US Army Corps of Engineers
Baltimore District

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND PORT ADMINISTRATION

BALTIMORE HARBOR ANCHORAGES AND CHANNELS (BHAC) MODIFICATION OF SEAGIRT LOOP CHANNEL FEASIBILITY STUDY

FINAL INTEGRATED FEASIBILITY REPORT & ENVIRONMENTAL ASSESSMENT

APPENDIX D:

AIR QUALITY

FEBRUARY 2023

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BALTIMORE HARBOR ANCHORAGES AND CHANNELS (BHAC) MODIFICATION OF SEAGIRT LOOP CHANNEL FEASIBILITY STUDY

FINAL INTEGRATED FEASIBILITY REPORT & ENVIRONMENTAL ASSESSMENT

APPENDIX D1:

AIR CONFORMITY ANALYSIS

JULY 2022

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Baltimore Harbor Anchorages and Channels (BHAC) Modification of Seagirt Loop Channel Feasibility Study

Air Conformity Assessment

06/22/2022

Prepared for:

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND PORT ADMINISTRATION

US Army Corps of Engineers
Baltimore District

Prepared by:

STRAUGHAN ENVIRONMENTAL

Straughan Environmental, Inc. | 10245 Old Columbia Road | Columbia, MD 21046
phone 301.362.9200 | www.straughanenvironmental.com | fax 301.362.9245

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List of Acronyms

Acronym	Definition
BHAC	Baltimore Harbor Anchorages and Channels
CAA	Clean Air Act
CO	Carbon Monoxide
DMCF	Dredged Material Containment Facility
GBA	Gahagan & Bryant Associates
MDOT MPA	Maryland Department of Transportation Maryland Port Administration
NAA	Nonattainment Areas
NAAQS	National Ambient Air Quality Standards
NOx	Nitrogen Oxide
O_3	Ozone
PM	Particulate Matter
Seagirt Study	Modification of Seagirt Loop Channel
SIP	State Implementation Plan
SOx	Sulfur Dioxide
USACE	United States Army Corps of Engineers
US EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds

1. Introduction

This Air Conformity analysis is submitted as support to the Integrated Feasibility Report and Environmental Assessment for the Baltimore Harbor Anchorages and Channels (BHAC) Modification of Seagirt Loop Channel (Seagirt Study). The Seagirt Study consists of the main navigation access channels to the Port of Baltimore (Port) facilities at Dundalk, Seagirt, and South Locust Point Marine Terminals and the federally authorized anchorages (Anchorage 3 and 4) serving vessels in Baltimore Harbor. Initially the study considered four alternatives:

- Assumption of federal responsibility to existing BHAC improvements;
- Deepening and widening the which includes the West Dundalk Branch Channel, the Dundalk-Seagirt Connecting Channel, and the West Seagirt Branch Channel;
- Deepening and widening the South Locust Point Branch Channel and Turning Basin; and
- Expanding an existing anchorage.

Through the study period the U.S Army Corps of Engineers, Baltimore District (USACE) and the non-federal sponsor, the Maryland Department of Transportation Maryland Port Administration (MDOT MPA) have narrowed the study to one alternative, deepening and widening the West Seagirt Branch Channel.

The Seagirt-Dundalk access channel system (Seagirt Loop) serves the Seagirt Marine Terminal through three channels, the West Seagirt Branch Channel, the West Dundalk Branch Channel, and the Dundalk-Seagirt Connecting Channel. The West Dundalk Branch Channel and the Dundalk-Seagirt Connecting Channel are already maintained by the State at 50 feet, therefore deepening and widening of the West Seagirt Branch Channel would result in the entire the Seagirt Loop being dredged to the 50-foot depth which will promote safe and efficient navigation, allowing for the vessels to loop through the channel without the need to backup and turn around.

2. Purpose and Objectives

The general conformity provision of Section 176(c) of the Clean Air Act (CAA) prohibits federal agencies from taking actions that do not conform to the State Implementation Plan (SIP) for the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). A general conformity evaluation is required as part of the Seagirt Study conducted by USACE and MDOT MPA. The objective of this task is to evaluate the plan to modify the West Seagirt Branch Channel to determine the applicability of the requirements of the general conformity rule and prepare a report detailing the results of the general conformity evaluation.

