DEEPWATER PORT LICENSE APPLICATION FOR THE BLUEWATER SPM PROJECT

VOLUME II – ENVIRONMENTAL EVALUATION

Section 13 – Meteorology, Air Quality, and Noise

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LIST OF ACRONYMS

AIS	Automatic Identification System
AQCR's	Air quality control regions
µPa	Micro Pascals
BACT	Best available control technology
BWTT	Bluewater Texas Terminal LLC
CFR	Code of Federal Regulations
CWA	Clean Water Act of 1977
CZMA	Coastal Zone Management Act of 1972
dB	decibels
dBA	decibels on the A-weighted scale
DWPA	Deepwater Port Act
DWPL	Deepwater Port License
ECA	Emission Control Area
EEZ	Exclusive Economic Zone
E.O.	Executive Order
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FIP	Federal implementation plan
FR	Federal Register
ft	feet
GHG	Greenhouse gas
GOLA	Galveston Offshore Lightering Area
GOM	Gulf of Mexico
HAP	Hazardoes air pollutant
HDD	horizontal directional drill
HUD	U.S. Department of Housing and Urban Development
Hz	hertz
km	kilometer
L_{dn}	day-night sound level
LEDPA	Least Environmentally Damaging Practicable Alternative
MACT	Maximum achievable control technology
MARAD	Maritime Administration
m	meter
m/s	meters per second
MHT	mean high tide
mi	mile
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NES	National Emission Standards
NOAA	National Oceanic and Atmospheric Administration
NO_x	Nitrogen oxides
NSA	noise sensitive area

NSPS	New Source Performance Standards
NSR	New source review
°F	degrees Fahrenheit
OSHA	Occupational Safety and Health Administration
PBR	Permit By Rule
P.L.	Public Law
PLEM	pipeline end manifold
PM	Particulate Mater
PPA	Pollution Prevention Act of 1990
PSD	Prevention of significatn deterioration
Project	Bluewater SPM Project
RHA	U.S. Rivers and Harbors Act of 1899
SIL	Significant impact levels
SIP	State Implementation Plan
SPM	single point mooring
TCEQ	Texas Commission on Environmental Quality
TWDB	Texas Water Development Board
U.S.	United States
U.S.C.	United States Code
U.S.C.G.	United States Coast Guard
USEPA	U.S. Environmental Protection Agency
VLCC	very large crude carrier
VOC	Volatile Organic Carbon

13 Meteorology, Air Quality, and Noise

This section discusses the existing meteorology, air quality, and noise conditions within the vicinity of the Proposed Project and the Alternative Project, and the anticipated environmental impacts associated with the construction, operation, and decommissioning of the Proposed Project and the Alternative Project. The detailed description of the Proposed and Alternative Project and the framework for the evaluation of environmental impacts is provided in Section 3: Project Description and Framework for Environmental Evaluation.

13.1 Applicable Laws and Regulations

Bluewater Texas Terminal, LLC (BWTT) has reviewed the following laws and statutes that relate to air quality and noise impacts and provided a list of applicable regulations required to comply with the Deepwater Port Act (DWPA) during construction and operation of the Proposed Project. Applicable laws and regulations are described below.

13.1.1 State and Local

13.1.1.1 Noise

The Onshore and Inshore Pipelines are largely in unincorporated areas of San Patricio and Aransas counties; however some portions lie within the boundaries of the City of Port Aransas, Texas and the City of Aransas Pass, Texas. The City of Port Aransas does not have numerical criteria for sound levels; however, sound from construction equipment which "disturb the comfort and repose of a person of ordinary sensibilities produced from tools and equipment in commercial construction, demolition, drilling, or reasonably similar activities" is considered a nuisance except between the hours of 6:00 a.m. to 7:00 p.m., Monday through Saturday, and 8:00 a.m. to 5:00 p.m. on Sunday.

The City of Aransas Pass has a general noise ordinance to protect from domestic disturbances of the peace; however, it does not contain specific provisions for construction or facility noise and is not applicable to the Project. No other applicable state and/or local noise ordinances are applicable to the Project.

The Alternative Onshore and Inshore Pipelines will not be within the boundaries of the Cities of Port Aransas and Aransas Pass; however, the Alternative Onshore Pipelines will be within the boundaries of the City of Ingleside and the Alternative Inshore Pipelines will be within the City of Corpus Christi on Mustang Island.

Ingleside has established a noise ordinance limiting noise that extends beyond the property on which it is produced (Ingleside code of Ordinances, Chapter 30, Article IV – Noise). Noise limits, by land use type, are:

- On residential land, 70 decibels (dB) between 6:00 a.m. and 6:00 p.m., 65 dB between 6:00 p.m. and 10:00 p.m., and 60 dB between 10:00 p.m. and 6:00 a.m.
- On other land use types, including industrial land, 85 dB between 6:00 a.m. and 10:00 p.m., and 80 dB between 10:00 p.m. and 6:00 a.m.

However, construction noise occurring between the hours of 6:00 a.m. and 10:00 p.m. is exempted from the above ordinance.

