C1. Air Quality Emissions Calculations (May 2022)

Air Quality Assessment

Revised May 2022

Maryland Offshore Wind Project

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1.0 Emissions Calculations

US Wind has utilized the BOEM Offshore Wind Energy Facilities Emission Estimating Tool, Version 2.0 (BOEM 2021) (BOEM Tool), to estimate the potential emissions from the construction and operation of the US Wind Maryland Offshore Wind Project (the Project), as well as the estimated emissions avoided due to the reduction in operation of on-shore fossil fuel combustion facilities as a result of the energy generated by the Project.

The methodology used by the BOEM Tool to estimate emissions is described in the BOEM Offshore Wind Energy Facilities Emission Estimating Tool – Version 2.0 User's Guide (Chang et al. 2021). To estimate emissions from marine engines, BOEM used representative vessels to develop a "default fleet profile" that defined the type and range of vessel sizes typically used for offshore wind farm construction, operation and decommissioning. The vessel information was combined with the latest EPA emission factors from the Ports Inventory Guidance/Methodologies for Estimating Port-Related and Goods Movement Mobile Source Emissions Report (EPA 2020) to develop the emission factors used in the BOEM Tool. The emissions from transit vessel propulsion engines are based on the estimated number of trips to and from the Project area and the distance traveled per trip.

The emergency generators to be used on the Project offshore substations were assumed to be Category 1 engines with a power rating of 150 kW and representative emissions factors were used to estimate their emissions. The emissions from stationary engines are based on the expected number of hours of usage.

The BOEM Tool calculates the avoided emissions by using the EPA's AVERT modeling tool to obtain emission factors for the regional mix of conventional energy sources. The estimated quantity of energy to be produced by the Project is assumed to offset the energy produced by the regional mix of energy sources resulting in proportional reduction in emissions. The emissions generated by the Project are deducted from the expected emissions from the existing mix of energy sources to calculate the avoided emissions.

The BOEM Offshore Wind Energy Facilities Emission Estimating Tool – Version 2.0 User's Guide (Chang et al. 2021) lists the emission factors used by the BOEM Tool to estimate emissions associated with the installation of an offshore wind project. The emission factors and default information used in the BOEM Tool can be found in the following tables located in the BOEM Version 2.0 User's Guide:

- Table A-1 Marine Engine & Generator Diesel Emission Factors
- Table A-4 Default Vessel Characteristics

1.1 Project Data

Consistent with the input requirements for the BOEM Tool, potential Project emissions during construction and operation have been based on the expected equipment used. The emissions from transit vessel propulsion engines are based on the estimated number of trips to and from the Project area. The emissions from stationary engines are based on the expected number of hours of usage. Land-based emission sources are not included in the BOEM Tool.

State boundaries, anticipated vessel routes and the OCS permit area for the Project are shown on Figure 1.

