Where:

EMS = estimated emissions
EF = emissions factor in grams per horsepower hours
HP = peak horsepower
LF = load factor (assumed percentage of peak horsepower)
Act = activity in hours of operation per period of operation
DF = deterioration factor

The emissions factor is specific to the equipment type, engine size, and technology type. The technology type for diesel equipment can be "base" (before 1988), "tier 0" (1988 to 1999), "tier 1" (2000 to 2005), "tier 3 (2005 and beyond). Tier 2 emissions factors could be applied to equipment that satisfies 2006 national standards (or slightly earlier California standards). For this study, all diesel equipment was assumed to be either tier 0 or tier 1.

The load factor is specific to the equipment type in the NONROAD model regardless of engine size or technology type, and it represents the average fraction of peak horsepower at which the engine is assumed to operate. NONROAD model default values were used in all cases. Because Tier 0 and Tier 1 equipment was conservatively used throughout the analysis period (2009-2012), deterioration factors were not used to estimate increased emissions due to engine age.

Based on the methodology described, it is possible to make a conservative estimate of emissions from off-road equipment if the types of equipment and durations of use are known (see tables following).

Construction calculations were performed for each year when construction is proposed, 2009-2012. Information provided by NAVSTA Mayport personnel were used to identify periods of construction for large, multi-year projects, as well as detailed information on acreages to be cleared, building square footages, and paving.

Off-Road Equipment Emissions – Marine

Marine equipment emission factors, load factors, and production rates were provided by the USEPA technical report *Final Regulatory Impact Analysis: Control of Emissions from Marine Diesel Engines*, EPA420-R-99-026, November 1999 and manufacturer data. Like land based non-road equipment, the emissions factor is specific to the equipment type, engine size, and technology type. The technology type for diesel equipment can be "base" (before 1988), "tier 0" (1988 to 1999), "tier 1" (2000 to 2005), "tier 3 (2005 and beyond). Tier 2 emissions factors could be applied to equipment that satisfies 2006 national standards (or slightly earlier California standards). Dredging equipment was as assumed to be Tier 0. For dredges, load factors were averaged at 40 percent for the clamshell dredge and 50 percent for the hopper dredge. Load factors were averaged at 60 percent for tugboat engines for disposal round trips, as the tugs would be towing fully loaded scows to a disposal site, and returning to the dredge site with empty scows.

Dredge volume, duration, offshore locations, and scow size information was provided by NAVSTA Mayport personnel.

Two scenarios were evaluated for dredging. The first scenario removes all dredge spoils to the offshore Jacksonville and Fernandina Offshore Dredged Material Disposal Sites. The second scenario evaluates using approximately 250,000 cubic yards of dredge material for beach replenishment and 100,000 cubic yards of dredge materials to be disposed in a permitted confined disposal facility located in proximity to NAVSTA Mayport. The scenarios were developed during the preparation of the Draft Environmental Impact Statement, when beach replenishment was a potential option for placement of to 225,000 cubic yards of material and to account for the possibility that some material would not met USEPA rules for ocean disposal. In both scenarios, two types of dredges are used: a clamshell dredge for the turning basin and nearby environs and a hopper dredge for the areas located further out into the river and coastal waters. The clamshell dredge is estimated to be used for 40% of the dredging work and the hopper dredge for 60% of the dredging work.

For hopper dredging, a slurry comprised of 80 percent water was assumed, resulting in a total volume to be removed of 10.26 million cubic yards (5.7 million cubic yards of dredged spoils and 4.56 million cubic yards of water). De-watering occurs within the dredge itself, which is able to self propel to disposal sites for release of dredge materials.

For the onshore disposal option, it was assumed that a confined disposal facility (CDF) would be available within a reasonable distance of the dredging operations occurring in the NAVSTA Mayport turning basin and nearby environs. Once the clamshell dredging operations began in the turning basin and nearby environs, the material to be transported to the CDF would undergo dewatering onboard the scow, and then transported to the land-based CDF.

Beach replenishment was evaluated as an option for up to 225,000 cubic yards of material; however, evaluation subsequent to the publication of the Draft Environmental Impact Statement concluded that beach replenishment would not be feasible. The analysis was retained in this appendix although beach replenishment was not carried forward n the Final Environmental Impact Statement. The analysis of the beneficial use option assumed that beach replenishment would be performed using scows towed to nearby beaches and pumped out. Dispersal of 225,000 cubic yards of dredge material using this method would take approximately 25 days to accomplish.

Fugitive Dust

Emission rates for fugitive dust were estimated using guidelines outlined in the Western Regional Air Partnership (WRAP) fugitive dust handbook (WRAP 2004). Although these guidelines were developed for use in western states, they assume standard dust mitigation best practices activities of 50 percent from wetting; therefore, they were deemed applicable but conservative for the Southeastern United States. The

WRAP handbook offers several options for selecting factors for PM_{10} (coarse PM) depending on what information is known about the locality and action that will produce dust.

After PM_{10} is estimated, the fraction of fugitive dust emitted as $PM_{2.5}$ is estimated, the most recent WRAP study (MRI 2005) recommends the use of a fractional factor of 0.10 to estimate the $PM_{2.5}$ portion of the PM_{10}.

For site preparation activities, the emission factor was obtained from Table 3-2 of the WRAP Fugitive Dust Handbook. The areas of disturbance and approximate durations were used in conjunction with the large scale of land-disturbing activities occurring, resulting in the selection of the first factor with worst-case conditions for use in the analysis.

PM_{10}, $PM_{2.5}$ and Mobile Sources

Diesel exhaust is a primary, well-documented source of $PM_{2.5}$ emissions. The vast majority of PM emissions in diesel exhaust are $PM_{2.5}$. Therefore, all calculated PM is assumed to be $PM_{2.5}$. A corollary result of this is that the PM_{10} fraction of diesel exhaust is estimated very conservatively as only a small fraction of PM_{10} is present in the exhaust. However, ratios of PM_{10} to $PM_{2.5}$ in diesel exhaust are not yet published and therefore for the purposes of the Environmental Impact Statement calculations, all PM emissions are equally distributed as PM_{10} and $PM_{2.5}$.

VOC Emissions from Paving and Pavement Marking

VOC emissions from the application of hot mix asphalt were calculated for the improvements associated with Massey Road. The estimates used estimated asphalt volumes the published California Air Resources Board (CARB) hot mix asphalt emission factor.

VOC emissions from pavement marking (road and parking lot striping, etc.) were calculated based on the use of acrylic water-based paint containing a commonly formulated quantity of VOCs and using a typical industry application volume.

Construction Workers – Mobile Sources

Mobile source emissions were calculated for construction workers for each of the construction years. These emissions assumed that each worker drove their own car, and that the average mileage driven each workday within the NAVSTA Mayport fenceline, was 6 miles (to include driving during lunch break) and at a rate not exceeding 30 miles per hour. Emission factors were derived from the California Air Resources Board (CARB) EMFAC 2002 mobile emissions model, Scenario Year: 2006 – Passenger Vehicle Model Years: 1965 to 2006. Although construction continues to 2012, no adjustments were made to the emission factors to account for newer model vehicles, resulting in more conservative emissions estimates in the out-years. The USEPA has indicated that the use of EMFAC model emission

factors and other similar spreadsheet formats provide reasonable estimates for the very small scale calculations such as used in the NAVSTA Mayport commuting scenarios.

OPERATIONS

Operations evaluated for air emissions from boilers installed in large new buildings constructed as part of the Group 3 Alternatives, and mobile source emissions generated by the growth of commuters to NAVSTA Mayport, under the Group 3 Alternatives 8, 10 and 12.

Boiler Emissions

Boiler emissions were calculated based on the following assumptions:

- Only large buildings/complexes (150,000 sq ft) would use boilers between 10 and 100 MMBtu. All other buildings would use small, electric space heating units or boilers less than 10 MMBtu.
- Boilers would only use natural gas as an energy source.

With these assumptions, boiler emissions were calculated using annual fuel consumption estimates for a 10-100 MMBtu boiler documented as part of the NAVSTA Mayport *2006 Annual Operating Report*. Emission factors came from AP-42, Section 1.4, *External Combustion*.

Mobile Source Emissions

Mobile source emissions are associated with the population increase at NAVSTA Mayport. This increase ranges from as few as 430 under Alternative 10 to as many as 1,594 under Alternative 12. For the purpose of estimating commute emissions from personally-owned vehicles (POVs), it was assumed that 100 percent of the added personnel would commute to NAVSTA Mayport each workday. A total daily commuting distance of 20 miles per day was used, with each worker driving a car. Annual emissions were based on personnel increases not occurring until completion of construction, with the first year of commuter traffic beginning in 2012. Emission factors were derived from the CARB EMFAC 2002 mobile emissions model, Scenario Year: 2006 – Passenger Vehicle Model Years: 1965 to 2006. No adjustments were made to the emission factors to account for newer model vehicles in future years.