Similarly, Corpus Christi has established a noise ordinance limiting noise that extends beyond the property on which it is produced (Corpus Christi Code of Ordinances, Chapter 31 – Noise). Noise limits are:

- 70 decibels on the A-weighted scale (dBA) between the hours of 8:01 a.m. and 11:00 p.m. Sunday through Thursday and between the hours of 7:01 a.m. and 12:00 midnight on Friday and Saturday; and
- 60 dBA between the hours of 11:01 p.m. and 8:00 a.m. Sunday through Thursday and between the hours of 12:01 a.m. and 7:00 a.m. on Friday and Saturday and between the hours of 12:01 a.m. and 8:00 a.m. on Sunday.

However, construction noise occurring between the hours of 7:00 a.m. and 8:00 p.m. is exempted from the above ordinance.

13.1.2 Federal and International

13.1.2.1 National Environmental Policy Act of 1969 (NEPA)

In compliance with 33 U.S.C. 1504(f) and 33 Code of Federal Regulations (CFR) 148.710(b), the BWTT Deepwater Port License (DWPL) will be processed in accordance with the NEPA (44 U.S.C. 4332). 33 U.S.C. 1504(f) states that "such compliance shall fulfill the requirement of all Federal agencies in carrying out their responsibilities under the National Environmental Policy Act of 1969 pursuant to [the Deepwater Port Act of 1974]." The process by which the licensing will comply with NEPA is further set in 33 U.S.C. 1504(f) and 33 CFR Part 148.

13.1.2.2 Noise Laws and Regulations

Noise Pollution and Abatement Act of 1972 is a statute of the United States (U.S.) initiating a federal program of regulating noise pollution with the intent of protecting human health and minimizing annoyance of noise to the general public. However, this program lost funding in 1981. Currently, there are no federal regulations that limit overall environmental noise levels. However, in 1974 the U.S. Environmental Protection Agency (USEPA) published its Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, which provides a resource for state and local governments to use in developing noise standards. The USEPA determined that a day-night sound level (L_{dn}) of 55 decibels dBA (which is equivalent to a continuous sound level of 48.6 dBA) protects the public from indoor and outdoor activity noise interference (USEPA 1974). In addition, the U.S. Department of Housing and Urban Development (HUD) has developed a noise abatement and control policy applicable to HUD programs codified in 24 CFR Part 51. Consistent with USEPA's guidance, it is a HUD goal that exterior noise levels not exceed 55 dBA L_{dn}. However, according to HUD policy, noise at or below 65 dBA is acceptable, noise between 65 and 75 dBA is generally acceptable, and noise exceeding 75 dBA is unacceptable at a given site.

In addition to public health and welfare, airborne noise from operation of the Project can affect the operational workforce. The Occupational Safety and Health Administration (OSHA) has established a requirement that sound levels should be controlled to a time-weighted sound level of 85 dBA; if that is not met, a worker hearing conservation program must be implemented (29 CFR 1910.95).

13.1.2.3 Clean Air Act

The Clean Air Act (42 USC § 7401 et seq.) is a comprehensive law whose purpose is to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population. The Clean Air Act requires USEPA to set uniform National Ambient Air Quality Standards (NAAQS) for air pollutants which cause or contribute to air pollution reasonably anticipated to endanger public health or welfare, and which are emitted from numerous and diverse mobile or stationary sources (42 USC § 7408).

USEPA establishes air quality control regions (AQCR's) and classifies them according to whether they have attained the NAAQS for each listed pollutant ("criteria pollutants"). Attainment and maintenance of the NAAQS in each AQCR is primarily the responsibility of the states, and each state is required to submit a state implementation plan (SIP) for approval by EPA. For areas not belonging to a state or for which a state has failed to submit an adequate SIP, EPA promulgates a federal implementation plan (FIP).

SIP's and FIP's include control measures for individual stationary sources and specific classes of stationary sources, and also include preconstruction permitting programs which allow for USEPA and state pollution control agencies to supervise the construction of new sources of air pollutant emissions. Stationary source preconstruction permitting programs include two nationwide programs: Prevention of Significant Deterioration (PSD), which applies for pollutants for which an AQCR has attained the NAAQS; and Nonattainment New Source Review (NNSR), which applies for pollutants for which an AQCR has not attained the NAAQS. Additionally, a "minor NSR" preconstruction permitting program is included as part of each SIP or FIP, whose provisions can vary in different parts of the country. While enforcement of SIP requirements is the primary responsibility of the states, USEPA has authority under the Clean Air Act to enforce specific requirements of a SIP against a source owner.

In additional to SIP and FIP requirements (including preconstruction permitting), the Clean Air Act requires USEPA to establish uniform nationwide emissions standards for stationary sources under two different programs: New Source Performance Standards (NSPS) apply to specific categories of new and modified sources of air pollutant emissions; and National Emissions Standards for Hazardous Air Pollutants (NESHAP) apply to new and existing sources of named hazardous air pollutants (HAP). Major stationary sources are also required to obtain a Clean Air Act operating permit ("Title V permit") which identifies all applicable requirements under the Clean Air Act, including emissions sources from mobile sources (e.g., automobiles, locomotives, construction equipment, and marine vessels) which are also subject to emission standards established by USEPA under Title II of the Clean Air Act. These standards generally apply to the manufacturers and importers of vehicle engines. States, with the exception of California, are not permitted to establish mobile source emission standards (42 USC § 7543). In addition to authority granted under the Clean Air Act, USEPA has authority under the Act to Prevent Pollution from Ships (APPS; 33 USC §§ 1905–1915) to regulate air emissions from marine vessels, consistent with the requirements of Annex VI to the International Convention for the Prevention of Pollution from Ships ("MARPOL Annex VI").