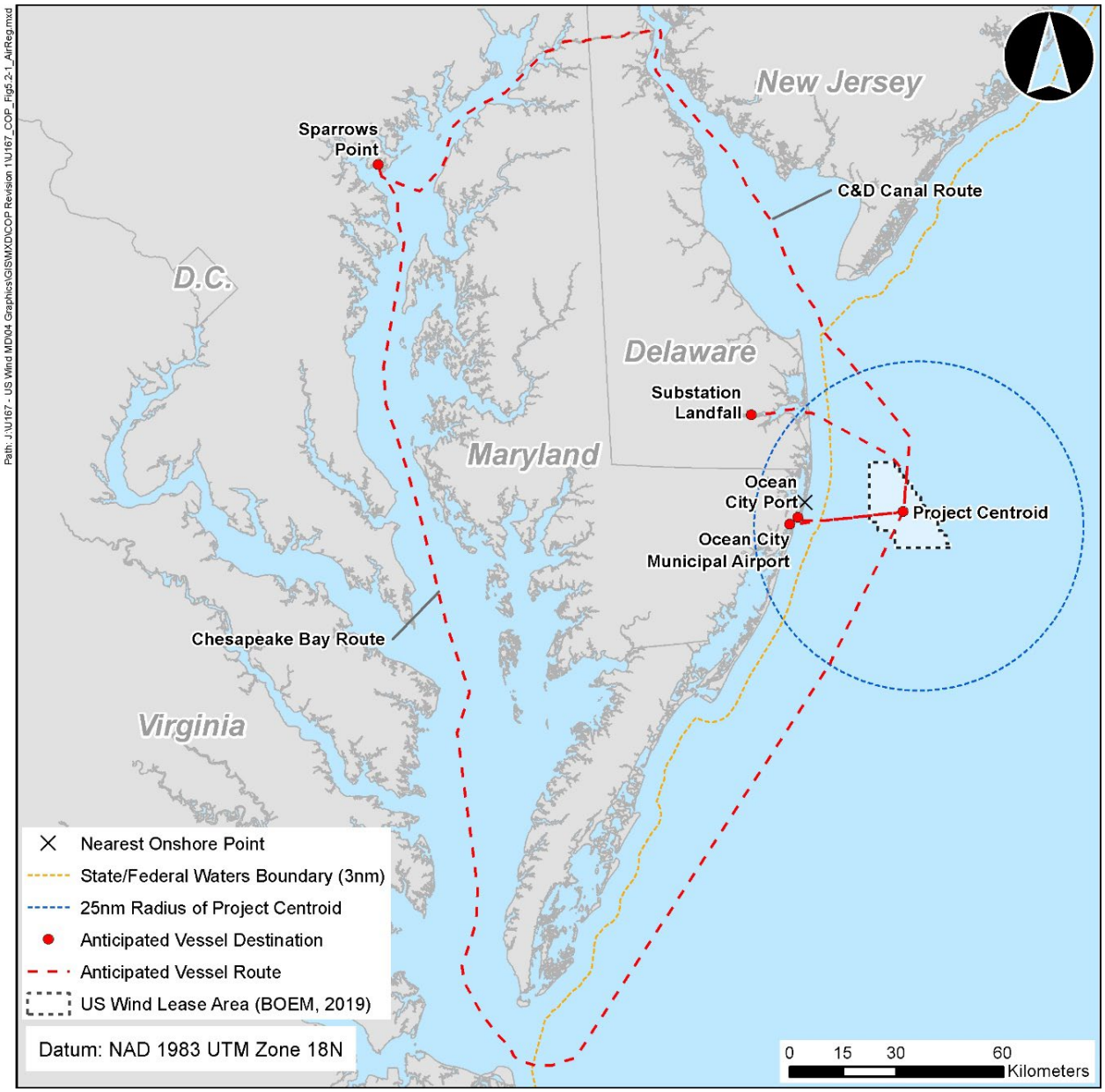

Figure 1. Air Regulatory Boundaries and Vessel Routes

The Project-specific data in Tables 1, 2, 3 and 4 was used to calculate the estimated air emissions with the BOEM Tool.

Table 1. Project Data

Input	Description
Lease #	OCS-A 0490
Project Name	Maryland Offshore Wind Project
Construction Period	4 Years
Operation Period	25 Years
Project Lat/Long	38.305453/-74.704267
Number of Turbines	121
Rated Power (MW)	1,676 –2,178 MW
Capacity Factor	41%
Zip Code for Grid Connection	19966

Table 2. Vessel Travel Distances (Nautical Miles)

Route	MD	DE	VA	NJ	State Waters	OCS	Other	Total
Sparrows Point - C & D Canal Route	45	65	NA	NA	110	27	8	145
Sparrows Point - Chesapeake Bay Route	81	NA	64	NA	145	25	78	248
Ocean City Port to Project Centroid	4	NA	NA	NA	4	15	NA	19
Portsmouth, VA to Project Centroid	NA	NA	26	NA	26	27	73	126
Newport News, VA to Project Centroid	NA	NA	26	NA	26	27	73	126
Cape May, NJ to Project Centroid	NA	NA	NA	5	5	25	8	38
Paulsboro, NJ to Project Centroid	NA	81	NA	1	82	25	8	115
Lewes, DE to Project Centroid	NA	7	NA	NA	7	25	8	40
Project Centroid to Substation Landfall	NA	13	NA	NA	13	23	NA	36
Project Centroid to Exclusive Economic Zone (used for all foreign ports)	NA	NA	NA	NA	NA	25	161	186

Note: The Sparrows Point – Chesapeake Bay Route represents the worst-case route for construction emissions in state waters as each vessel will be in state waters for the longest distance during each trip.