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ALTERNATIVE TOTALS BY YEAR

Group 1 Alternatives: Homeporting of Surface Ships (Non-CVN)

Alternative 1 - CRU/DES Homeporting - New DESRON Building

2011 EMISSIONS (tons/year):

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.01	0.10	0.07	0.01	0.21	0.02

2012 EMISSIONS (tons/year):

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.02	0.12	0.08	0.01	0.00	0.00

Alternative 5 - ARG Homeporting - new PHIBRON Building

2011 EMISSIONS (tons/year):

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.01	0.08	0.08	0.01	0.27	0.03

2012 EMISSIONS (tons/year):

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.02	0.10	0.10	0.01	0.01	0.01

Group 2 Alternatives: Dredging for Unrestricted CVN Capability

Alternative 3 - CVN Capable
Dredging Scenario 1: Clamshell and Hopper Dredging with Offshore Disposal
2 MCY to Jacksonville ODMDS
3.15 MCY to Fernandina ODMDS

2011 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
4.29	37.29	194.12	0.00	4.78	4.78

2012 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
2.84	25.27	131.35	0.00	3.08	3.08

Alternative 3 - CVN Capable
Dredging Scenario 2: Clamshell and Hopper Dredging with 100,000 CY placed in confined disposal facility and 225,000 CY used for beach replenishment

2011 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
4.29	37.25	193.69	0.01	4.78	4.78

2012 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
2.84	25.23	130.82	0.01	3.07	3.07

Alternative 7: CRU/DES Homeporting and CVN Capable - same as Alternative 3 with addition of DESRON Building Construction

Dredging Scenario 1: Clamshell and Hopper Dredging and Offshore Disposal; DESRON construction

2 MCY to Jacksonville ODMDS
3.15 MCY to Fernandina ODMDS

2011 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
4.31	37.38	194.19	0.01	5.00	4.81

2012 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
2.86	25.39	131.43	0.01	3.08	3.08

Alternative 7: CRU/DES Homeporting and CVN Capable - same as Alternative 3 with addition of DESRON Building Construction

Dredging Scenario 2: Clamshell and Hopper Dredging with 100,000 CY placed in confined disposal facility and 225,000 CY used for beach replenishment; Desron construction

2011 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
4.31	37.35	193.76	0.02	4.99	4.80

2012 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
2.86	25.35	130.90	0.02	3.08	3.08

Alternative 9: LHD Homeporting and CVN Capable - same as Alternative 3.
Alternative 11: CRU/DES and LHD Homeporting and CVN Capable - same as Alternative 7.

GROUP 3 ALTERNATIVES - Homeporting of a CVN

Alternative 4: CVN Homeporting - same as Alternative 3 with addition of Group 3 Construction

Dredging Scenario 1: Clamshell and Hopper Dredging and Offshore Disposal with Group 3 Construction

2 MCY to Jacksonville ODMDS
3.15 MCY to Fernandina ODMDS

2011 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
4.88	39.13	197.59	0.32	4.98	5.37

2012 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
3.65	27.73	134.54	0.45	9.82	3.94

2013 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.56	2.08	2.93	0.35	0.19	0.37

2014 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.06	0.37	0.43	0.05	0.03	0.03

Alternative 4: CVN Homeporting - same as Alternative 3 with addition of Group 3 Construction

Dredging Scenario 2: Clamshell and Hopper Dredging with 100,000 CY placed in confined disposal facility and 225,000 CY used for beach replenishment; and Group 3 Construction

2011 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
4.88	39.09	197.17	0.33	4.97	5.37

2012 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
3.65	27.73	134.54	0.45	9.82	3.94

2013 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.56	2.08	2.93	0.35	0.19	0.37

2014 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.06	0.37	0.43	0.05	0.03	0.03

Alternative 8: CRU/DES and CVN Homeporting - Alternative 4 with addition of DESRON Building Construction

Dredging Scenario 1: Clamshell and Hopper Dredging and Offshore Disposal with Group 3 and DESRON Construction

2 MCY to Jacksonville ODMDS
3.15 MCY to Fernandina ODMDS

2011 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
5.01	39.79	198.92	0.47	5.26	5.46

2012 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
3.85	28.75	137.04	0.66	9.93	4.06

2013 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.62	2.37	3.56	0.43	0.22	0.41

2014 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.06	0.37	0.43	0.05	0.03	0.03

Alternative 8: CRU/DES and CVN Homeporting - Alternative 4 with addition of DESRON Building Construction

Dredging Scenario 2: Clamshell and Hopper Dredging with 100,000 CY placed in confined disposal facility and 225,000 CY used for beach replenishment; with Group 3 and DESRON Construction

2011 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
5.01	39.75	198.49	0.48	5.26	5.46

2012 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
3.85	28.70	136.51	0.68	9.92	4.05

2013 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.62	2.37	3.56	0.43	0.22	0.41

2014 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.06	0.37	0.43	0.05	0.03	0.03

Alternative 10: CVN Homeporting - same as Alternative 3 with Parking Garages

Dredging Scenario 1: Clamshell and Hopper Dredging and Offshore Disposal with Group 3 Construction

2 MCY to Jacksonville ODMDS
3.15 MCY to Fernandina ODMDS

2011 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
5.01	39.78	198.88	0.47	5.05	5.44

2012 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
3.85	28.75	137.01	0.66	9.93	4.05

2013 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.62	2.41	3.58	0.43	0.22	0.41

2014 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.06	0.37	0.43	0.05	0.03	0.03

Alternative 10: CVN Homeporting - same as Alternative 4 with Parking Garages

Dredging Scenario 2: Clamshell and Hopper Dredging with 100,000 CY placed in confined disposal facility and 225,000 CY used for beach replenishment; with Group 3 Construction

2011 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
5.01	39.74	198.46	0.48	5.04	5.43

2012 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
3.84	28.70	136.48	0.67	9.92	4.05

2013 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.62	2.41	3.58	0.43	0.22	0.41

2014 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.06	0.37	0.43	0.05	0.03	0.03

Alternative 12: Same as Alternative 8 with Parking Garages

Alternative 12: CRU/DES and CVN Homeporting - Alternative 8 with addition of Parking Garage Construction

Dredging Scenario 1: Clamshell and Hopper Dredging and Offshore Disposal with Group 3, DESRON and Parking Garage Construction

2 MCY to Jacksonville ODMDS
3.15 MCY to Fernandina ODMDS

2011 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
5.07	37.38	194.95	2.78	10.27	5.34

2012 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
3.94	29.29	137.86	0.76	9.98	4.10

2013 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.65	2.55	3.84	0.46	0.23	0.42

2014 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.06	0.37	0.43	0.05	0.03	0.03

Alternative 12: CRU/DES and CVN Homeporting - Alternative 8 with addition of Parking Garage Construction

Dredging Scenario 2: Clamshell and Hopper Dredging with 100,000 CY placed in confined disposal facility and 225,000 CY used for beach replenishment; with Group 3, DESRON and Parking Garage Construction

2011 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
5.07	40.12	199.04	0.55	5.29	6.32

2012 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
3.94	29.24	137.33	0.77	9.97	4.10

2013 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.65	2.55	3.84	0.46	0.23	0.42

2014 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.06	0.37	0.43	0.05	0.03	0.03

Operational Emissions - Boilers

Commercial/Institutional Boiler, Natural Gas, 10-100 MMBtu/hr

Example Boiler from 2006 Annual Operating Repo

Heat Input (MMBtu/hr)[a]	Fuel Type	Annual Fuel Usage (MCF)
42	N.G.	17.52

Quantity of natural gas consumed 17,524,296 ft3

Pollutant	Emission Factor ($lb/10^6$ ft^3)[a,b]
	0.3 to 100 MMBtu/hr
CO	84
NO_x	100
PM-10[d]	7.6
SO_2	0.6
VOC	5.5

[a] Emission factors from U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors - Volume I (AP-42), Section 1.4, 5th Edition.

[b] Emission factors based on burning natural gas with a heating value of 1,020 Btu/ft^3

Annual Emissions from Example Heater (tons/yr):

VOC	CO	NOx	SO2	PM10	PM2.5
0.05	0.74	0.88	0.01	0.07	0.07

Assume up to a maximum of 12 boilers will be added to the Naval Station as a result of the proposed action:

Total Boiler Emissions (tons/yr):

VOC	CO	NOx	SO2	PM10	PM2.5
0.58	8.83	10.51	0.06	0.80	0.80

Commuter Emissions for Alternatives 10 and 12 (Alternatives that have an increase in net daily population):

Alternative 10 net population increase = 5

Alternative 12 net population increase = 1169

POV Commuter Emissions from NAVSTA Personnel

Assume 20 miles per day per vehicle (one vehicle per worker)

Alternative 10 Commuter POV emissions

			VOC	CO	NOx	SOx	PM	VOC	CO	NOx	SOx	PM
# vehicles	# days	mi/day	lb/mi	lb/mi	lb/mi	lb/mi	lb/mi	lb	lb	lb	lb	lb
5	200	20	0.001497	0.013925	0.001489	0.000009	0.000080	30	279	30	0	2
							Tons per Year	0.01	0.14	0.01	0.00	0.00

Alternative 12 Commuter POV emissions

			VOC	CO	NOx	SOx	PM	VOC	CO	NOx	SOx	PM
# vehicles	# days	mi/day	lb/mi	lb/mi	lb/mi	lb/mi	lb/mi	lb	lb	lb	lb	lb
1169	200	20	0.001497	0.013925	0.001489	0.000009	0.000080	7000	65113	6963	42	372
							Tons per Year	3.50	32.56	3.48	0.02	0.19

ANNUAL OPERATIONAL TOTALS

Annual Operational Emissions for Alternative 4 and 8 (boilers only) in tons/year:

VOC	CO	NOx	SO2	PM10	PM2.5
0.58	8.83	10.51	0.06	0.80	0.80

Annual Operational Emissions for Alternative 10 (boilers and commuters) in tons/year:

VOC	CO	NOx	SO2	PM10	PM2.5
0.59	8.97	10.53	0.06	0.80	0.80

Annual Operational Emissions for Alternative 12 (boilers and commuters) in tons/year:

VOC	CO	NOx	SO2	PM10	PM2.5
4.08	41.39	14.00	0.08	0.99	0.99

MAYPORT EIS - CONSTRUCTION EMISSIONS GROUP 1 ALTERNATIVES- HOMEPORTING OF SURFACES SHIPS (NON-CVN)

Construct new DESRON HQ bldg (5,800 sf) **May 2011 - Oct 2012** **(18 months)**

ALTERNATIVE 1 - CRU/DES HOMEPORTING
ALTERNATIVE 6: CRU/DES HOMEPORTING AND LHD HOMEPORTING
ALTERNATIVE 7: CRU/DES HOMEPORTING AND CVN CAPABLE
ALTERNATIVE 11: CRU/DES HOMEPORTING AND LHD HOMEPORTING AND CVN CAPABLE
ALTERNATIVE 8: CRU/DES HOMEPORTING AND CVN HOMEPORTING
ALTERNATIVE 12: CRU/DES HOMEPORTING AND LHD HOMEPORTING AND CVN HOMEPORTING

Site prep (grading, compacting, drainage, etc.) 21780 ft^2

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Dozer	1	8	1	299	0.58	0.68	2.7	8.38	0.93	0.402	2.08	8.26	25.63	2.84	1.23
Backhoe/loader	1	4	5	98	0.21	0.99	3.49	6.9	0.85	0.722	0.90	3.17	6.26	0.77	0.66
Skid steer loader	2	4	2	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	0.28	1.29	3.04	0.51	0.26
Grader	1	8	1	135	0.58	0.68	2.7	8.38	0.93	0.402	0.94	3.73	11.57	1.28	0.56
Small diesel engines	3	8	5	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	0.87	4.68	5.95	1.06	0.51
Dump truck (12 CY)	3	1	1	275	0.21	0.68	2.7	8.38	0.89	0.402	0.26	1.03	3.20	0.34	0.15
										Subtotal	5.33	22.15	55.66	6.80	3.36

Construct parking 9,000 ft^2

Grading/Gravel

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Grader	2	6	2	135	0.58	0.68	2.7	8.38	0.93	0.402	2.82	11.19	34.72	3.85	1.67
Backhoe/loader	1	4	2	98	0.21	0.99	3.49	6.9	0.85	0.722	0.36	1.27	2.50	0.31	0.26
Skid steer loader	3	4	2	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	0.43	1.93	4.57	0.76	0.39
Small diesel engines	3	4	2	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	0.17	0.94	1.19	0.21	0.10
Dump truck (12 CY)	5	0.5	3	275	0.21	0.68	2.7	8.38	0.89	0.402	0.65	2.58	8.00	0.85	0.38
										Subtotal	4.42	17.90	50.98	5.98	2.80

Parking Pavement

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Grader	1	4	1	150	0.59	0.68	2.7	8.38	0.93	0.402	0.53	2.11	6.54	0.73	0.31
Roller	2	4	1	30	0.59	1.8	5	6.9	1	0.8	0.56	1.56	2.15	0.31	0.25
Paver	1	8	1	107	0.59	0.68	2.7	8.38	0.93	0.402	0.76	3.01	9.33	1.04	0.45
Concrete truck	4	2	2	250	0.21	0.68	2.7	8.38	0.89	0.402	1.26	5.00	15.52	1.65	0.74
Delivery truck	2	1	2	180	0.21	0.68	2.7	8.38	0.89	0.402	0.23	0.90	2.79	0.30	0.13
Small diesel engines	1	6	2	25	0.43	1.7	5	8.5	0.93	0.9	0.48	1.42	2.42	0.26	0.26
										Subtotal	3.82	14.00	38.75	4.28	2.15

Construct new DESRON HQ bldg (5,800 sf)

Foundation (slab)

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Skid steer loader	2	2	7	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	0.50	2.25	5.33	0.88	0.45
Concrete truck	4	1	3	250	0.21	0.68	2.7	8.38	0.89	0.402	0.94	3.75	11.64	1.24	0.56
Dump truck	8	1	2	275	0.21	0.68	2.7	8.38	0.89	0.402	1.39	5.50	17.07	1.81	0.82
Delivery truck	6	2	2	180	0.21	0.68	2.7	8.38	0.89	0.402	1.36	5.40	16.76	1.78	0.80
Backhoe/loader	1	8	2	98	0.21	0.99	3.49	6.9	0.85	0.722	0.72	2.53	5.01	0.62	0.52
Small diesel engines	2	2	7	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	0.20	1.09	1.39	0.25	0.12
										Subtotal	5.11	20.53	57.19	6.58	3.27

Structure

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Small diesel engines	2	4	4	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	0.23	1.25	1.59	0.28	0.14
Delivery truck	1	1	12	180	0.21	0.68	2.7	8.38	0.89	0.402	0.68	2.70	8.38	0.89	0.40
Skid steer loader	2	4	17	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	2.41	10.93	25.87	4.30	2.19
Dump truck	2	1	4	275	0.21	0.68	2.7	8.38	0.89	0.402	0.69	2.75	8.54	0.91	0.41
Crane	1	8	3	120	0.43	0.3384	0.8667	5.6523	0.93	0.2799	0.92	2.37	15.43	2.54	0.76
										Subtotal	4.94	19.99	59.80	8.91	3.90

Fugitive Dust Emissions:

PM_{10}		days of	**PM_{10}**	**$PM_{2.5}/PM_{10}$**	**$PM_{2.5}$**
tons/acre/mo	acres	disturbance	Total Tons	Ratio	Total Tons
0.42	0.5	30	0.21	0.1	0.0

POV Emissions from Construction Workers

Assume 6 miles per day per vehicle (one vehicle per worker)

On-base POV emissions

			VOC	**CO**	**NOx**	**SOx**	**PM**	**VOC**	**CO**	**NOx**	**SOx**	**PM**
# vehicles	# days	mi/day	lb/mi	lb/mi	lb/mi	lb/mi	lb/mi	lb	lb	lb	lb	lb
20	200	6	0.001497	0.013925	0.001489	0.000009	0.000080	35.93	334.20	35.74	0.216	2
							Subtotal	36	334	36	0	2

2011 Construction Emissions (tons/year):

VOC	**CO**	**NOx**	**SO2**	**PM_{10}**	**$PM_{2.5}$**
0.01	0.10	0.07	0.01	0.21	0.02

2012 Construction Emissions (tons/year):

VOC	**CO**	**NOx**	**SO2**	**PM_{10}**	**$PM_{2.5}$**
0.02	0.12	0.08	0.01	0.00	0.00

ALTERNATIVE 5: ARG HOMEPORTING

May 2011 - Oct 2012 **(18 months)**

Construct a new PHIBRON Command bldg (8,800 sf)

Site prep (grading, drainage, utilities etc.) 21780 ft^2

						VOC	**CO**	**NOx**	**SO2**	**PM**	**VOC**	**CO**	**NOx**	**SO2**	**PM**
Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	lb	lb	lb	lb	lb
Dozer	1	8	1	299	0.58	0.68	2.7	8.38	0.93	0.402	2.08	8.26	25.63	2.84	1.23
Backhoe/loader	1	4	5	98	0.21	0.99	3.49	6.9	0.85	0.722	0.90	3.17	6.26	0.77	0.66
Skid steer loader	2	4	2	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	0.28	1.29	3.04	0.51	0.26
Grader	1	8	1	135	0.58	0.68	2.7	8.38	0.93	0.402	0.94	3.73	11.57	1.28	0.56
Small diesel engines	3	8	5	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	0.87	4.68	5.95	1.06	0.51
Dump truck (12 CY)	3	1	1	275	0.21	0.68	2.7	8.38	0.89	0.402	0.26	1.03	3.20	0.34	0.15
										Subtotal	5.33	22.15	55.66	6.80	3.36

Foundation (slab)

						VOC	**CO**	**NOx**	**SO2**	**PM**	**VOC**	**CO**	**NOx**	**SO2**	**PM**
Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	lb	lb	lb	lb	lb
Skid steer loader	2	2	10	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	0.71	3.21	7.61	1.26	0.64
Concrete truck	4	1	4	250	0.21	0.68	2.7	8.38	0.89	0.402	1.26	5.00	15.52	1.65	0.74
Dump truck	8	1	2	275	0.21	0.68	2.7	8.38	0.89	0.402	1.39	5.50	17.07	1.81	0.82
Delivery truck	6	6	3	180	0.21	0.68	2.7	8.38	0.89	0.402	6.12	24.30	75.42	8.01	3.62
Backhoe/loader	1	8	2	98	0.21	0.99	3.49	6.9	0.85	0.722	0.72	2.53	5.01	0.62	0.52
Small diesel engines	2	2	10	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	0.29	1.56	1.98	0.35	0.17
										Subtotal	10.48	42.11	122.61	13.70	6.52

Structure

						VOC	**CO**	**NOx**	**SO2**	**PM**	**VOC**	**CO**	**NOx**	**SO2**	**PM**
Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	lb	lb	lb	lb	lb
Small diesel engines	2	4	6	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	0.35	1.87	2.38	0.42	0.20
Delivery truck	1	1	16	180	0.21	0.68	2.7	8.38	0.89	0.402	0.91	3.60	11.17	1.19	0.54
Skid steer loader	2	4	24	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	3.40	15.43	36.52	6.07	3.09
Dump truck	2	1	6	275	0.21	0.68	2.7	8.38	0.89	0.402	1.04	4.13	12.80	1.36	0.61
Crane	1	8	4	120	0.43	0.3384	0.8667	5.6523	0.93	0.2799	1.23	3.16	20.58	3.39	1.02
										Subtotal	6.92	28.18	83.45	12.42	5.46