MARAD regulations implementing the DWP Act require an analysis showing that the deepwater port will comply with all applicable Federal, tribal, and State requirements for the protection of the environment (33 CFR § 148.105(z)), and also require that an applicant prepare and submit applications to USEPA for all permits required under the Clean Air Act (33 CFR § 148.700). EPA is a cooperating agency under the DWP licensing program (33 CFR § 148.3(d)).

Clean Air Act requirements potentially applicable to the Project are summarized in further detail below. Air emissions from subsea pipelines are not expected, and the discussion relating to Air Quality in this Section relates primarily to the SPM buoys, and to a lesser extent to the Harbor Island Booster Station.

13.1.2.3.1 NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

NAAQS have been established for six criteria pollutants (40 CFR §§ 50.4–50.19). Primary NAAQS are summarized in Table 13-1, along with the corresponding Significant Impact Levels (SIL) for each pollutant (40 CFR § 51.165 (b)(2)). SIL's for the 1-hr NO_2 and SO_2 standards and for Ozone have been issued on an interim basis, no SIL has been issued for Lead.. Secondary NAAQS, which are of equal or lesser stringency than the primary NAAQS, are not presented here. USEPA has established SIL's for criteria pollutant as screening tools for determining whether the impact of a particular stationary source could reasonably cause or contribute to any NAAQS violation.

Table 13-1: Primary NAAQS and USEPA SIL's

Pollutant	Averaging Period	SIL	NAAQS
Carbon Monoxide (CO)	1-hr	2 mg/m^3	35 ppm
	8-hr	0.5 mg/m^3	9 ppm
Lead	3-month	—	0.15 µg/m^3
Nitrogen Dioxide (NO_2)	1-hr	4 ppb	100 ppb
	1-yr	1.0 µg/m^3	53 ppb

Pollutant	Averaging Period	SIL	NAAQS
Ozone	8-hr	1.0 ppb	70 ppb
Particulate Matter	24-hr (PM_{10})	5 µg/m^3	150 µg/m^3
	24-hr ($PM_{2.5}$)	1.2 µg/m^3	35 µg/m^3
	1-yr ($PM_{2.5}$)	0.2 µg/m^3	12 µg/m^3
Sulfur Dioxide (SO_2)	1-hr	3 ppb	75 ppb

Activities associated with the SPM buoys (crude oil loading) will emit Volatile Organic Compounds, which are a precursor to Ozone. Mobile sources associated with the SPM buoys (crude oil tankers, tugboats and workboats) will emit products of combustion, which include CO, oxides of nitrogen (NO_X),[1] particulate matter[2] and SO_2. Criteria pollutants other than lead will be emitted from stationary sources at the Harbor Island Booster Station (storage tanks, wastewater treatment, and stationary engines).

13.1.2.3.2 NEW SOURCE PERFORMANCE STANDARDS (NSPS)

NSPS are established by EPA for categories of stationary sources that cause or contribute significantly to air pollution which may reasonably be anticipated to endanger public health or welfare (42 USC § 7411(b)). Currently promulgated NSPS are codified at 40 CFR Part 60. NSPS apply to new and modified sources, and are set based on the best system of emission reduction for reducing air emissions from the source category, based on technology that has been adequately demonstrated.

No currently promulgated NSPS applies to the SPM buoys.

NSPS associated with the Harbor Island Booster Station apply to Organic Liquid Storage Vessels (40 CFR Part 60, Subpart K) and Stationary Compression Ignition Internal Combustion Engines (i.e., diesel engines; 40 CFR Part 60, Subpart IIII).

13.1.2.3.3 NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)

NESHAP apply to sources emitting a limited set of specifically named pollutants (e.g., vinyl chloride, mercury, benzene), and apply more generally to "major" stationary sources of HAP emissions. A stationary source is "major" if it has the potential to emit at least 10 tons per year of any individual HAP, or 25 tons per year of any combination of HAP. NESHAP for specific source categories are codified at 40 CFR Part 63.

Neither the SPM buoys nor the Harbor Island Booster Station correspond to any listed source subject to a NESHAP standard. Notwithstanding, however, new and reconstructed major sources of HAP which are not subject to a promulgated NESHAP must obtain a case-by-case Maximum Achievable Control Technology (MACT) determination prior to beginning actual construction on the source (40 CFR § 63.42(c)). The SPM buoys will constitute a major source of HAP and are required to obtain case-by-case approval. Accordingly, BWTT has filed with EPA a request for

[1] Ambient NO_2 levels result from direct emissions of NO_2 as well as NO_2 formed through secondary reaction of other oxides of nitrogen in the atmosphere. NO_2 impacts caused by a source are therefore customarily assessed in terms of the source's total NO_X emissions. NO_X is also a precursor to ozone formation.