3. Attainment Status

Areas where concentrations of criteria pollutants are below the National Ambient Air Quality Standards (NAAQS) are designated by EPA as being in “attainment” and areas where a criteria pollutant level exceeds the NAAQS are designated as being in “nonattainment.” Ozone (O_3) nonattainment areas are categorized based on the severity of nonattainment: marginal, moderate, serious, severe, or extreme. Carbon monoxide (CO) and Particulate Matter (PM_{10}) nonattainment areas are categorized as moderate or serious.

EPA designates the Baltimore, MD Region, which includes the Seagirt Marine Terminal, as a marginal nonattainment area for O_3 under the 2015 8-hour standard. The Baltimore, MD region is designated as in attainment of the NAAQS for all other criteria pollutants.

4. General Conformity Applicability

Title 1, Section 176(c)(1) of the CAA defines conformity as the upholding of "an implementation plan's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving attainment of such standards." Conforming activities or actions should not, through additional air pollutant emissions:

- Cause or contribute to new violations of any NAAQS in any area;
- Increase the frequency or severity of any existing violation of any NAAQS; or
- Delay timely attainment of any NAAQS or interim emission reductions.

An analysis of all direct and indirect emissions associated with the proposed Baltimore, MD region dredging operation was completed and compared to de minimis thresholds to determine if general conformity is applicable to the proposed action. The proposed project area is in the Baltimore, MD region, which is in "nonattainment" for O_3. The primary precursors to O_3 development are nitrogen oxide(NOx) and volatile organic compound (VOC). Emission factors were estimated for the dredging operations based on U.S. Environmental Protection Agency (US EPA) AP42 Chapter 3.3 (10/1996) for engines less than 600 hp and Chapter 3.4 (10/1996) for large engines (greater than 600 hp). Each type of process equipment that was proposed for dredging operations was evaluated for emissions from criteria pollutants which include PM_{10}, $PM_{2.5}$, NOx, VOC, sulfur dioxide (SOx) and CO. No emissions from lead are anticipated for the proposed project. Conservative assumptions were used in the emissions analysis (loading factors) to determine the overall levels of control and mitigation that will be required.

The General Conformity regulations exempt dredging projects that are considered as maintenance of channels previously dredged. Only new dredging projects fall under the regulations; therefore, only dredging that is considered new work is evaluated for the Seagirt Study.

5. Assessment of Project Emissions and De Minimis Emission Rates

40 CFR 93.153(b) details conformity determinations for federal actions in nonattainment areas. The following rates apply to nonattainment areas for each pollutant:

Table 1. EPA Nonattainment Limits for Criteria Pollutants

40 CFR 93.153(b)(1) - For purposes of paragraph (b) of this section the following rates apply in nonattainment areas (NAA's):	
	Tons/year
Ozone (VOC's or NOx):	
Serious NAA's	50
Severe NAA's	25
Extreme NAAs	10
Other ozone NAA's outside an ozone transport region:	100
Other ozone NAA's inside an ozone transport region:	
VOC	50
NOx	100
Carbon Monoxide: All maintenance areas	100
SO_2 or NO_2: All NAA's	100
PM_{10}:	
Moderate NAA's	100
Serious NAA's	70
$PM_{2.5}$ (direct emissions, SO_2, NOx, VOC, and Ammonia):	
Moderate NAA's	100
Serious NAA's	70
Pb: All NAA's	25

The proposed project for the Baltimore, MD area is in a nonattainment area but meets the current NAAQs for NOx and O_3 with a marginal designation. As a result, the NOx and O_3 NAAQ's limits are 100 tons/year, respectively, as shown in Table 1. The SIP requirements for the Baltimore, MD area for NAAQs can be found at: SPECS for SIPs Public Dashboard (epa.gov).

Projects with annual total emissions from direct and indirect emissions less than the *de minimis* thresholds are not considered to be significant and do not require a General Conformity Determination. The proposed work reviewed for this study evaluated emissions from dredging operations related to the deepening and widening of the West Seagirt Branch Channel. Based on the supporting data provided by the study partners (Table 2), the dredging operations' air emissions for the West Seagirt Branch Channel do conform to the current de minimis thresholds for the Baltimore, MD region.