Construct parking 3000 ft^2

Grading/Gravel

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Grader	1	8	1	135	0.58	0.68	2.7	8.38	0.93	0.402	0.94	3.73	11.57	1.28	0.56
Backhoe/loader	1	4	1	98	0.21	0.99	3.49	6.9	0.85	0.722	0.18	0.63	1.25	0.15	0.13
Skid steer loader	1	4	2	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	0.14	0.64	1.52	0.25	0.13
Small diesel engines	1	4	2	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	0.06	0.31	0.40	0.07	0.03
Dump truck (12 CY)	5	0.5	1	275	0.21	0.68	2.7	8.38	0.89	0.402	0.22	0.86	2.67	0.28	0.13
										Subtotal	1.53	6.18	17.41	2.05	0.98

Parking Pavement

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Grader	1	4	1	150	0.59	0.68	2.7	8.38	0.93	0.402	0.53	2.11	6.54	0.73	0.31
Roller	2	4	1	30	0.59	1.8	5	6.9	1	0.8	0.56	1.56	2.15	0.31	0.25
Paver	1	8	1	107	0.59	0.68	2.7	8.38	0.93	0.402	0.76	3.01	9.33	1.04	0.45
Concrete truck	4	2	2	250	0.21	0.68	2.7	8.38	0.89	0.402	1.26	5.00	15.52	1.65	0.74
Delivery truck	2	1	2	180	0.21	0.68	2.7	8.38	0.89	0.402	0.23	0.90	2.79	0.30	0.13
Small diesel engines	1	6	2	25	0.43	1.7	5	8.5	0.93	0.9	0.48	1.42	2.42	0.26	0.26
										Total	3.82	14.00	38.75	4.28	2.15

Fugitive Dust Emissions:

PM $_{10}$		days of	**PM $_{10}$**	**PM $_{2.5}$/PM $_{10}$**	**PM $_{2.5}$**
tons/acre/mo	acres	disturbance	Total Tons	Ratio	Total Tons
0.42	0.8	25	0.26	0.1	0.0

POV Emissions from Construction Workers

Assume 6 miles per day per vehicle (one vehicle per worker)

On-base POV emissions

# vehicles	# days	mi/day	**VOC** lb/mi	**CO** lb/mi	**NOx** lb/mi	**SOx** lb/mi	**PM** lb/mi	**VOC** lb	**CO** lb	**NOx** lb	**SOx** lb	**PM** lb
20	150	6	0.001497	0.013925	0.001489	0.000009	0.000080	26.95	250.65	26.80	0.162	1
							Subtotal	27	251	27	0	1

2011 Construction Emissions (tons/year): 8 months

VOC	**CO**	**NOx**	**SO2**	**PM $_{10}$**	**PM $_{2.5}$**
0.01	0.08	0.08	0.01	0.27	0.03

2012 Construction Emissions (tons/year): 10 months

VOC	**CO**	**NOx**	**SO2**	**PM $_{10}$**	**PM $_{2.5}$**
0.02	0.10	0.10	0.01	0.01	0.01

MAYPORT EIS - CONSTRUCTION EMISSIONS GROUP 2 ALTERNATIVES- Dredging for Unrestricted CVN Capability
Clamshell/Hopper Dredging

May 2011 - October 2012

5,150,000 CY to be dredged
The Fernandina ODMDS covers an
area of about four square nautical miles at a site located about 8.5 nautical miles northeast of the NAVSTA Mayport turning basin

Barges would be used to transport dredged material to the ODMDS. It is most likely that a 4,000 cy capacity barge would be used for this purpose, although it is possible that a 8,000 cy barge would be used. Assuming that the 4,000 cy capacity barge is used, there would be an estimated 569 trips from the dredging location to the ODMDS and an equal number of return trips to the dredging site.

Effective production rate = 500 CY/hour 10,000 CY/day

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** lb/hp-hr	**CO** lb/hp-hr	**NOx** lb/hp-hr	**SO2** lb/hp-hr	**PM** lb/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Mechanical Dredge- main	2	20	206	1,500	0.40	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	2,274	20,369	105,802	NA	2,442
Mechanical Dredge- auxiliary	2	20	206	500	0.40	4.60E-04	0.003	0.016	NA	0.000658	758	4,944	26,368	NA	1,084
Tugboat - main	2	10	206	2,000	0.60	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	2,274	20,369	105,802	NA	2,442
Tugboat - auxiliary	2	20	206	50	0.40	4.60E-04	0.003	0.016	NA	0.000658	76	494	2,637	NA	108
Tender Boat - main	2	5	206	1,200	0.68	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	773	6,926	35,973	NA	830
Tender Boat- auxiliary	2	20	206	35	0.40	4.60E-04	0.003	0.016	NA	0.000658	53	346	1,846	NA	76
Work Boat	2	2	206	300	0.68	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	77	693	3,597	NA	83
Survey Vessel	1	8	103	100	0.68	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	26	231	1,199	NA	28
										Subtotal	6,312	54,372	283,223	0	7,095

Hopper Dredging 60% of total dredging 5,562,000 total CY to be dredged
3,090,000 CY Dredged Material 2,472,000 - 80% water included in hopper dredging operations
hopper capacity = 3,600 CY 14,400 CY/day dredged material
Effective production rate = 2,400 CY/hour (inc. water) 5 miles average distance to ODMDS; 1 hour roundtrip to dump

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** lb/hp-hr	**CO** lb/hp-hr	**NOx** lb/hp-hr	**SO2** lb/hp-hr	**PM** lb/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Hopper Dredge - dredge	1	12	215	1,700	0.50	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	1,009	9,035	46,930	NA	1,083
Hopper Dredge - propulsion	1	4	215	4,350	0.50	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	860	7,706	40,029	NA	924
Tender Boat - main	2	5	215	1,200	0.68	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	807	7,228	37,544	NA	867
Tender Boat- auxiliary	2	20	215	35	0.40	4.60E-04	0.003	0.016	NA	0.000658	55	361	1,926	NA	79
Work Boat	2	2	215	300	0.68	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	81	723	3,754	NA	87
Survey Vessel	1	8	107	100	0.68	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	27	240	1,246	NA	29
										Subtotal	2,839	25,294	131,430	0	3,069

2011 EMISSIONS (Clamshell dredging in tons/yr)

VOC	**CO**	**NOx**	**SO2**	**PM_{10}**	**$PM_{2.5}$**
3.16	27.19	141.61	0.00	3.55	3.55

2012 EMISSIONS (Hopper dredging in tons/yr)

VOC	**CO**	**NOx**	**SO2**	**PM_{10}**	**$PM_{2.5}$**
1.42	12.65	65.71	0.00	1.53	1.53

MAYPORT EIS - CONSTRUCTION EMISSIONS GROUP 2 ALTERNATIVES: Dredging for Unrestricted CVN Capability
Offshore Dredge Disposal Scenario - barge transport of clamshell dredge material

May 2011 - Oct 2012

800,000 MCY to Jacksonville ODMDS

4,000 CY barge transport of dredge materials to Jacksonville ODMDS
6.4 knots 7.4 mph

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** lb/hp-hr	**CO** lb/hp-hr	**NOx** lb/hp-hr	**SO2** lb/hp-hr	**PM** lb/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Tugboat - main	10	3	80	1,800	0.6	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	1,192	10,679	55,469	NA	1,280
Tugboat - auxiliary	10	5	80	50	0.40	4.60E-04	0.003	0.016	NA	0.000658	37	240	1,280	NA	53
										Subtotal	1,229	10,919	56,749	0	1,333

1.26 MCY to Fernandina ODMDS

4,000 CY barge transport of dredge materials to Fernandina ODMDS
6.4 knots 7.4 mph

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** lb/hp-hr	**CO** lb/hp-hr	**NOx** lb/hp-hr	**SO2** lb/hp-hr	**PM** lb/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Tugboat - main	10	6	126	1,800	0.6	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	3,756	33,639	174,727	NA	4,033
Tugboat - auxiliary	10	12	126	50	0.40	4.60E-04	0.003	0.016	NA	0.000658	139	907	4,838	NA	199
										Subtotal	3,895	34,546	179,565	0	4,232

2011 EMISSIONS (tons/yr)

VOC	**CO**	**NOx**	**SO2**	**PM_{10}**	**$PM_{2.5}$**
1.14	10.10	52.51	0.00	1.24	1.24

2012 EMISSIONS (tons/yr)

VOC	**CO**	**NOx**	**SO2**	**PM_{10}**	**$PM_{2.5}$**
1.42	12.63	65.64	0.00	1.55	1.55

MAYPORT EIS - CONSTRUCTION EMISSIONS GROUP 2 ALTERNATIVES: Dredging for Unrestricted CVN Capability

100,000 CY Maximum to be disposed in confined disposal facility **May 2011 - Oct 2012**

4,000 CY barge transport of dredge materials to dredge disposal site within ~ 5 mi of NAVSTA Mayport

6.4 knots 7.4 mph

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** lb/hp-hr	**CO** lb/hp-hr	**NOx** lb/hp-hr	**SO2** lb/hp-hr	**PM** lb/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Tugboat - main	3	3	10	1,800	0.60	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	45	400	2,080	NA	48
Tugboat - auxiliary	3	5	10	50	0.40	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	1	12	64	NA	1
										Subtotal	46	413	2,144	0	49

2011 EMISSIONS (tons/yr)

VOC	**CO**	**NOx**	**SO2**	**PM $_{10}$**	**PM $_{2.5}$**
0.01	0.09	0.48	0.00	0.01	0.01

2012 EMISSIONS (tons/yr)

VOC	**CO**	**NOx**	**SO2**	**PM $_{10}$**	**PM $_{2.5}$**
0.01	0.11	0.60	0.00	0.01	0.01

MAYPORT EIS - CONSTRUCTION EMISSIONS GROUP 2 ALTERNATIVES: Dredging for Unrestricted CVN Capability
Beneficial Use Dredge Disposal Scenario May 2011 - Oct 2012

Beneficial use is is assumed to be some action that requires removal of material to some onshore location (beach, habitat development, fill, etc.)
This alternative uses offshore transport to a coastal location (beach replenishment). Assumes that material from clamshell dredging is used.