[2] NAAQS for particulate matter may refer either to particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}; "inhalable particulate"), or to particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$; "fine particulate").

a case-by-case MACT determination (Volume I). BWTT has proposed as MACT a requirement to limit use of the terminal to vessels compliant with USCG submerged fill standards and with MARPOL Annex VI VOC Management Plan requirements.

13.1.2.3.4 PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

PSD permitting applies to the construction of new "major" stationary sources. A stationary source is "major" for PSD purposes if it has the potential to emit 250 tons per year of any regulated pollutant.[3] A PSD permit must be obtained by a source owner prior to beginning actual construction. In order to be issued a PSD permit, a source owner must apply the Best Available Control Technology (BACT) to the new or modified source. The source owner must additionally perform an analysis on the air quality impacts of the proposed source which shows that the source will not cause a violation of any NAAQS standard or any PSD increment. PSD increments (40 CFR § 52.21(c)) are air quality standards similar to the NAAQS which are intended to prevent the degradation of air quality in areas which are in attainment for a NAAQS pollutant. The required BACT and air quality analysis requirements apply to each pollutant that a new or modified major source would emit in significant amounts. In the case of Greenhouse Gases (GHG), however, the scope of PSD review is limited to BACT (EPA 2014).

The SPM buoys would constitute a new major stationary source for PSD purposes, and will emit VOC and Greenhouse Gases (GHG) in significant amounts. BWTT has filed a PSD permit application to EPA (Volume I) which includes an air quality analysis and a control technology review establishing a proposed BACT consistent with the proposed MACT standard.

13.1.2.3.5 NONATTAINMENT NEW SOURCE REVIEW (NNSR)

NNSR applies to construction and modification of stationary sources which have the potential to emit "major" amounts of a pollutant for which an area is classified as nonattainment. Since the portion of the Outer Continental Shelf where the SPM buoys will locate has not been designated as an AQCR, and emissions from the project will not impact any nonattainment area, NNSR does not apply.

13.1.2.3.6 STATE IMPLEMENTATION PLAN (SIP)

The SPM buoys will be located outside the jurisdictional waters of the State of Texas, and will therefore not be directly subject to any SIP requirements. Notwithstanding, the Deepwater Port Act specifies that the law of the nearest adjacent coastal state applies to a deepwater port, to the extent applicable and not inconsistent with any applicable Federal law or regulation (33 USC § 1518(b)).

The relevant state law in this context is the Texas Clean Air Act (TEXAS HEALTH AND SAFETY CODE, Chapter 382), which requires in relevant part that a preconstruction permit be obtained prior to beginning work on the construction of a new "facility."[4] In order to obtain a preconstruction permit, the Texas Commission on Environmental Quality (TCEQ) must find that the proposed facility will use at least the best available control technology (BACT), and also must find no indication that emissions from the facility will contravene the intent of the Texas Clean Air Act (i.e., "*to safeguard the state's air resources from pollution by controlling or abating air pollution and emissions of air contaminants, consistent with the protection of public health, general welfare, and physical property, including the esthetic enjoyment of air resources by the public and the maintenance of adequate visibility*") (TEXAS HEALTH AND SAFETY CODE §§ 382.002, 382.0518(b)). The BACT demonstration that would be required by TCEQ, if the project were under its jurisdiction, is similar to the required PSD control technology review discussed above. The showing of acceptable impacts to public health, welfare and property required by the Texas Clean Air Act is included in the modeling reports whose results are summarized below.

[3] A lower threshold of 100 tpy applies to specifically listed source categories (40 CFR § 52.21(b)(1)).

[4] "Facility" in Texas Clean Air Act permitting generally corresponds to the EPA term "emissions unit" (40 CFR § 52.21(b)(7)).

The Harbor Island Booster Station is subject to certain elements of the Texas SIP (40 CFR § 52.2270).

The Texas SIP requires that all new and modified stationary sources obtain an authorization prior to beginning actual constructions (30 TAC § 116.110). In the case of sources that do not significantly contribute air contaminants to the atmosphere, such as the Harbor Island Booster Station, a Permit by Rule (PBR) may be obtained pursuant to applicable requirements of 30 TAC Chapter 106. A PBR is a streamlined form of air permitting authorization which contains generic control requirements and emission rate limits, and does not require case-by-case evaluation. BWTT will register a claim for a PBR for air emissions from the Harbor Island Booster Station (Volume I).

Storage tanks and wastewater treatment equipment are subject to control requirements at 30 TAC Chapter 115, Subchapter B. These requirements are generally consistent with otherwise applicable requirements of the PBR that must be obtained.

13.1.2.3.7 TITLE V OPERATING PERMIT

For areas of the country where the applicable SIP does not contain an approved operating permit program, the owner of a stationary source subject to Title V of the Clean Air Act must obtain a federal operating permit from EPA (40 CFR § 71.1(b)). Title V permits are generally required for stationary sources which are "major" for the purposes of the NESHAP, PSD, and/or NNSR programs. An operating permit must specify all applicable requirements of the Clean Air Act (including SIP requirements) that apply to the source, as well as monitoring, reporting and recordkeeping requirements adequate to demonstrate compliance with each applicable requirement.