Table 3. Vessel Information

Construction / Operation	BOEM Tool Category	Project Description	Total Vessel Count	Days per Vessel	Round Trips per Vessel	Port State	Port	Route	Distance from Port to facility or EEZ (NM)	Distance Outside 25 mile radius of state and of installation centroid (NM)
Foundation Installation										
Construction	Crew	Marine Mammal Observers and Environmental Monitors	1	500	24	MD	Ocean City	Ocean City	19	0
Construction	Supply	Scour Protection Installation	1	500	8	MD	Canada	Atlantic Ocean	186	161
Construction	Jack-up Vessel	Installation Vessel	1	500	4	MD	Europe	Atlantic Ocean	186	161
Construction	Supply	Support Vessel - Anchor Handling, Noise Mitigation, Supply	1	500	4	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78
Construction	Crew	Crew Transfer	1	24	24	MD	Ocean City	Ocean City	19	0
Construction	Barge	Foundation Feeder	2	122	61	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78
Construction	Tugboat	Tugboats - Feeder Vessel Movement and general support	3	248	42	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78
OSS Installation										
Construction	Jack-up Vessel	OSS Installation	1	72	4	MD	Europe	Atlantic Ocean	186	161
Construction	Barge	OSS Transport	1	72	4	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78

Construction / Operation	BOEM Tool Category	Project Description	Total Vessel Count	Days per Vessel	Round Trips per Vessel	Port State	Port	Route	Distance from Port to facility or EEZ (NM)	Distance Outside 25 mile radius of state and of installation centroid (NM)
Construction	Tugboat	OSS Transport	2	72	4	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78
Construction	Supply	Scour Protection	1	8	4	MD	Canada	Atlantic Ocean	186	161
Construction	Jack-up Vessel	Crew Hotel Vessel	1	144	4	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78
Offshore Export Cable Installation										
Construction	Supply	Pre-Lay Grapnel Run boulder clearance	1	300	4	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78
Construction	Research/Survey	Pre-Installation Surveys	1	300	4	MD	Sparrows Point	C&D Canal	145	8
Construction	Cable Laying	Laying of the Cables (and potentially burial)	1	360	4	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78
Construction	Supply	Support Vessel - Supply	1	360	4	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78
Construction	Supply	Trenching Vessel	1	120	4	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78
Construction	Supply	Place Rock or Concrete Mattresses	1	120	4	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78
Construction	Jack-up Vessel	Cable Termination and Commissioning	1	120	4	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78

Construction / Operation	BOEM Tool Category	Project Description	Total Vessel Count	Days per Vessel	Round Trips per Vessel	Port State	Port	Route	Distance from Port to facility or EEZ (NM)	Distance Outside 25 mile radius of state and of installation centroid (NM)
Inter-Array Cable Installation										
Construction	Supply	Pre-Lay Grapnel Run	1	300	4	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78
Construction	Cable Laying	Laying Cables	1	360	4	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78
Construction	Supply	Trenching Vessel	1	120	4	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78
WTG Installation										
Construction	Barge	WTG Component Transport	3	162	41	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78
Construction	Tugboat	Feeder Vessel Tug	3	162	41	MD	Sparrows Point	Chesapeake Bay/C & D Canal	248	78
Construction	Jack-up Vessel	WTG Installation	1	280	4	MD	Europe	Atlantic Ocean	186	161
WTG Commissioning										
Construction	Crew	Crew Transfer	2	480	480	MD	Ocean City	Ocean City	19	0
Miscellaneous Construction Activities										
Construction	Supply	Refueling Vessels	1	104	104	MD	Sparrows Point	C&D Canal	145	8
Construction	Crew	Guard Vessels	1	24	24	MD	Ocean City	Ocean City	19	0