Beach Replenishment - Barges towed to beach areas and pumped out

225,000 CY maximum to be used as beach replenishment
4,000 CY barge transport of dredge materials to beach areas within ~ 5 mi of NAVSTA Mayport
6.4 knots 7.4 mph

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** lb/hp-hr	**CO** lb/hp-hr	**NOx** lb/hp-hr	**SO2** lb/hp-hr	**PM** lb/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Tugboat - main	3	3	25	1,800	0.60	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	112	1,001	5,200	NA	120
Tugboat - auxiliary	3	5	25	50	0.40	4.60E-04	4.12E-03	2.14E-02	NA	4.94E-04	3	31	161	NA	4
										Subtotal	115	1,032	5,361	0	124

Pump Out of Barge

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Diesel Pumps	6	5	25	50	0.60	0.76	4.11	5.23	0.91	0.45	38	204	33	45	22

2011 EMISSIONS (tons/yr)

VOC	**CO**	**NOx**	**SO2**	**PM $_{10}$**	**PM $_{2.5}$**
0.03	0.27	1.20	0.01	0.03	0.03

2012 EMISSIONS (tons/yr)

VOC	**CO**	**NOx**	**SO2**	**PM $_{10}$**	**PM $_{2.5}$**
0.04	0.34	1.50	0.01	0.04	0.04

GROUP 3 ALTERNATIVES - HOMEPORTING OF A CVN

ALTERNATIVE 4: CVN HOMEPORTING

Demo **1,653 space paved parking areas** **May 2011-April 2013 (24 months)**

388 ft^2 per vehicle **641,364 ft^2 total**

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Dozer	1	6	15	299	0.58	0.68	2.7	8.38	0.93	0.402	23	93	288	32	14
Backhoe/loader	3	6	32	98	0.21	0.99	3.49	6.9	0.85	0.722	26	91	180	22	19
Skid steer loader	1	4	32	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	2	10	24	4	2
Grader	1	6	11	135	0.58	0.68	2.7	8.38	0.93	0.402	8	31	95	11	5
Small diesel engines	3	8	36	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	6	34	43	8	4
Dump truck (12 CY)	32	0.5	32	275	0.21	0.68	2.7	8.38	0.89	0.402	44	176	546	58	26
										Subtotal	110	435	1,178	134	69

Demo Debris Removal to Disposal Site

Equipment	*Number*	*# days*	*Trip Length*	**ROG** lb/mi	**CO** lb/mi	**NOx** lb/mi	**SOx** lb/mi	**PM_{10}** lb/mi	**$PM_{2.5}$** lb/mi	**ROG** lb	**CO** lb	**NOx** lb	**SOx** lb	**PM_{10}** lb	**$PM_{2.5}$** lb
Trucks	32	32	30	0.00373	0.01446	0.04718	0.00004	0.00231	0.00204	115	444	1,449	1	71	62

Parking Garage Construction 2.5 level structure - 3 AC total

Site prep (grading, compacting, drainage, etc.)

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Grader	1	6	15	135	0.58	0.68	2.7	8.38	0.93	0.402	11	42	130	14	6
Skid steer loader	2	4	75	98	0.21	0.99	3.49	6.9	0.85	0.722	27	95	188	23	20
Backhoe/loader	2	6	60	135	0.58	0.68	2.7	8.38	0.93	0.402	85	336	1,042	116	50
Small diesel engines	1	4	45	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	1	7	9	2	1
Dump truck	6	1	20	275	0.21	0.68	2.7	8.38	0.89	0.402	10	41	128	14	6
										Subtotal	134	521	1,497	168	83

Foundation 98,000 SF

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Skid steer loader	2	2	74	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	5	24	56	9	5
Concrete truck	4	4	74	250	0.21	0.68	2.7	8.38	0.89	0.402	93	370	1,148	122	55
Dump truck	6	6	49	275	0.21	0.68	2.7	8.38	0.89	0.402	153	606	1,882	200	90
Delivery truck	1	1	100	180	0.21	0.68	2.7	8.38	0.89	0.402	6	23	70	7	3
Backhoe/loader	1	8	8	98	0.21	0.99	3.49	6.9	0.85	0.722	3	10	20	2	2
Small diesel engines	2	2	84	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	2	13	17	3	1
										Subtotal	262	1,046	3,193	344	157

Structure

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Small diesel engines	2	4	81	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	5	25	32	6	3
Delivery truck	1	2	81	180	0.21	0.68	2.7	8.38	0.89	0.402	9	36	113	12	5
Skid steer loader	3	4	218	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	46	210	498	83	42
Concrete truck	8	1	120	250	0.21	0.68	2.7	8.38	0.89	0.402	76	300	931	99	45
Crane	1	8	40	120	0.43	0.3384	0.8667	5.6523	0.93	0.2799	12	32	206	34	10
										Subtotal	148	604	1,780	233	105

POV Emissions from Construction Workers

Assume 6 miles per day per vehicle (one vehicle per worker)

On-base POV emissions

# vehicles	# days	mi/day	VOC lb/mi	CO lb/mi	NOx lb/mi	SOx lb/mi	PM lb/mi	VOC lb	CO lb	NOx lb	SOx lb	PM lb
60	240	6	0.001497	0.013925	0.001489	0.000009	0.000080	129.34	1203.12	128.65	0.78	7
							Subtotal	129	1,203	129	1	7

2011 Parking Demo and Construction Totals (tons)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.22	1.00	2.40	0.19	0.13	0.13

2012 Parking Garage Construction Totals (tons)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.17	0.84	1.65	0.19	0.09	0.09

2013 Parking Garage Construction Totals (tons)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.06	0.28	0.55	0.06	0.03	0.03

Construct **400 space paved parking area**

388 ft^2 per vehicle **155,200 ft^2 total** **Jan- Apr 2013**

Site prep (grading, compacting, drainage, etc.)

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Grader	1	6	20	135	0.58	0.68	2.7	8.38	0.93	0.402	14	56	174	19	8
Skid steer loader	2	4	90	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	13	58	137	23	12
Backhoe/loader	1	8	75	110	0.21	0.99	3.49	6.9	0.85	0.722	30	107	211	26	22
Small diesel engines	3	8	60	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	10	56	71	13	6
Dump truck (12 CY)	2	1	30	275	0.21	0.68	2.7	8.38	0.89	0.402	5	21	64	7	3
										Subtotal	73	297	657	87	51

Grading/Gravel

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Grader	1	6	3	135	0.58	0.68	2.7	8.38	0.93	0.402	2	8	26	3	1
Backhoe/loader	1	4	6	98	0.21	0.99	3.49	6.9	0.85	0.722	1	4	8	1	1
Skid steer loader	1	4	15	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	1	5	11	2	1
Small diesel engines	3	3	20	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	1	7	9	2	1
Dump truck (12 CY)	16	0.5	10	275	0.21	0.68	2.7	8.38	0.89	0.402	7	28	85	9	4
										Subtotal	12	52	139	16	8

Parking Pavement

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Grader	1	4	10	135	0.58	0.68	2.7	8.38	0.93	0.402	5	19	58	6	3
Roller	2	4	10	30	0.59	1.8	5	6.9	1	0.8	6	16	22	3	2
Paver	1	8	10	107	0.59	0.68	2.7	8.38	0.93	0.402	8	30	93	10	4
Concrete truck	4	2	5	250	0.21	0.68	2.7	8.38	0.89	0.402	3	13	39	4	2
Delivery truck	1	2	6	180	0.21	0.68	2.7	8.38	0.89	0.402	1	3	8	1	0
Small diesel engines	2	6	30	25	0.43	1.7	5	8.5	0.93	0.9	15	43	73	8	8
										Total	36	122	292	33	20

Volume of hot mix asphalt (HMA)	51,682	ft^3
Average density of HMA	145	lb/ft^3
CARB EF for HMA	0.04	lb/ton
VOC emissions from HMA paving	150	lb

POV Emissions from Construction Workers

Assume 6 miles per day per vehicle (one vehicle per worker)

On-base POV emissions

			VOC	CO	NOx	SOx	PM	VOC	CO	NOx	SOx	PM
# vehicles	# days	mi/day	lb/mi	lb/mi	lb/mi	lb/mi	lb/mi	lb	lb	lb	lb	lb
12	50	6	0.001497	0.013925	0.001489	0.000009	0.000080	5.39	50.13	5.36	0.03	0.29
							Subtotal	5.39	50.13	5.36	0.03	0.29

2013 Parking Construction Total (tons)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.14	0.26	0.55	0.07	0.04	0.04

Construct Controlled Industrial Facility (CIF) 48,000 SF **July 2011 - Mar 2014 (33 months)**