Potential Annual Emissions from Seagirt Study

Table 2. Supporting Operating Equipment and Operating Data

Equipment[1]	Main Engine (HP)	Auxiliary Engines	Avg. Operation (Hrs/day)	Annual Operation (Hrs/year)		
				2025	2026	2027
Clamshell Mechanical Dredge	2340		15	750	750	750
Towing Tug	3500	200	24	1200	1200	1200
Tending Tug	2200	175	24	1200	1200	1200
Crew/Survey Boats	500		16	800	800	800

Table 3. Mobilization and Demobilization of Equipment

Vessel Type	Engine Power		Average Hours of Operation By Stage			
	Main Engine(s)	Aux. Engine(s)	Mob (MD/VA Line to SMT)	Set-up	Take Down	De-mob (SMT To MD/VA Line)
Towing Tug	3500	200	17.4	36	36	17.4
Hired Towing Tug (1)	3500	200	29.8			29.8
Hired Towing Tug (2)	3500	200	29.8			29.8
Hired Towing Tug (3)	3500	200	29.8			29.8
Hired Towing Tug (4)	3500	200	29.8			29.8
Tending Tug	2200	175	12.4	60	60	12.4
Crew/Survey Boat	500		30	60	60	30

The Seagirt Study fuel combustion-based emissions are estimated from mobilization, dredging, transport, and demobilization of dredging equipment/vessels. Emission sources associated with this project include the following dredging equipment: a clamshell mechanical dredge, towing and tending tugs, and crew/ survey

boats. These activities and associated emissions are based on the construction schedule that is planned to occur in calendar years October 2025 – October 2027 and includes two mobilizations and demobilizations (Gahagan & Bryant Associates Memorandum, 2022).

Based on the projected annual emission rates, it is anticipated that the criteria pollutant NOx will not exceed the EPA de minimis threshold of 100 tons per years 2025 through 2027.

Table 4 shows the estimated total uncontrolled (no equipment controls applied) project emissions by year for the proposed West Seagirt Branch Channel operations. See Appendix A for the complete emissions data by year for all criteria pollutants evaluated.

Table 4. Emissions Summary for Seagirt Study**

Year	Criteria Pollutant	Dredge Operations	Mob/De-mob Activities	Total Emissions for Seagirt Dredge Operation
2025	NOx	70.71	6.67	78.32
	VOC	2.23	0.21	2.47
	CO	16.16	1.52	17.91
	SOx	0.04	00.00	0.04
	PM10	2.19	.21	2.43
	PM2.5	2.13	.20	2.35
	Lead	0.00	0.00	0.00
2026	NOx	70.71	13.33	84.99
	VOC	2.23	0.43	2.69
	CO	16.16	3.04	19.43
	SOx	0.04	0.00	0.04
	PM10	2.19	0.42	2.64
	PM2.5	2.13	0.41	2.56
	Lead	0.00	0.00	0.00
2027	NOx	70.71	6.67	78.32
	VOC	2.23	0.21	2.47
	CO	16.16	1.52	17.91
	SOx	0.04	0.00	0.04
	PM10	2.19	0.21	2.43
	PM2.5	2.13	0.20	2.35
	Lead	0.00	0.00	0.00

**** Evaluation conducted on new work. Normal maintenance dredging not subject to evaluation as part of this Seagirt Study.