Since the SPM buoys will constitute a major stationary source for purposes of NESHAP and PSD, an operating permit must be required. The SPM buoys will be located beyond the jurisdictional waters of Texas. Accordingly, BWTT has filed an application for a federal operating permit (Volume I).

The Harbor Island Booster Station will not be a major source and will not otherwise be subject to Title V permitting requirements.

13.1.2.3.8 MOBILE SOURCE EMISSIONS STANDARDS

The APPS requires engine manufacturers, owners and operators of vessels, and other persons to comply with MARPOL Annex VI. APPS applies to all U.S.-flagged ships anywhere in the world and to all foreign-flagged vessels operating in navigable waters of the United States or while at port under U.S. jurisdiction. Regulations promulgated by EPA[5] are generally consistent with MARPOL Annex VI requirements discussed elsewhere in this section.

MARPOL Annex VI requirements will apply to ships operating in the area of the SPM buoys, including oil tankers and support vessels. These requirements generally apply to manufacturers, sellers, and importers of marine vessels and marine engines, as well as to the owners and operators of marine vessels.

13.1.2.3.9 MANDATORY GREENHOUSE GAS REPORTING RULE

Under the Consolidated Appropriations Act of 2008 (P.L. 110–161), EPA authorized funding to develop a rule requiring mandatory reporting of greenhouse gas (GHG) emissions above appropriate thresholds. EPA has authority under sections 114 and 208 of the Clean Air Act (42 USC §§ 7414, 7542) to collect information about sources of air pollution,[6] and has issued implementing regulations at 40 CFR Part 98.

Mandatory Greenhouse Gas Reporting requirements do not apply to the SPM Buoys or to the Harbor Island Booster Station because they do not belong to any of the categories of source required to report GHG emissions.

[5] Cf. 75 FR 22896; April 30, 2010.

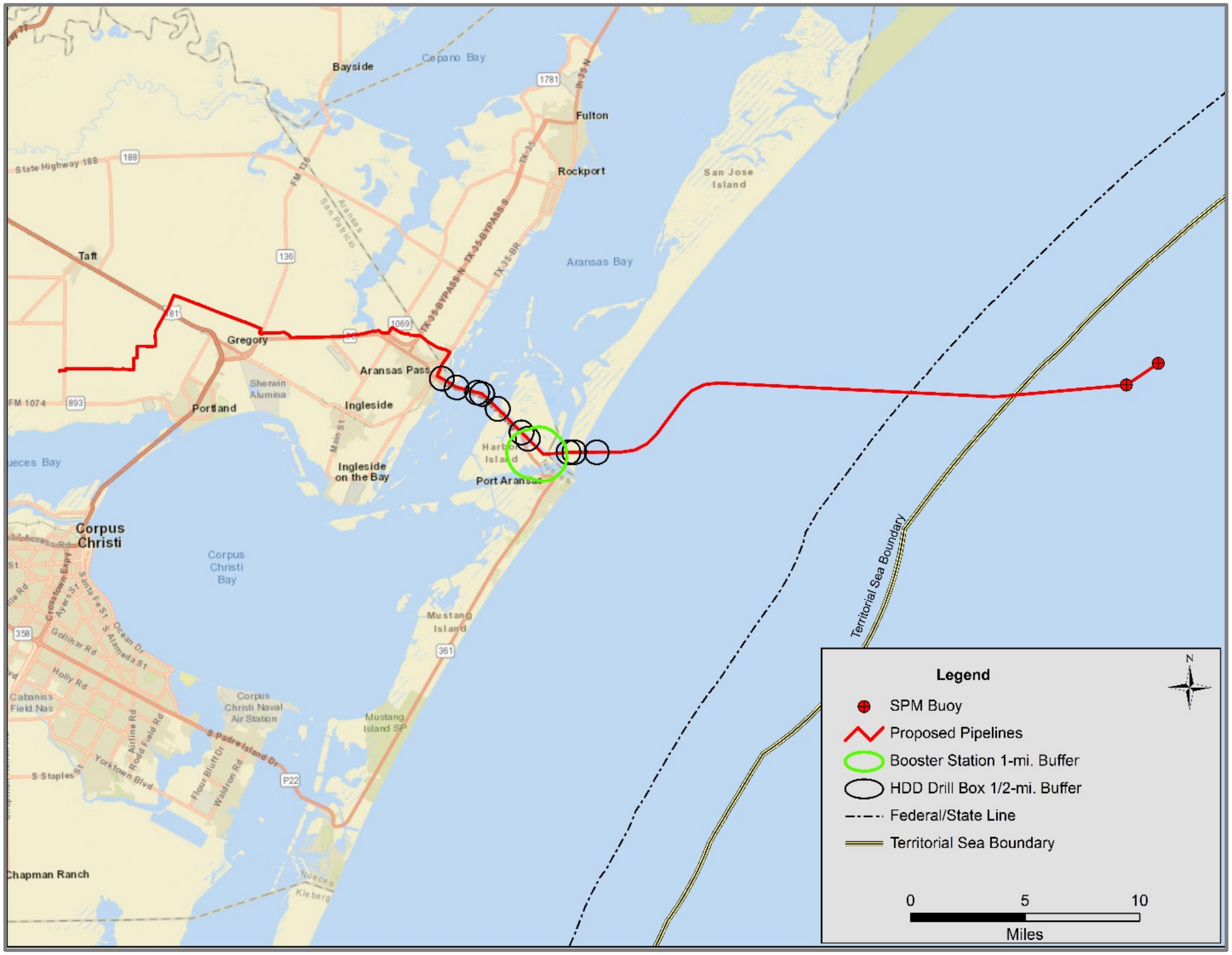
[6] 74 FR 56264; October 30, 2009.