Site prep (grading, drainage, utilities etc.) 2.95 AC

						VOC	CO	NOx	SO2	PM	VOC	CO	NOx	SO2	PM
Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	lb	lb	lb	lb	lb
Grader	1	6	15	135	0.58	0.68	2.7	8.38	0.93	0.402	11	42	130	14	6
Skid steer loader	2	4	75	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	11	48	114	19	10
Backhoe/loader	2	6	60	98	0.21	0.99	3.49	6.9	0.85	0.722	32	114	225	28	24
Small diesel engines	1	4	45	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	1	7	9	2	1
Dump truck	6	1	20	275	0.21	0.68	2.7	8.38	0.89	0.402	10	41	128	14	6
										Subtotal	65	252	607	76	46

Foundation

						VOC	CO	NOx	SO2	PM	VOC	CO	NOx	SO2	PM
Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	lb	lb	lb	lb	lb
Skid steer loader	2	2	36	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	3	12	27	5	2
Concrete truck	8	1	19	250	0.21	0.68	2.7	8.38	0.89	0.402	12	48	147	16	7
Dump truck	3	1	24	275	0.21	0.68	2.7	8.38	0.89	0.402	6	25	77	8	4
Delivery truck	1	1	75	180	0.21	0.68	2.7	8.38	0.89	0.402	4	17	52	6	3
Backhoe/loader	1	8	4	98	0.21	0.99	3.49	6.9	0.85	0.722	1	5	10	1	1
Small diesel engines	2	2	135	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	4	21	27	5	2
										Subtotal	30	127	341	40	19

Structure

						VOC	CO	NOx	SO2	PM	VOC	CO	NOx	SO2	PM
Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	lb	lb	lb	lb	lb
Small diesel engines	2	4	40	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	2	12	16	3	1
Delivery truck	1	2	48	180	0.21	0.68	2.7	8.38	0.89	0.402	5	22	67	7	3
Skid steer loader	2	4	160	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	23	103	243	40	21
Concrete truck	8	1	75	250	0.21	0.68	2.7	8.38	0.89	0.402	47	188	582	62	28
Crane	1	8	25	120	0.43	0.3384	0.8667	5.6523	0.93	0.2799	8	20	129	21	6
										Subtotal	85	344	1,037	133	59

POV Emissions from Construction Workers

Assume 6 miles per day per vehicle (one vehicle per worker)

On-base POV emissions

# vehicles	# days	mi/day	VOC lb/mi	CO lb/mi	NOx lb/mi	SOx lb/mi	PM lb/mi	VOC lb	CO lb	NOx lb	SOx lb	PM lb
25	360	6	0.001497	0.013925	0.001489	0.000009	0.000080	80.84	751.95	80.41	0.49	4.30
							Subtotal	81	752	80	0	4

2011 CIF Construction Total (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.02	0.13	0.19	0.02	0.01	0.01

2012 CIF Construction Total (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.05	0.27	0.37	0.05	0.02	0.02

2013 CIF Construction Total (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.05	0.27	0.37	0.05	0.02	0.01

2014 CIF Construction Total (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.01	0.07	0.09	0.01	0.01	0.00

Construct Ship Maintenance Facility (SMF) 114,000 SF **July 2011 - Mar 2014 (33 months)**

Site prep (grading, drainage, utilities etc.) 6.80 AC

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Grader	1	6	45	135	0.58	0.68	2.7	8.38	0.93	0.402	32	126	391	43	19
Skid steer loader	2	4	175	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	25	113	266	44	22
Backhoe/loader	2	6	140	98	0.21	0.99	3.49	6.9	0.85	0.722	75	266	526	65	55
Small diesel engines	1	4	105	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	3	16	21	4	2
Dump truck	2	1	60	275	0.21	0.68	2.7	8.38	0.89	0.402	10	41	128	14	6
										Subtotal	145	562	1,332	170	104

Foundation

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Skid steer loader	2	2	86	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	6	28	65	11	6
Concrete truck	8	1	44	250	0.21	0.68	2.7	8.38	0.89	0.402	28	110	341	36	16
Dump truck	3	1	57	275	0.21	0.68	2.7	8.38	0.89	0.402	15	59	182	19	9
Delivery truck	1	1	120	180	0.21	0.68	2.7	8.38	0.89	0.402	7	27	84	9	4
Backhoe/loader	1	8	10	98	0.21	0.99	3.49	6.9	0.85	0.722	4	13	25	3	3
Small diesel engines	2	2	100	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	3	16	20	4	2
										Subtotal	62	252	718	82	39

Structure

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Small diesel engines	2	4	95	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	5	30	38	7	3
Delivery truck	1	2	114	180	0.21	0.68	2.7	8.38	0.89	0.402	13	51	159	17	8
Skid steer loader	2	4	380	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	54	244	578	96	49
Concrete truck	8	1	130	250	0.21	0.68	2.7	8.38	0.89	0.402	82	325	1,009	107	48
Crane	1	8	59	120	0.43	0.3384	0.8667	5.6523	0.93	0.2799	18	47	303	50	15
										Subtotal	172	697	2,087	277	123

POV Emissions from Construction Workers
Assume 6 miles per day per vehicle (one vehicle per worker)

On-base POV emissions

# vehicles	# days	mi/day	VOC lb/mi	CO lb/mi	NOx lb/mi	SOx lb/mi	PM lb/mi	VOC lb	CO lb	NOx lb	SOx lb	PM lb
60	480	6	0.001497	0.013925	0.001489	0.000009	0.000080	258.68	2406.24	257.30	1.56	13.77
							Subtotal	259	2,406	257	2	14

2011 SMF Construction Total (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.057	0.353	0.395	0.048	0.025	0.025

2012 SMF Construction Total (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.11	0.71	0.79	0.10	0.05	0.05

2013 SMF Construction Total (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.11	0.71	0.79	0.10	0.05	0.05

2014 SMF Construction Total (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.03	0.18	0.20	0.02	0.01	0.01

Construct Maintenance Support Facility (MSF) 82,000 SF **July 2011 - Mar 2014 (33 months)**
(including 7,200 SF Tank Storage Facility and 2,270 SF Mixed Waste Storage Facility)

Site prep (grading, drainage, utilities etc.) 5.25 AC

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Grader	1	6	25	135	0.58	0.68	2.7	8.38	0.93	0.402	18	70	217	24	10
Skid steer loader	2	4	125	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	18	80	190	32	16
Backhoe/loader	2	6	100	98	0.21	0.99	3.49	6.9	0.85	0.722	54	190	376	46	39
Small diesel engines	1	4	75	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	2	12	15	3	1
Dump truck	2	1	30	275	0.21	0.68	2.7	8.38	0.89	0.402	5	21	64	7	3
										Subtotal	97	373	862	111	70

Foundations

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Skid steer loader	2	2	62	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	4	20	47	8	4
Concrete truck	8	1	32	250	0.21	0.68	2.7	8.38	0.89	0.402	20	80	248	26	12
Dump truck	3	1	34	275	0.21	0.68	2.7	8.38	0.89	0.402	9	35	109	12	5
Delivery truck	1	1	88	180	0.21	0.68	2.7	8.38	0.89	0.402	5	20	61	7	3
Backhoe/loader	1	8	7	98	0.21	0.99	3.49	6.9	0.85	0.722	3	9	18	2	2
Small diesel engines	2	2	80	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	2	12	16	3	1
										Subtotal	43	176	499	57	27

Structures

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Small diesel engines	2	4	68	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	4	21	27	5	2
Delivery truck	1	2	68	180	0.21	0.68	2.7	8.38	0.89	0.402	8	31	95	10	5
Skid steer loader	2	4	274	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	39	176	417	69	35
Concrete truck	8	1	88	250	0.21	0.68	2.7	8.38	0.89	0.402	55	220	683	73	33
Crane	1	8	43	120	0.43	0.3384	0.8667	5.6523	0.93	0.2799	13	34	221	36	11
										Subtotal	119	482	1,443	193	86

Paved Staging Areas 2,500 sf total

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Grader	1	4	1	135	0.58	0.68	2.7	8.38	0.93	0.402	0	2	6	1	0
Roller	1	4	1	30	0.59	1.8	5	6.9	1	0.8	0	1	1	0	0
Paver	1	2	1	107	0.59	0.68	2.7	8.38	0.93	0.402	0	1	2	0	0
Dump truck	3	0.5	1	275	0.21	0.68	2.7	8.38	0.89	0.402	0	1	2	0	0
Concrete truck	1	1	1	250	0.21	0.68	2.7	8.38	0.89	0.402	0	0	1	0	0
Delivery truck	1	1	1	180	0.21	0.68	2.7	8.38	0.89	0.402	0	0	1	0	0
Small diesel engines	2	6	3	25	0.43	1.7	5	8.5	0.93	0.9	1	4	7	1	1
										Subtotal	3	9	20	2	1

Construct Two 2,500 sf Buildings

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Dozer	1	6	2	299	0.58	0.68	2.7	8.38	0.93	0.402	3	12	38	4	2
Skid steer loader	2	4	5	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	1	3	8	1	1
Backhoe/loader	2	6	4	98	0.21	0.99	3.49	6.9	0.85	0.722	2	8	15	2	2
Small diesel engines	2	2	10	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	0	2	2	0	0
Dump truck	6	1	2	275	0.21	0.68	2.7	8.38	0.89	0.402	1	4	13	1	1
										Subtotal	7	29	76	9	5

Foundation (slab)