Table 5. Emissions from Proposed Operating Equipment for Seagirt Study

Primary Operating Equipment for Dredge Operations Emissions (Tons/Year)						
Year	Criteria Pollutant	Clamshell Dredge	Towing Tug-Dredge Operations	Tending Tug Dredge Operations	Crew Survey Boat	Total Emissions for Dredge Operations (Tons/Yr)
2025	NOx	14.74	36.72	17.10	3.10	71.66
	VOC	0.43	1.08	0.50	0.25	2.26
	CO	3.38	8.42	3.92	0.67	16.39
	SOx	0.01	0.02	0.01	0.00	0.04
	PM10	0.43	1.07	0.50	0.22	2.22
	PM2.5	0.42	1.04	0.48	0.21	2.15
	Lead	-	-	-	-	0.00
2026	NOx	14.74	36.72	17.10	3.10	71.66
	VOC	0.43	1.08	0.50	0.25	2.26
	CO	3.38	8.42	3.92	0.67	16.39
	SOx	0.01	0.02	0.01	0.00	0.04
	PM10	0.43	1.07	0.50	0.22	2.22
	PM2.5	0.42	1.04	0.48	0.21	2.15
	Lead	-	-	-	-	0.00
2027	NOx	14.74	36.72	17.10	3.10	71.66
	VOC	0.43	1.08	0.50	0.25	2.26
	CO	3.38	8.42	3.92	0.67	16.39
	SOx	0.01	0.02	0.01	0.00	0.04
	PM10	0.43	1.07	0.50	0.22	2.22
	PM2.5	0.42	1.04	0.48	0.21	2.15
	Lead	-	-	-	-	0.00

Table 5 depicts the criteria pollutant emissions for the major dredging equipment for the Seagirt Study. Because the operating hours were averaged over a 3-year period, the emissions for each proposed year are identical.

Table 6. Emissions from Mobilization and Demobilization for Seagirt Study

Mobilization/Demobilization Activities Emissions (Tons/Year)						
Year	**Criteria Pollutant**	**Towing Tug Mob-De-mob**	**Tending Tug Mob/De-mob**	**Crew Survey Boat Mob/De-mob**	**Hired Towing Tug Mob-De-mob**	**Total Emissions for Mob/De-mob Activities**
2025 (Mob)	NOx	1.63	1.03	0.35	3.65	6.66
	VOC	0.05	0.03	0.03	0.11	0.21
	CO	0.37	0.24	0.08	0.84	1.52
	SOx	0.00	0.00	0.00	0.00	0.00
	PM10	0.05	0.03	0.02	0.11	0.21
	PM2.5	0.05	0.03	0.02	0.10	0.20
	Lead	-	-	-	-	0.00
2026 (Mob/De-mob)	NOx	3.27	2.06	0.70	7.30	13.33
	VOC	0.10	0.06	0.06	0.21	0.43
	CO	0.75	0.47	0.15	1.67	3.04
	SOx	0.00	0.00	0.00	0.00	0.00
	PM10	0.10	0.06	0.05	0.21	0.42
	PM2.5	0.09	0.06	0.05	0.21	0.41
	Lead	-	-	-	-	0.00
2027 (De-mob)	NOx	1.63	1.03	0.35	3.65	6.66
	VOC	0.05	0.03	0.03	0.11	0.21
	CO	0.37	0.24	0.08	0.84	1.52
	SOx	0.00	0.00	0.00	0.00	0.00
	PM10	0.05	0.03	0.02	0.11	0.21
	PM2.5	0.05	0.03	0.02	0.10	0.20
	Lead	-	-	-	-	0.00

Table 6 depicts the criteria pollutant emissions for the mobilization and demobilization activities for the equipment as described by the client: mobilization in 2025, mobilization/demobilization (2026), and demobilization in 2027. Mobilization calculations include the set-up time hours and demobilization includes the take-down hours.

6. Mitigation Measures

The proposed dredging operations for the West Seagirt Branch Channel (2025-2027) will not exceed any of the emission thresholds for the criteria pollutants listed above for each year of the proposed project; therefore, no mitigation measures are required. Evaporative emissions from diesel engines are insignificant due to the low evaporation rate of diesel fuel.

7. References

(June 2020). *2015 -Hour Ozone NAAQS (0.070 ppm) Marginal Area State Implementation Plan for the Baltimore MD Nonattainment Area. SIP Number 20-8.* Maryland Department of the Environment.

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(April 2009). *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories; Final Report.* Washington, DC: US EPA.