Construction / Operation	BOEM Tool Category	Project Description	Total Vessel Count	Days per Vessel	Round Trips per Vessel	Port State	Port	Route	Distance from Port to facility or EEZ (NM)	Distance Outside 25 mile radius of state and of installation centroid (NM)
Operations										
Operations	Crew	Operations and Maintenance	3	2,500	2,500	MD	Ocean City	Ocean City	19	0
Operations	Research/Survey	Cable Survey	1	360	6	MD	Ocean City	Ocean City	19	0

Table 4. Generator Information

Phase	Emission Source	Engine Type [1]	Generator Count	Annual Operating Hours per generator [1]	kW [1]	Comments
Operations	Generator	Category 1	4	500	150	OSS

1 – Default value

1.2 Assumptions

The following Project assumptions were made for the use of the BOEM Tool:

1.2.1 BOEM Tool Assumptions

- Main and auxiliary engines are operational 24 hours per day for vessels that are OCS sources (operating inside the 25 nautical mile radius around the Project).
- Vessels are attached to the OCS seabed and are OCS sources 24 hours per day while operating inside the 25 nautical mile radius of the Project.
- Vessel routes are linear. Distances entered into the BOEM Tool are the estimated actual travel distances.

1.2.2 Project Related Assumptions

- The emission factors and default values for vessels and generators in the BOEM Tool were used without modification.
- Emissions from sources that are not included in the BOEM Tool (such as air compressors and solvent use) are assumed to be negligible.
- Emissions that are not calculated by the BOEM Tool (such as hazardous air pollutants and sulfuric acid mist) are assumed to be negligible.
- Construction vessel routes are assumed to be from a staging area in Sparrows Point through Chesapeake Bay to the installation location and return by the C & D Canal. Crew and survey vessels are assumed to originate from Ocean City, Maryland.
- No preconstruction emissions are anticipated. Survey vessels have been included in the construction portion of the Project.

1.3 Emissions Summaries

Total Emissions by Source Type (mt)

Phase/Source		NOx	SO_2	$PM_{2.5}$	CO_2
Construction	Barge	2,344	90	45	150,939
Construction	Cable Laying	804	32	16	51,780
Construction	Crew	340	13	7	21,905
Construction	Jack-up	455	18	9	29,299
Construction	Research/ Survey	150	6	3	9,680
Construction	Supply Ship	1,112	43	21	71,608
Construction	Tug	362	14	7	23,309
Operation	Crew	1,768	68	34	113,858
Operation	Emergency Generator	0	0	0	43
Operation	Research/ Survey	179	7	3	11,536

Total Emissions by Phase

Phase	NOx	SO_2	$PM_{2.5}$	CO_2
Construction (short tons)	6,136	238	118	395,200
Construction (metric tonnes)	5,567	216	107	358,519
Operation (short tons)	2,146	83	41	138,271
Operation (metric tonnes)	1,947	75	38	125,438

Total Avoided Emissions

Project Size	NOx	SO_2	$PM_{2.5}$	CO_2
1,676 MW (short tons)	51,560	80,447	9,245	107,088,323
1,676 MW (metric tonnes)	46,774	72,981	8,387	97,148,921
2,178 MW (short tons)	67,003	104,543	12,014	139,163,704
2,178 MW (metric tonnes)	60,785	94,840	10,899	126,247,225