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Skid steer loader	2	2	4	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	0	1	3	1	0
Concrete truck	4	1	2	250	0.21	0.68	2.7	8.38	0.89	0.402	1	3	8	1	0
Dump truck	8	1	1	275	0.21	0.68	2.7	8.38	0.89	0.402	1	3	9	1	0
Delivery truck	1	1	4	180	0.21	0.68	2.7	8.38	0.89	0.402	0	1	3	0	0
Backhoe/loader	1	8	1	98	0.21	0.99	3.49	6.9	0.85	0.722	0	1	3	0	0
Small diesel engines	2	2	10	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	0	2	2	0	0
										Subtotal	2	10	27	3	2

Structure

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Small diesel engines	2	2	9	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	0	1	2	0	0
Delivery truck	1	1	6	180	0.21	0.68	2.7	8.38	0.89	0.402	0	1	4	0	0
Skid steer loader	2	4	10	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	1	6	15	3	1
Dump truck	2	1	3	275	0.21	0.68	2.7	8.38	0.89	0.402	1	2	6	1	0
Crane	1	8	3	120	0.43	0.3384	0.8667	5.6523	0.93	0.2799	1	2	15	3	1
										Subtotal	3	14	43	7	3

POV Emissions from Construction Workers

Assume 6 miles per day per vehicle (one vehicle per worker)

On-base POV emissions

# vehicles	# days	mi/day	VOC lb/mi	CO lb/mi	NOx lb/mi	SOx lb/mi	PM lb/mi	VOC lb	CO lb	NOx lb	SOx lb	PM lb
45	480	6	0.001497	0.013925	0.001489	0.000009	0.000080	194.01	1804.68	192.97	1.17	10.32
							Subtotal	194	1,805	193	1	10

2011 MSF Construction Total (tons)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.04	0.26	0.28	0.03	0.02	0.02

2012 MSF Construction Total (tons)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.08	0.52	0.57	0.07	0.04	0.04

2013 MSF Construction Total (tons)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.08	0.52	0.57	0.07	0.04	0.04

2014 MSF Construction Total (tons)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.02	0.13	0.14	0.02	0.01	0.01

Massey Avenue Widening and Intersection Improvements **May 2011 – April 2013 (12 AC**

Grading 522,720 SF 58,080 SY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Dozer	1	6	5	90	0.59	0.99	3.49	6.9	0.93	0.722	3	12	24	3	3
Skid steer loader	1	4	28	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	2	9	21	4	2
Backhoe/loader	1	6	21	98	0.21	0.99	3.49	6.9	0.85	0.722	6	20	39	5	4
Small diesel engines	1	4	14	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	0	2	3	0	0
Dump truck	3	1	14	275	0.21	0.68	2.7	8.38	0.89	0.402	4	14	45	5	2
										Subtotal	15	58	133	17	11

Gravel 9680 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Grader	1	4	30	135	0.58	0.68	2.7	8.38	0.93	0.402	14	56	174	19	8
Skid steer loader	4	4	65	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	18	84	198	33	17
Small diesel engines	4	4	69	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	8	43	55	10	5
Dump truck (12 CY)	16	0.5	55	275	0.21	0.68	2.7	8.38	0.89	0.402	38	151	469	50	23
										Subtotal	79	334	896	112	52

Paving 9680 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Grader	1	4	8	150	0.59	0.68	2.7	8.38	0.93	0.402	4	17	52	6	3
Roller	2	8	8	30	0.59	1.8	5	6.9	1	0.8	9	25	34	5	4
Paver	1	8	8	107	0.59	0.68	2.7	8.38	0.93	0.402	6	24	75	8	4
Delivery truck	2	2	8	180	0.21	0.68	2.7	8.38	0.89	0.402	2	7	22	2	1
										Subtotal	21	73	184	21	11

Volume of hot mix asphalt 261,360 ft^3
Average density of HMA 145 lb/ft^3
CARB EF for HMA 0.04 lb/ton
VOC emissions from HMA paving 758 lb

Pavement Marking 87,120 LF
4" Solid Line= 215 ft/gal VOC content of paint = 1.3 lb/gal

VOC lb
527

Fugitive Dust Emissions:

PM_{10} tons/acre/mo	acres	days of disturbance	**PM_{10}** Total	**$PM_{2.5}/PM_{10}$** Ratio	**$PM_{2.5}$** Total
0.42	12	70	12	0.1	1

POV Emissions from Construction Workers
Assume 6 miles per day per vehicle (one vehicle per worker)

On-base POV emissions

# vehicles	# days	mi/day	VOC lb/mi	CO lb/mi	NOx lb/mi	SOx lb/mi	PM lb/mi	VOC lb	CO lb	NOx lb	SOx lb	PM lb
20	85	6	0.001497	0.013925	0.001489	0.000009	0.000080	15.27	142.04	15.19	0.0918	0.81
							Subtotal	15	142	15	0	1

2011 Road Construction Total (tons)

VOC	**CO**	**NOx**	**SO2**	**PM_{10}**	**$PM_{2.5}$**
0.24	0.10	0.20	0.03	0.01	0.40

2012 Road Construction Total (tons)

VOC	**CO**	**NOx**	**SO2**	**PM_{10}**	**$PM_{2.5}$**
0.39	0.17	0.34	0.04	6.55	0.67

2013 Road Construction Total (tons)

VOC	**CO**	**NOx**	**SO2**	**PM_{10}**	**$PM_{2.5}$**
0.12	0.05	0.10	0.01	0.01	0.20

GROUP 3: ALTERNATIVE 4 CONSTRUCTION GRAND TOTALS

2011 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.58	1.84	3.47	0.32	0.20	0.59

2012 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.81	2.50	3.72	0.44	6.75	0.87

2013 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.56	2.08	2.93	0.35	0.19	0.37

2014 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.06	0.37	0.43	0.05	0.03	0.03

ALTERNATIVE 8: CVN AND CRU/DES HOMEPORTING

May 2011-April 2013 (24 months)

Parking Garage Construction 4 level structure - 3 AC total

Site prep (grading, compacting, drainage, etc.)

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Grader	1	6	15	135	0.58	0.68	2.7	8.38	0.93	0.402	11	42	130	14	6
Skid steer loader	2	4	75	98	0.21	0.99	3.49	6.9	0.85	0.722	27	95	188	23	20
Backhoe/loader	2	6	60	135	0.58	0.68	2.7	8.38	0.93	0.402	85	336	1,042	116	50
Small diesel engines	1	4	45	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	1	7	9	2	1
Dump truck	6	1	20	275	0.21	0.68	2.7	8.38	0.89	0.402	10	41	128	14	6
										Subtotal	134	521	1,497	168	83

Foundation 98,000 SF

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Skid steer loader	2	2	74	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	5	24	56	9	5
Concrete truck	4	4	74	250	0.21	0.68	2.7	8.38	0.89	0.402	93	370	1,148	122	55
Dump truck	6	6	49	275	0.21	0.68	2.7	8.38	0.89	0.402	153	606	1,882	200	90
Delivery truck	1	1	100	180	0.21	0.68	2.7	8.38	0.89	0.402	6	23	70	7	3
Backhoe/loader	1	8	8	98	0.21	0.99	3.49	6.9	0.85	0.722	3	10	20	2	2
Small diesel engines	2	2	84	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	2	13	17	3	1
										Subtotal	262	1,046	3,193	344	157

Structure

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Small diesel engines	2	4	130	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	8	41	52	9	4
Delivery truck	1	2	130	180	0.21	0.68	2.7	8.38	0.89	0.402	15	59	182	19	9
Skid steer loader	4	4	233	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	66	300	709	118	60
Concrete truck	8	1	192	250	0.21	0.68	2.7	8.38	0.89	0.402	121	480	1,490	158	71
Crane	1	8	64	120	0.43	0.3384	0.8667	5.6523	0.93	0.2799	20	50	329	54	16
										Subtotal	229	929	2,761	359	161

POV Emissions from Construction Workers

Assume 6 miles per day per vehicle (one vehicle per worker)

On-base POV emissions

# vehicles	# days	mi/day	**VOC** lb/mi	**CO** lb/mi	**NOx** lb/mi	**SOx** lb/mi	**PM** lb/mi	**VOC** lb	**CO** lb	**NOx** lb	**SOx** lb	**PM** lb
45	240	6	0.001497	0.013925	0.001489	0.000009	0.000080	97.01	902.34	96.49	0.58	5
							Subtotal	97	902	96	1	5

2011 Parking Garage Construction Total (tons)

VOC	**CO**	**NOx**	**SO2**	**PM** $_{10}$	**PM** $_{2.5}$
0.12	0.57	1.26	0.15	0.07	0.07

2012 Parking Garage Construction Total (tons)

VOC	**CO**	**NOx**	**SO2**	**PM** $_{10}$	**PM** $_{2.5}$
0.18	0.85	1.89	0.22	0.10	0.10

2013 Parking Garage Construction Total (tons)

VOC	**CO**	**NOx**	**SO2**	**PM** $_{10}$	**PM** $_{2.5}$
0.06	0.28	0.63	0.07	0.03	0.03

GROUP 3: ALTERNATIVE 8 CONSTRUCTION GRAND TOTALS

2011 EMISSIONS (tons/yr)

VOC	**CO**	**NOx**	**SO2**	**PM** $_{10}$	**PM** $_{2.5}$
0.70	2.41	4.73	0.47	0.26	0.65

2012 EMISSIONS (tons/yr)

VOC	**CO**	**NOx**	**SO2**	**PM** $_{10}$	**PM** $_{2.5}$
0.99	3.35	5.61	0.66	6.85	0.97

2013 EMISSIONS (tons/yr)

VOC	**CO**	**NOx**	**SO2**	**PM** $_{10}$	**PM** $_{2.5}$
0.62	2.37	3.56	0.43	0.22	0.41

2014 EMISSIONS (tons/yr)

VOC	**CO**	**NOx**	**SO2**	**PM** $_{10}$	**PM** $_{2.5}$
0.06	0.37	0.43	0.05	0.03	0.03

ALTERNATIVE 10: CVN AND LHD HOMEPORTING

Parking Garage Construction 4.5 level structure - 3 AC total

May 2011-April 2013 (24 months)

Site prep (grading, compacting, drainage, etc.)