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Gahagan and Bryant Associates, I. (2022). *Seagirt Feasibility Study-Air Conformity Package Memorandum.*

BALTIMORE HARBOR ANCHORAGES AND CHANNELS (BHAC) MODIFICATION OF SEAGIRT LOOP CHANNEL
FEASIBILITY STUDY

FINAL INTEGRATED FEASIBILITY REPORT & ENVIRONMENTAL ASSESSMENT

APPENDIX D1a:

EQUIPMENT SCHEDULE

JULY 2022

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Gahagan & Bryant Associates, Inc.
9008-O Yellow Brick Road
Baltimore, Maryland 21237
(410) 682-5595 Fax (410) 682-2175
info@gba-inc.com

ENGINEERS ★ SURVEYORS

MEMORANDUM

Date: May 18, 2022

To: Michelle Osborn

From: Lauren Folkert, E.I.T.

Cc: Megan O'Hara, Brian Newbury, P.E.

Re: Seagirt Feasibility Study – Air Conformity Equipment Package
Update to October 2021 Memo

INTRODUCTION

The Maryland Department of Transportation Maryland Port Administration (MDOT MPA) contracted Straughn Environmental Inc. (Straughn) to perform an air conformity assessment for the Environmental Assessment (EA) associated with the Baltimore Harbor Anchorages and Channels (BHAC) Modifications of Seagirt Loop Channel Study.

Ship simulations were performed at the U.S. Army Engineer Research and Development Center (ERDC) in April 2022. The proposed Seagirt West Access Channel (Seagirt West Loop) alignment was revised based on comments received during the ship simulations. Gahagan & Bryant Associates, Inc. (GBA) is providing an updated equipment package for the deepening and widening of the Seagirt West Loop to elevation -50 feet mean lower low water (MLLW) plus 2 feet of allowable pay overdepth (El. -50 + 2 ft. OD MLLW).

DREDGING/PLACEMENT EMISSIONS: SEAGIRT WEST LOOP

The Seagirt West Loop fuel combustion-based emissions are estimated from mobilization, dredging and transport of dredged material, and demobilization of dredging equipment and support vessels. These activities and associated emissions are predicted to occur in two (2) Phases between 2025 and 2027.

Based on discussions with the Maryland Environmental Service (MES), maintenance dredging has been accounted for, so only new work dredging is considered for this analysis. Table 1 below summarizes the estimated new work material and maintenance material quantities required to deepen and widen the Seagirt West Loop channel to El. -50 + 2 ft. OD MLLW with 5H:1V side slopes.

Table 1: Seagirt West Loop Volumes

MAINTENANCE[1]	NEW WORK	TOTAL[2]
105,700 CY	1,836,500 CY	1,942,200 CY

1) *The Seagirt West Access Channel was dredged to El. -45 + 2 ft. OD MLLW in 2007. Incremental volumes were calculated based on GBA 2021/2022 conditional survey data and the GBA 2007 after dredge survey data. The difference between volumes for the El. -47 ft. MLLW template (2007 overdepth template) is assumed to be maintenance material.*
2) *Total volume to dredge existing channel and proposed wideners to El. -50 + 2 ft. OD' MLLW with 5H:1V side slopes.*

To estimate the emissions associated with deepening and widening the Seagirt West Loop, it is estimated that a total of 1,836,500 cubic yards (CY) of new work material will need to be dredged. Dredging will need to be spread out over a minimum of two (2) inflows due to capacity restraints.

For this analysis, it is assumed the dredging will be performed in two (2) phases with the following assumptions:

- **Phase 1: 918,250 CY dredged in 2025/2026**
  - Assume one clamshell mechanical dredge (26 CY bucket)
  - Production of 12,300 CY/day
  - Approximately 75 workdays
- **Phase 2: 918,250 CY dredged in 2026/2027**
  - Assume one clamshell mechanical dredge (26 CY bucket)
  - Production of 12,300 CY/day
  - Approximately 75 workdays

Table 2 below summarizes the dredging equipment expected to be used for the Seagirt West Loop dredging operations.

Table 2: Seagirt West Loop Dredging Equipment and Operation Information

EQUIPMENT[1]	ENGINE POWER (HP)		AVG. OPERATION (HRS/DAY)	PHASE I ANNUAL OPERATION (HRS/YEAR)	PHASE 2 ANNUAL OPERATION (HRS/YEAR)
	MAIN ENGINE(S)	AUX. ENGINE(S)			
Clamshell Mechanical Dredge	2,340		15	1,125	1,125
Towing Tug	3,500	200	24	1,800	1,800
Tending Tug	2,200	175	24	1,800	1,800
Crew/Survey Boats	500		16	1,200	1,200

(1) Assume one (1) unit of each piece of equipment is used for daily dredging operations.