Estimated Annual Project Emissions - Total

			Metric Tons				Short Tons			
Year	**Phase**	**Campaign**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**
Year 1	Construction	Campaign 1	942	37	18	60,673	1,038	40	20	66,880
	Operations	Not Applicable	0	0	0	0	0	0	0	0
	Total	Total	942	37	18	60,673	1,038	40	20	66,880
Year 2	Construction	Campaign 2	1,541	60	30	99,282	1,699	66	33	109,440
	Operations	Campaign 1	13	1	0	849	15	1	0	936
	Total	Total	1,555	60	30	100,131	1,714	66	33	110,376
Year 3	Construction	Campaign 3	1,541	60	30	99,282	1,699	66	33	109,440
	Operations	Campaigns 1,2	35	1	1	2,239	38	1	1	2,468
	Total	Total	1,576	61	30	101,521	1,737	67	33	111,908
Year 4	Construction	Campaign 4	1,541	60	30	99,282	1,699	66	33	109,440
	Operations	Campaigns 1,2,3	56	2	1	3,628	62	2	1	3,999
	Total	Total	1,598	62	31	102,910	1,761	68	34	113,439
Years 5 - 26	Operations	Campaigns 1,2,3,4	78	3	1	5,017	79	3	2	5,104
Year 27	Operations	Campaigns 2,3,4	65	3	1	4,168	67	3	1	4,311
Year 28	Operations	Campaigns 3,4	43	2	1	2,779	45	2	1	2,921
Year 29	Operations	Campaign 4	22	1	0	1,389	24	1	0	1,532
Project Total Emissions	**Construction**	**Project**	**5,566**	**216**	**107**	**358,520**	**6,136**	**238**	**118**	**395,200**
	Operations	**Project**	**1,947**	**75**	**37**	**125,437**	**2,146**	**83**	**41**	**138,271**
	Total	**Project**	**7,513**	**291**	**144**	**483,957**	**8,282**	**321**	**159**	**533,471**

Estimated Annual Project Emissions –Vessels From Sparrows Point - Within State Waters[1]

			Metric Tons				Short Tons			
Year	**Phase**	**Campaign**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**
Year 1	Construction	Campaign 1	170	6	3	10,959	188	7	4	12,080
	Operations	Not Applicable	0	0	0	0	0	0	0	0
	Total	Total	170	6	3	10,959	188	7	4	12,080
Year 2	Construction	Campaign 2	278	11	5	17,932	307	12	6	19,767
	Operations	Campaign 1	0	0	0	0	0	0	0	0
	Total	Total	278	11	5	17,932	307	12	6	19,767
Year 3	Construction	Campaign 3	278	11	5	17,932	307	12	6	19,767
	Operations	Campaigns 1,2	0	0	0	0	0	0	0	0
	Total	Total	278	11	5	17.932	307	12	6	19,767
Year 4	Construction	Campaign 4	278	11	5	17,932	307	12	6	19,767
	Operations	Campaigns 1,2,3	0	0	0	0	0	0	0	0
	Total	Total	278	11	5	17,932	307	12	6	19,767
Years 5 - 26	Operations	Campaigns 1,2,3,4	0	0	0	0	0	0	0	0
Year 27	Operations	Campaigns 2,3,4	0	0	0	0	0	0	0	0
Year 28	Operations	Campaigns 3,4	0	0	0	0	0	0	0	0
Year 29	Operations	Campaign 4	0	0	0	0	0	0	0	0
Project Total Emissions	**Construction**	**Project**	**1,005**	**38**	**19**	**64,756**	**1,108**	**42**	**21**	**71,381**
	Operations	**Project**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Total	**Project**	**1,005**	**38**	**19**	**64,756**	**1,108**	**42**	**21**	**71,381**

[1] As noted in Table 2, trips from Sparrows Point are considered worst-case for emissions in state waters

Estimated Annual Project Emissions –Vessels From Ocean City - Within State Waters