13.2 Proposed Project

13.2.1 Proposed Project Area

The Proposed Project area considered for ambient sound and noise impacts includes noise sensitive areas (NSA) within 0.5 mile (mi) of planned horizontal directional drill (HDD) construction and within 1 mi of the Harbor Island Booster Station, as well as other potential noise receptors in the immediate vicinity of the Onshore Pipelines, Inshore Pipelines, Offshore Pipelines, and both SPM buoys (which make up the SPM buoy systems). The Proposed Project area is depicted in Figure 13-1. Underwater sound is addressed in Section 8: Wildlife and Protected Resources.

Figure 13-1: Proposed Project Area, Noise Analysis



Source: BOEM 2019

The Proposed Project area analyzed for impacts to air quality includes the onshore vicinity of the Proposed Project components as well as the surrounding western Gulf of Mexico including existing oil and gas operations. Texas counties in the vicinity of the Proposed Project include Kenedy, Kleberg, Nueces, San Patricio, Aransas and Refugio. The Proposed Project Area for air emissions that occur from current, prevailing means of conducting crude oil export activities, which rely on the use of shuttle tankers for long-haul voyages includes the greater Gulf of Mexico region where these vessels currently transit. Existing Air Quality conditions are characterized in two ways. First, data from onshore, regulatory air quality monitors are presented, showing compliance with the NAAQS. Second, emission rates of VOC and NO_X associated with existing offshore crude oil loading operations are estimated.

13.2.2 Proposed Project Area Existing Conditions

13.2.2.1 Climatology/Meteorology

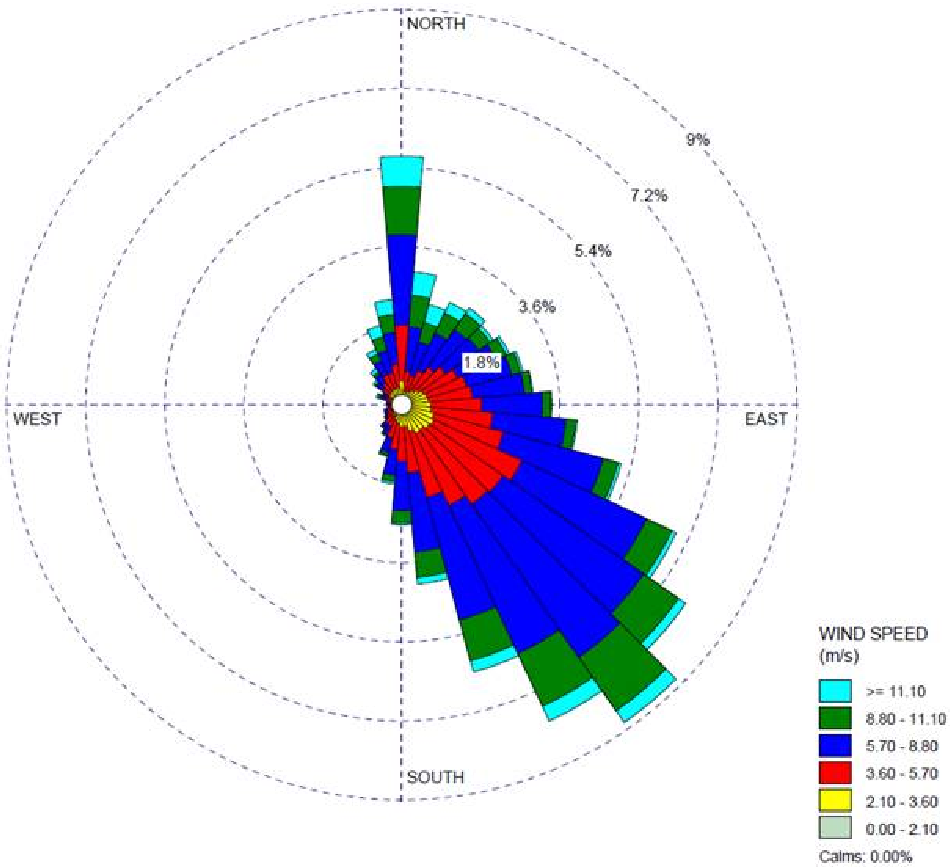
The Proposed Project area in southeastern Texas has a humid, subtropical climate, where summers are long and hot, and winters are short and mild. Along the southeastern Texas coast and offshore, climate is influenced by the GOM, which moderates seasonal temperatures along the coast and provides the state's major source of precipitation (Texas Water Development Board [TWDB] 2012). As shown in Table 13-2, the average annual temperature for the Onshore Project area is about 73 degrees Fahrenheit (°F). January is the coldest month of the year with an average temperature of 57°F. August is the hottest month of the year with an average temperature of about 85°F. September is typically the wettest month. The precipitation of southeastern Texas occurs primarily in spring and fall (see Table 13-2). The area's total average rainfall amount is about 35 inches a year. (National Oceanic and Atmospheric Administration [NOAA] 2019).