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Grader	1	6	15	135	0.58	0.68	2.7	8.38	0.93	0.402	11	42	130	14	6
Skid steer loader	2	4	75	98	0.21	0.99	3.49	6.9	0.85	0.722	27	95	188	23	20
Backhoe/loader	2	6	60	135	0.58	0.68	2.7	8.38	0.93	0.402	85	336	1,042	116	50
Small diesel engines	1	4	45	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	1	7	9	2	1
Dump truck	6	1	20	275	0.21	0.68	2.7	8.38	0.89	0.402	10	41	128	14	6
										Subtotal	134	521	1,497	168	83

Foundation 98,000 SF

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Skid steer loader	2	2	74	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	5	24	56	9	5
Concrete truck	4	4	74	250	0.21	0.68	2.7	8.38	0.89	0.402	93	370	1,148	122	55
Dump truck	6	6	49	275	0.21	0.68	2.7	8.38	0.89	0.402	153	606	1,882	200	90
Delivery truck	1	1	100	180	0.21	0.68	2.7	8.38	0.89	0.402	6	23	70	7	3
Backhoe/loader	1	8	8	98	0.21	0.99	3.49	6.9	0.85	0.722	3	10	20	2	2
Small diesel engines	2	2	84	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	2	13	17	3	1
										Subtotal	262	1,046	3,193	344	157

Structure

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Small diesel engines	2	4	146	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	8	46	58	10	5
Delivery truck	1	2	146	180	0.21	0.68	2.7	8.38	0.89	0.402	17	66	204	22	10
Skid steer loader	3	4	262	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	56	253	598	99	51
Concrete truck	8	1	216	250	0.21	0.68	2.7	8.38	0.89	0.402	136	540	1,676	178	80
Crane	1	8	72	120	0.43	0.3384	0.8667	5.6523	0.93	0.2799	22	57	370	61	18
										Subtotal	239	961	2,906	370	164

POV Emissions from Construction Workers

Assume 6 miles per day per vehicle (one vehicle per worker)

On-base POV emissions

# vehicles	# days	mi/day	**VOC** lb/mi	**CO** lb/mi	**NOx** lb/mi	**SOx** lb/mi	**PM** lb/mi	**VOC** lb	**CO** lb	**NOx** lb	**SOx** lb	**PM** lb
68	240	6	0.001497	0.013925	0.001489	0.000009	0.000080	146.59	1363.54	145.80	0.88	8
							Subtotal	147	1,364	146	1	8

2011 Parking Garage Construction Total (tons)

VOC	**CO**	**NOx**	**SO2**	**PM $_{10}$**	**PM $_{2.5}$**
0.13	0.65	1.29	0.15	0.07	0.07

2012 Parking Garage Construction Total (tons)

VOC	**CO**	**NOx**	**SO2**	**PM $_{10}$**	**PM $_{2.5}$**
0.20	0.97	1.94	0.22	0.10	0.10

2013 Parking Garage Construction Total (tons)

VOC	**CO**	**NOx**	**SO2**	**PM $_{10}$**	**PM $_{2.5}$**
0.07	0.32	0.65	0.07	0.03	0.03

GROUP 3: ALTERNATIVE 10 CONSTRUCTION GRAND TOTALS

2011 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.71	2.49	4.76	0.47	0.26	0.66

2012 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
1.00	3.48	5.66	0.66	6.85	0.97

2013 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.62	2.41	3.58	0.43	0.22	0.41

2014 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.06	0.37	0.43	0.05	0.03	0.03

ALTERNATIVE 12: CVN, CRUDES AND LHD HOMEPORTING

Parking Garage Construction 5 level structure - 3 AC total

May 2011-April 2013 (24 months)

Site prep (grading, compacting, drainage, etc.)

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Grader	1	6	15	135	0.58	0.68	2.7	8.38	0.93	0.402	11	42	130	14	6
Skid steer loader	2	4	75	98	0.21	0.99	3.49	6.9	0.85	0.722	27	95	188	23	20
Backhoe/loader	2	6	60	135	0.58	0.68	2.7	8.38	0.93	0.402	85	336	1,042	116	50
Small diesel engines	1	4	45	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	1	7	9	2	1
Dump truck	6	1	20	275	0.21	0.68	2.7	8.38	0.89	0.402	10	41	128	14	6
										Subtotal	134	521	1,497	168	83

Foundation 98,000 SF

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Skid steer loader	2	2	74	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	5	24	56	9	5
Concrete truck	4	4	74	250	0.21	0.68	2.7	8.38	0.89	0.402	93	370	1,148	122	55
Dump truck	6	6	49	275	0.21	0.68	2.7	8.38	0.89	0.402	153	606	1,882	200	90
Delivery truck	1	1	100	180	0.21	0.68	2.7	8.38	0.89	0.402	6	23	70	7	3
Backhoe/loader	1	8	8	98	0.21	0.99	3.49	6.9	0.85	0.722	3	10	20	2	2
Small diesel engines	2	2	84	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	2	13	17	3	1
										Subtotal	262	1,046	3,193	344	157

Structure

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Small diesel engines	2	4	163	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	9	51	65	11	6
Delivery truck	1	2	163	180	0.21	0.68	2.7	8.38	0.89	0.402	18	73	228	24	11
Skid steer loader	5	4	233	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	83	374	886	147	75
Concrete truck	8	1	240	250	0.21	0.68	2.7	8.38	0.89	0.402	151	600	1,862	198	89
Crane	1	8	80	120	0.43	0.3384	0.8667	5.6523	0.93	0.2799	25	63	412	68	20
										Subtotal	286	1,162	3,452	448	201

Parking Garage Construction 4 level structure - 1 AC total **May 2011-April 2013 (24 months)**

Site prep (grading, compacting, drainage, etc.)

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Grader	1	6	5	135	0.58	0.68	2.7	8.38	0.93	0.402	4	14	43	5	2
Skid steer loader	2	4	25	98	0.21	0.99	3.49	6.9	0.85	0.722	9	32	63	8	7
Backhoe/loader	2	6	20	135	0.58	0.68	2.7	8.38	0.93	0.402	28	112	347	39	17
Small diesel engines	1	4	15	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	0	2	3	1	0
Dump truck	6	1	7	275	0.21	0.68	2.7	8.38	0.89	0.402	4	14	45	5	2
										Subtotal	45	174	501	56	28

Foundation 32,670 SF

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Skid steer loader	2	2	25	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	2	8	19	3	2
Concrete truck	4	4	25	250	0.21	0.68	2.7	8.38	0.89	0.402	31	125	388	41	19
Dump truck	6	6	16	275	0.21	0.68	2.7	8.38	0.89	0.402	50	198	615	65	29
Delivery truck	1	1	33	180	0.21	0.68	2.7	8.38	0.89	0.402	2	7	23	2	1
Backhoe/loader	1	8	3	98	0.21	0.99	3.49	6.9	0.85	0.722	1	4	8	1	1
Small diesel engines	2	2	28	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	1	4	6	1	0
										Subtotal	87	347	1,058	114	52

Structure

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Small diesel engines	2	4	43	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	2	13	17	3	1
Delivery truck	1	2	43	180	0.21	0.68	2.7	8.38	0.89	0.402	5	19	60	6	3
Skid steer loader	4	4	78	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	22	100	237	39	20
Concrete truck	8	1	64	250	0.21	0.68	2.7	8.38	0.89	0.402	40	160	497	53	24
Crane	1	8	21	120	0.43	0.3384	0.8667	5.6523	0.93	0.2799	6	17	108	18	5
										Subtotal	76	310	919	119	54

POV Emissions from Construction Workers

Assume 6 miles per day per vehicle (one vehicle per worker)

On-base POV emissions

# vehicles	# days	mi/day	VOC lb/mi	CO lb/mi	NOx lb/mi	SOx lb/mi	PM lb/mi	VOC lb	CO lb	NOx lb	SOx lb	PM lb
100	240	6	0.001497	0.013925	0.001489	0.000009	0.000080	215.57	2005.20	214.42	1.30	11
							Subtotal	216	2,005	214	1	11

2011 Parking Garage Construction Total (tons)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.18	0.93	1.80	0.21	0.10	0.93

2012 Parking Garage Construction Total (tons)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.28	1.39	2.71	0.31	0.15	0.15

2013 Parking Garage Construction Total (tons)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.09	0.46	0.90	0.10	0.05	0.05

GROUP 3: ALTERNATIVE 12 CONSTRUCTION GRAND TOTALS

2011 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.77	2.77	5.28	0.53	0.29	1.51

2012 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
1.08	3.89	6.43	0.75	6.89	1.02

2013 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.65	2.55	3.84	0.46	0.23	0.42

2014 EMISSIONS (tons/yr)

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
0.06	0.37	0.43	0.05	0.03	0.03

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