			Metric Tons				Short Tons			
Year	**Phase**	**Campaign**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**
Year 1	Construction	Campaign 1	1.7	0.1	0.0	111	1.9	0.1	0.0	122
	Operations	Not Applicable	0.0	0.0	0.0	0	0.0	0.0	0.0	0
	Total	Total	1.7	0.1	0.0	111	1.9	0.1	0.0	122
Year 2	Construction	Campaign 2	2.8	0.1	0.1	181	3.1	0.1	0.1	199
	Operations	Campaign 1	0.5	0.0	0.0	32	0.6	0.0	0.0	35
	Total	Total	3.3	0.1	0.1	213	3.7	0.1	0.1	235
Year 3	Construction	Campaign 3	2.8	0.1	0.1	181	3.1	0.1	0.1	199
	Operations	Campaigns 1,2	1.3	0.1	0.0	85	1.5	0.1	0.0	94
	Total	Total	4.1	0.2	0.1	266	4.6	0.2	0.1	293
Year 4	Construction	Campaign 4	2.8	0.1	0.1	181	3.1	0.1	0.1	199
	Operations	Campaigns 1,2,3	2.1	0.1	0.0	138	2.4	0.1	0.0	152
	Total	Total	4.9	0.2	0.1	318	5.5	0.2	0.1	351
Years 5 - 26	Operations	Campaigns 1,2,3,4	3.0	0.1	0.1	190	3.0	0.1	0.1	194
Year 27	Operations	Campaigns 2,3,4	2.5	0.1	0.0	158	2.5	0.1	0.0	163
Year 28	Operations	Campaigns 3,4	1.6	0.1	0.0	105	1.7	0.1	0.0	111
Year 29	Operations	Campaign 4	0.8	0.0	0.0	53	0.9	0.0	0.0	58
Project Total Emissions	**Construction**	**Project**	**10.2**	**0.4**	**0.2**	**653**	**11.2**	**0.4**	**0.2**	**720**
	Operations	**Project**	**73.8**	**2.8**	**1.5**	**4,755**	**81.4**	**3.1**	**1.6**	**5,242**
	Total	**Project**	**84.0**	**3.2**	**1.6**	**5,409**	**92.6**	**3.5**	**1.8**	**5,962**

Estimated Annual Project Emissions –Vessels From Portsmouth (Alternate WTG/Foundation Construction) - Within State Waters

			Metric Tons				Short Tons			
Year	**Phase**	**Campaign**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**
Year 1	Construction	Campaign 1	27	1.0	0.5	1,744	30	1.1	0.6	1,922
	Operations	Not Applicable	0	0.0	0.0	0	0	0.0	0.0	0
	Total	Total	27	1.0	0.5	1,744	30	1.1	0.6	1,922
Year 2	Construction	Campaign 2	44	1.7	0.9	2,853	49	1.9	0.9	3,145
	Operations	Campaign 1	0	0.0	0.0	0	0	0.0	0.0	0
	Total	Total	44	1.7	0.9	2,853	49	1.9	0.9	3,145
Year 3	Construction	Campaign 3	44	1.7	0.9	2,853	49	1.9	0.9	3,145
	Operations	Campaigns 1,2	0	0.0	0.0	0	0	0.0	0.0	0
	Total	Total	44	1.7	0.9	2,853	49	1.9	0.9	3,145
Year 4	Construction	Campaign 4	44	1.7	0.9	2,853	49	1.9	0.9	3,145
	Operations	Campaigns 1,2,3	0	0.0	0.0	0	0	0.0	0.0	0
	Total	Total	44	1.7	0.9	2,853	49	1.9	0.9	3,145
Years 5 - 26	Operations	Campaigns 1,2,3,4	0	0.0	0.0	0	0	0.0	0.0	0
Year 27	Operations	Campaigns 2,3,4	0	0.0	0.0	0	0	0.0	0.0	0
Year 28	Operations	Campaigns 3,4	0	0.0	0.0	0	0	0.0	0.0	0
Year 29	Operations	Campaign 4	0	0.0	0.0	0	0	0.0	0.0	0
Project Total Emissions	**Construction**	**Project**	**160**	**6.1**	**3.1**	**10,304**	**176**	**6.7**	**3.4**	**11,358**
	Operations	**Project**	**0**	**0.0**	**0.0**	**0**	**0**	**0.0**	**0.0**	**0**
	Total	**Project**	**160**	**6.1**	**3.1**	**10,304**	**176**	**6.7**	**3.4**	**11,358**

Estimated Annual Project Emissions –Vessels From Newport News (Primary Large Construction Support Vessels) - Within State Waters