Emissions are also estimated from mobilization/demobilization of dredging equipment. Note that emission calculations for mobilization and demobilization account for vessels travel within Maryland waters. It is about 100 miles between the Maryland/Virginia line and the project area.

Table 3 on the next page summarizes the mobilization/demobilization equipment for a single mobilization/demobilization event. Mobilization and demobilization will be required for each phase of dredging, so further assessments should assume there will be one (1) mobilization/demobilization in 2025/2026 and one (1) mobilization/demobilization in 2026/2027.

Table 3: Mobilization/Demobilization of Equipment

VESSEL TYPE	ENGINE POWER (HP)		AVERAGE HOURS OF OPERATION BY STAGE			
	MAIN ENGINE(S)	AUX. ENGINE(S)	MOB (MD/VA LINE TO SMT)[2,3]	SET-UP	TAKEDOWN	DEMOB (SMT TO MD/VA LINE)[2,3]
Towing Tug	3,500	200	17.4	36.0	36.0	17.4
Hired Towing Tug (1)	3,500	200	29.8			29.8
Hired Towing Tug (2)	3,500	200	29.8			29.8
Hired Towing Tug (3)	3,500	200	29.8			29.8
Hired Towing Tug (4)	3,500	200	29.8			29.8
Tending Tug	2,200	175	12.4	60.0	60.0	12.4
Crew/Survey Boat	500		30.0	60.0	60.0	30.0

(1) Equipment in tow are classified as dead ship and are not burning fuel.
(2) Towing tug hours for mobilization/demobilization represent time taken to travel distance (100 miles) from the Maryland/Virginia line to the project site.
(3) Towing tugs travel more slowly (5 knots) while towing equipment, and more quickly (7 knots) when leaving the project with no equipment.

BALTIMORE HARBOR ANCHORAGES AND CHANNELS (BHAC) MODIFICATION OF SEAGIRT LOOP CHANNEL FEASIBILITY STUDY

FINAL INTEGRATED FEASIBILITY REPORT & ENVIRONMENTAL ASSESSMENT

APPENDIX D2:

GREENHOUSE GAS EMISSIONS CALCULATIONS

JULY 2022

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Work Component	**TONS CO_2**
Mobilization/Demobilization	1,247
Mechanical Dredging and Transport of Material	10,127
Clamshell Dredge	2,155
Tending Tug	2,425
Towing Tug	5,207
Crew boat / Survey Boat	340
Total	**11,374**

1) See Sheet 2 for the assumptions used to calculate the CO_2 emissions for each work component.

Schedule-months of work per year

		2025	**2026**	**2027**
Mechanical Dredge	cubic yards	**Yr 1**	**Yr 2**	**Yr 3**
Total Months	6	2	2	2
Volume:	1,836,500			

1) Dredging planned to be completed in two (2) phases spread over three (3) years, so that project emissions do not exceed annual thresholds.

2) Project duration assumes a total volume of 1,836,500 cy of new work material and a production rate of 12,300 cy/day.

Tons emissions per year

		2025	**2026**	**2027**
Mechanical Dredge	% of cubic yards	**Yr 1**	**Yr 2**	**Yr 3**
	100%	3,791	3,791	3,791
Annual totals (tons per year)		**3,791**	**3,791**	**3,791**

Table 1: Seagirt West Loop Dredging Equipment GHG Emissions

Marine Equipment	Engine	Horsepower (approx.) (hp)	Load Factor[1]	Hours/Day (hr)	Days[2] (days)	Hours (hr)	Horsepower Hours (hphrs)	Grams per hphr[3,4] CO_2	Tons[5] CO_2
Clamshell Dredge	Total Installed	2,340	0.70	15	150	2,250	3,685,500	531	2,155
Tending Tug	Main	2,200	0.50	24	150	3,600	3,960,000	515	2,246
	Auxiliary	175	0.50	24	150	3,600	315,000	515	179
Towing Tug	Main	3,500	0.70	24	150	3,600	8,820,000	515	5,003
	Auxiliary	200	0.50	24	150	3,600	360,000	515	204
Crew/Survey Boat	Main	500	0.50	16	150	2,400	600,000	515	340
						Total	**17,740,500**		**10,127**