Table 13-2: Baseline Climate Data (1981 to 2010) for Port Aransas, TX

Month	Precipitation (Inches)	Minimum Temperature (°F)	Average Temperature (°F)	Maximum Temperature (°F)
January	2.21	50.6	56.6	62.6
February	2.53	53.5	59.3	65.1
March	2.39	59.4	65.0	70.7
April	2.03	66.6	71.8	77.0
May	3.55	73.7	78.4	83.2
June	2.76	78.4	83.1	87.8
July	2.63	79.5	84.3	89.2
August	2.14	80.0	85.1	90.1
September	5.70	76.8	82.2	87.6
October	4.29	70.7	76.3	82.0
November	2.86	61.6	67.7	73.7
December	1.66	52.6	59.0	65.5
Source: NOAA 2019.				

The prevailing wind direction within the vicinity of the Project is from the southeast (Figure 13-2). During the summer, thunderstorms are common along breezes from the GOM or resulting from tropical and subtropical disturbances (TWDB 2012). The southeastern coastal region of Texas can be affected by tropical cyclones, including hurricanes that originate in or move through the GOM. Recent major tropical cyclones that have hit the Project area include Hurricane Harvey (2017), Hurricane Ike (2008), and Hurricane Bret (1999) (National Weather Service 2019). On average, along any 50-mi-long segment of the Texas coast, one hurricane occurs every 6 years (Roth 2010).

Figure 13-2: Project Location Wind Rose



13.2.2.2 Noise

13.2.2.2.1 SOUND FUNDAMENTALS

Sound is a physical disturbance in a medium, such as air or water, which can be detected by a human or animal ear. Sound pressure levels (intensity) are measured in units of dB with respect to a reference pressure value on a logarithmic scale; the pitch of sound is its frequency, which is measured in hertz (Hz). Because the human ear is more sensitive to mid-frequency sounds, relative to low and high frequency sounds, airborne sound is measured on a frequency-adjusted scale that gives greater weighting to mid-frequency sounds (dBA). The threshold for the human ear to detect a change in perceptible sound is 3 dBA; a 5-dBA sound level change is clearly noticeable; and a 10-dBA change is perceived as a doubling (or halving) of sound levels (Federal Highway Administration [FHWA] 1995). The relative sound levels of some common environmental sounds, as well as human impressions of those sounds, are provided in Table 13-3.

Table 13-3: Sound Levels and Relative Loudness

Noise Source or Activity	Sound Level (dBA)	Subjective Impression
Jet aircraft takeoff from carrier at 50 feet (ft; 15 meters [m])	140	Deafening (130 dBA is the threshold of pain)
Loud rock concert near stage	120	
Loud car horn 10 ft (3 m) away	100	Very loud
School cafeteria with untreated surfaces	80	Loud
Near freeway auto traffic	60	Moderate
Normal conversation	60	
Average office	50	
Average residence without stereo playing	30	Quiet
Quiet library, soft whisper	20	Very quiet
	0	Threshold of hearing

Source: HUD 1985; USEPA 1971.

Noise is defined as unwanted or objectionable sound, which may include sound that interferes with communication, disturbs sleep, or is intense enough to damage hearing. Ambient sound levels and human sensitivity to sound vary over time; for example, a nuisance sound (noise) generated during the night may be perceived as a greater disturbance than the same sound generated during the day. Evaluation of ambient noise levels and impacts is therefore based on measurements of sound exposure over time. Two measures of time-varying sound exposure are the 24-hour equivalent sound level (L_{eq}) and the weighted sound level (L_{dn}). The L_{eq} is the level of steady sound with the same total (equivalent) energy as the time-varying sound, averaged over a 24-hour period. The L_{dn} is the L_{eq}, weighted to account for people's greater sensitivity to nighttime sound by adding 10 dBA between the hours of 10:00 p.m. and 7:00 a.m.

Airborne sound is measured in dB relative to a reference pressure of 20 micro Pascals (μPa) at 1 meter (m), which is derived from the average human hearing threshold; however, the reference pressure in water is 1 μPa at 1 m. Therefore, a given sound will produce a higher sound pressure level in water than in air, and it is difficult to make direct comparisons between sound levels in air and water. In addition, sound travels much faster through water than through air (about 1,500 m per second [m/s] in water and about 330 m/s in air) (OSPAR Commission 2009). Underwater sound is addressed in Section 8: Wildlife and Protected Resources.

13.2.2.2.2 AMBIENT NOISE

The ambient sound level comprises the total sound generated within a specific environment, including natural and anthropogenic sounds. The magnitude and frequency of ambient sound at any specific location is variable in time, and that variation may be due to changing weather conditions, seasonal changes in vegetative cover, and, in developed areas, daily traffic or use patterns. Existing sources of sound in the Onshore Project area may include local road traffic, high altitude aircraft overflights, vessels in nearby open water areas, and natural sounds such as wildlife vocalizations and vegetation. Land uses and their associated human activities have different ambient sound levels.