			Metric Tons				Short Tons			
Year	**Phase**	**Campaign**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**
Year 1	Construction	Campaign 1	5.1	0.2	0.1	325	5.6	0.2	0.1	359
	Operations	Not Applicable	0.0	0.0	0.0	0	0.0	0.0	0.0	0
	Total	Total	5.1	0.2	0.1	325	5.6	0.2	0.1	359
Year 2	Construction	Campaign 2	8.3	0.3	0.2	533	9.1	0.4	0.2	587
	Operations	Campaign 1	0.0	0.0	0.0	0	0.0	0.0	0.0	0
	Total	Total	8.3	0.3	0.2	533	9.1	0.4	0.2	587
Year 3	Construction	Campaign 3	8.3	0.3	0.2	533	9.1	0.4	0.2	587
	Operations	Campaigns 1,2	0.0	0.0	0.0	0	0.0	0.0	0.0	0
	Total	Total	8.3	0.3	0.2	533	9.1	0.4	0.2	587
Year 4	Construction	Campaign 4	8.3	0.3	0.2	533	9.1	0.4	0.2	587
	Operations	Campaigns 1,2,3	0.0	0.0	0.0	0	0.0	0.0	0.0	0
	Total	Total	8.3	0.3	0.2	533	9.1	0.4	0.2	587
Years 5 - 26	Operations	Campaigns 1,2,3,4	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Year 27	Operations	Campaigns 2,3,4	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Year 28	Operations	Campaigns 3,4	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Year 29	Operations	Campaign 4	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Project Total Emissions	**Construction**	**Project**	**29.9**	**1.2**	**0.5**	**1,923**	**33.0**	**1.3**	**0.6**	**2,120**
	Operations	**Project**	**0.0**	**0.0**	**0.0**	**0**	**0.0**	**0.0**	**0.0**	**0**
	Total	**Project**	**29.9**	**1.2**	**0.5**	**1,923**	**33.0**	**1.3**	**0.6**	**2,120**

Estimated Annual Project Emissions –Vessels From Cape May (Alternate Construction Support Services) - Within State Waters

			Metric Tons				Short Tons			
Year	**Phase**	**Campaign**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**
Year 1	Construction	Campaign 1	2.1	0.1	0.0	137	2.4	0.1	0.1	151
	Operations	Not Applicable	0.0	0.0	0.0	0	0.0	0.0	0.0	0
	Total	Total	2.1	0.1	0.0	137	2.4	0.1	0.1	151
Year 2	Construction	Campaign 2	3.5	0.1	0.1	224	3.9	0.1	0.1	247
	Operations	Campaign 1	0.0	0.0	0.0	0	0.0	0.0	0.0	0
	Total	Total	3.5	0.1	0.1	224	3.9	0.1	0.1	247
Year 3	Construction	Campaign 3	3.5	0.1	0.1	224	3.9	0.1	0.1	247
	Operations	Campaigns 1,2	0.0	0.0	0.0	0	0.0	0.0	0.0	0
	Total	Total	3.5	0.1	0.1	224	3.9	0.1	0.1	247
Year 4	Construction	Campaign 4	3.5	0.1	0.1	224	3.9	0.1	0.1	247
	Operations	Campaigns 1,2,3	0.0	0.0	0.0	0	0.0	0.0	0.0	0
	Total	Total	3.5	0.1	0.1	224	3.9	0.1	0.1	247
Years 5 - 26	Operations	Campaigns 1,2,3,4	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Year 27	Operations	Campaigns 2,3,4	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Year 28	Operations	Campaigns 3,4	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Year 29	Operations	Campaign 4	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Project Total Emissions	**Construction**	**Project**	**12.7**	**0.5**	**0.3**	**809**	**14.0**	**0.5**	**0.3**	**892**
	Operations	**Project**	**0.0**	**0.0**	**0.0**	**0**	**0.0**	**0.0**	**0.0**	**0**
	Total	**Project**	**12.7**	**0.5**	**0.3**	**809**	**14.0**	**0.5**	**0.3**	**892**

Estimated Annual Project Emissions –Vessels From Paulsboro (Alternate Foundation Construction) - Within State Waters