1) Load factors based on what was used in the Air Conformity Emissions calculations [modified 5/31/22].
2) Days assume a total volume of 1,836,500 cy of new work material and a production rate of 12,300 cy/day.
3) CO_2 Emission Factors for the dredge based on EPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories (April 2009) Table 4-9: Calculated Emission Factors for Nonroad Engines.
4) CO_2 Emission Factors for the tending tug, towing tug, and crew boat based on EPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories (April 2009) Table 3-8: Harbor Craft Emission Factors
5) GHG emissions are calculated based on guidance from the EPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories (April 2009).

Table 2: Seagirt West Loop Mobilization / Demobilization Marine Vessel GHG Emissions

Marine Equipment	Engine	Horsepower (approx.) (hp)	Load Factor[1]	Hours/Mobilization[2] (hr)	Total Hours[3] (hr)	Horsepower Hours (hphrs)	Grams per hphr[4] CO_2	Tons[5] CO_2
Tending Tug	Main	2,200	0.50	144.8	289.6	318,560	515	181
	Auxiliary	175	0.50	144.8	289.6	25,340	515	14
Towing Tug	Main	3,500	0.70	106.8	213.6	523,320	515	297
	Auxiliary	200	0.50	106.8	213.6	21,360	515	12
Hired Towing Tug (1)	Main	3,500	0.70	59.6	119.2	292,040	515	166
	Auxiliary	200	0.50	59.6	119.2	11,920	515	7
Hired Towing Tug (2)	Main	3,500	0.70	59.6	119.2	292,040	515	166
	Auxiliary	200	0.50	59.6	119.2	11,920	515	7
Hired Towing Tug (3)	Main	3,500	0.70	59.6	119.2	292,040	515	166
	Auxiliary	200	0.50	59.6	119.2	11,920	515	7
Hired Towing Tug (4)	Main	3,500	0.70	59.6	119.2	292,040	515	166
	Auxiliary	200	0.50	59.6	119.2	11,920	515	7
Crew/Survey Boat	Main	500	0.50	180	360	90,000	515	51
					Total	**2,194,420**		**1,247**

1) Load factors based on what was used in the Air Conformity Emissions calculations [modified 5/31/22].
2) See Table 3 for mobilization/demobilization equipment hour details.
3) Equipment hours assume two (2) mobilization/demobilization events.
4) CO_2 Emission Factors for the tending tug, towing tugs, and crew boat based on EPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories (April 2009) Table 3-8: Harbor Craft Emission Factors
5) GHG emissions are calculated based on guidance from the EPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories (April 2009).

Table 3: Seagirt West Loop Mobilization / Demobilization Marine Vessel Equipment Hours

Vessel Type	Engine Power (hp)		Average Hours of Operation by Stage			
	Main Engine(s)	Aux.Engine(s)	Mobilization (MD/VA Line to SMT)	Set-Up	Takedown	Demobilization (SMT to MD/VA Line)
Tending Tug	2,200	175	12.4	60	60	12.4
Towing Tug	3,500	200	17.4	36.0	36.0	17.4
Hired Towing Tug (1)	3,500	200	29.8			29.8
Hired Towing Tug (2)	3,500	200	29.8			29.8
Hired Towing Tug (3)	3,500	200	29.8			29.8
Hired Towing Tug (4)	3,500	200	29.8			29.8
Crew/Survey Boat	500		30	60	60	30

1) Equipment in tow are classified as dead ship and are not burning fuel.
2) Towing tug hours for mobilization and demobilization represent time taken to travel the distance (100 miles) from the Maryland/Virginia line to the project site.
3) Towing tug travels more slowly (5 knots) while towing equipment, and more quickly (7 knots) when leaving the project with no equipment.