			Metric Tons				Short Tons			
Year	**Phase**	**Campaign**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**
Year 1	Construction	Campaign 1	14	0.5	0.3	874	15	0.6	0.3	963
	Operations	Not Applicable	0	0.0	0.0	0	0	0.0	0.0	0
	Total	Total	14	0.5	0.3	874	15	0.6	0.3	963
Year 2	Construction	Campaign 2	22	0.9	0.4	1,430	24	0.9	0.5	1,576
	Operations	Campaign 1	0	0.0	0.0	0	0	0.0	0.0	0
	Total	Total	22	0.9	0.4	1,430	24	0.9	0.5	1,576
Year 3	Construction	Campaign 3	22	0.9	0.4	1,430	24	0.9	0.5	1,576
	Operations	Campaigns 1,2	0	0.0	0.0	0	0	0.0	0.0	0
	Total	Total	22	0.9	0.4	1,430	24	0.9	0.5	1,576
Year 4	Construction	Campaign 4	22	0.9	0.4	1,430	24	0.9	0.5	1,576
	Operations	Campaigns 1,2,3	0	0.0	0.0	0	0	0.0	0.0	0
	Total	Total	22	0.9	0.4	1,430	24	0.9	0.5	1,576
Years 5 - 26	Operations	Campaigns 1,2,3,4	0	0.0	0.0	0	0	0.0	0.0	0
Year 27	Operations	Campaigns 2,3,4	0	0.0	0.0	0	0	0.0	0.0	0
Year 28	Operations	Campaigns 3,4	0	0.0	0.0	0	0	0.0	0.0	0
Year 29	Operations	Campaign 4	0	0.0	0.0	0	0	0.0	0.0	0
Project Total Emissions	**Construction**	**Project**	**80**	**3.1**	**1.5**	**5,164**	**88**	**3.4**	**1.7**	**5,692**
	Operations	**Project**	**0**	**0.0**	**0.0**	**0**	**0**	**0.0**	**0.0**	**0**
	Total	**Project**	**80**	**3.1**	**1.5**	**5,164**	**88**	**3.4**	**1.7**	**5,692**

Estimated Annual Project Emissions –Vessels From Lewes (Alternate Construction Support Services) - Within State Waters

			Metric Tons				Short Tons			
Year	**Phase**	**Campaign**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**	**NOx**	**SO_2**	**$PM_{2.5}$**	**CO_2**
Year 1	Construction	Campaign 1	3.1	0.1	0.1	194	3.4	0.1	0.1	214
	Operations	Not Applicable	0.0	0.0	0.0	0	0.0	0.0	0.0	0
	Total	Total	3.1	0.1	0.1	194	3.4	0.1	0.1	214
Year 2	Construction	Campaign 2	5.0	0.2	0.1	317	5.5	0.2	0.1	350
	Operations	Campaign 1	0.0	0.0	0.0	0	0.0	0.0	0.0	0
	Total	Total	5.0	0.2	0.1	317	5.5	0.2	0.1	350
Year 3	Construction	Campaign 3	5.0	0.2	0.1	317	5.5	0.2	0.1	350
	Operations	Campaigns 1,2	0.0	0.0	0.0	0	0.0	0.0	0.0	0
	Total	Total	5.0	0.2	0.1	317	5.5	0.2	0.1	350
Year 4	Construction	Campaign 4	5.0	0.2	0.1	317	5.5	0.2	0.1	350
	Operations	Campaigns 1,2,3	0.0	0.0	0.0	0	0.0	0.0	0.0	0
	Total	Total	5.0	0.2	0.1	317	5.5	0.2	0.1	350
Years 5 - 26	Operations	Campaigns 1,2,3,4	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Year 27	Operations	Campaigns 2,3,4	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Year 28	Operations	Campaigns 3,4	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Year 29	Operations	Campaign 4	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Project Total Emissions	**Construction**	**Project**	**18.1**	**0.7**	**0.4**	**1,146**	**20.0**	**0.8**	**0.4**	**1,263**
	Operations	**Project**	**0.0**	**0.0**	**0.0**	**0**	**0.0**	**0.0**	**0.0**	**0**
	Total	**Project**	**18.1**	**0.7**	**0.4**	**1,146**	**20.0**	**0.8**	**0.4**	**1,263**

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