Where the Project facilities will be located in inshore waters (including Redfish Bay) and the GOM, natural sources of ambient airborne sound include bird calls, water movement, and wind. Anthropogenic sources of ambient sound include commercial and recreational vessels, and helicopters transporting workers and supplies to offshore platforms and other facilities. Vessels in the Project area may include commercial vessels in the GOM travelling along shipping fairways or calling at nearby ports, including Port Aransas and Corpus Christi; commercial vessels travelling in the Intracoastal Waterway and other shipping/transit channels across the inshore waters; and smaller, recreational boats in both inshore waters and the GOM. Vessel traffic is discussed in detail in Section 14: Navigation and Navigation Safety. The occurrence of noise from vessel traffic is highly variable, and vessel-generated sound is transient and limited to the time when the vessel is passing through the sound receptor. Long periods of low anthropogenic sound levels may occur when vessels are not present at a specific location. Similarly, sound from helicopter overflights is transient and intermittent.

A noise-sensitive area (NSA) is a location which, because of its use by people, may be more susceptible to noise impacts. Examples of NSAs include residences, churches, and schools. NSAs in the Project area were identified based on a review of available aerial imagery. Surveys were conducted to document the ambient sound levels at the NSAs within 1 mi of the Harbor Island Booster Station and within 0.5 mi of each HDD entry and exit location; the results are presented in Table 13-4 and Appendix S. In addition, designated critical habitat for the piping plover on San Jose Island was assessed as an NSA for HDD construction and sound levels at that location were estimated based on available ambient data from similar environments; because sea turtles have also been documented nesting on San Jose Island, the NSA is also representative of suitable sea turtle nesting habitat in the Project vicinity. Appendix S also includes figures depicting each NSA assessed. As described in Table 13-4, the nearest NSA to HDD construction sites or aboveground facilities are residences located within about 150 feet (ft; 46 m) from HDDs 5 and 6.

Where the Harbor Island Booster Station will be installed in Port Aransas, Texas, the nearest NSA is 0.8 mi (1.3 kilometers [km]) away. The facility site is on undeveloped, open land (see Section 12: Coastal Zone Uses, Recreation, and Aesthetics). Similarly, where onshore construction activities are planned on San Jose Island and other inshore islands, the Inshore Pipelines will cross primarily undeveloped land, but adjacent to existing disturbance (e.g., roadways, powerlines). The Onshore Pipelines will cross predominantly developed areas in Aransas Pass and Port Aransas; the nearest NSAs to HDD construction will be 150 ft (46 m) away. Outside of incorporated areas, the Onshore Pipelines cross predominantly open and agricultural land, as well as some areas of wetlands.

Table 13-4: Noise Sensitive Areas within 0.5 mi of HDDs and 1 mi of the Harbor Island Booster Station

Facility/HDD Number	HDD Entry/Exit Location	NSA Description[a]	Distance and Direction to Construction Workspace (ft/m)	Ambient Sound Level (L_{dn} dBA)
Harbor Island Booster Station				
Booster Station		Park	4,400 ft (1,341 m; S)	51.2
		Residences	5,000 ft (1,524 m; SSW)	44.9
Onshore Pipelines				
2	Entry	Residence	1,700 ft (518 m; W)	54.4
	Exit	Residence	1,650 ft (503 m; NW)	
4	Entry	Residences	150 ft (46 m; W)	56.7
	Exit	Residence	450 ft (137 m; SW)	53.5
Inshore Pipelines				
5	Entry	Residences	2,200 ft (671 m; W)	60.5
	Exit	Residence	150 ft (46 m; S)	57.5
6	Entry	Residences (RV Park)	700 ft (213 m; S)	61.3
	Exit	Residences (RV Park)	1,100 ft (335 m; SE)	
7	Entry	Residences (RV Park)	700 ft (213 m; S)	61.3
	Exit	Residence	900 ft (274 m; SE)	65.7
9	Entry	Piping plover critical habitat	2,450 ft (747 m; E)	59 0
10	Entry		1,300 ft (396 m; E)	

a No NSAs were identified within 0.5 mi of HDDs 1, 3, and 8.

13.2.2.4 Air Quality

Existing Air Quality conditions are characterized in two ways. First, data from onshore, regulatory air quality monitors are presented, showing compliance with the NAAQS. Second, emission rates of VOC and NO_X associated with existing offshore crude oil loading operations are estimated.

13.2.2.4.1 CURRENT ONSHORE AIR QUALITY

Texas counties in the vicinity of the Project (Kenedy, Kleberg, Nueces, San Patricio, Aransas and Refugio) are currently classified as "attainment/unclassifiable" for each NAAQS pollutant (40 CFR § 81.344).

Background air quality in the area surrounding a proposed action is typically obtained from nearby air monitoring stations. No air monitoring stations are presently located offshore, so the closest onshore monitors have been selected to represent existing air quality conditions for the project area.

Table 13-5: Summary of Representative Monitored Concentrations for Project NAAQS Pollutants

Pollutant	Averaging Period	Monitor Location	AIRS ID[7]	Period	Design Value[8]
NO_2	1-hr	Galveston, TX	48-167-1034	2016–2018	28.3 ppb
	Annual			2018	2 ppb
Ozone	8-hr	Corpus Christi, TX	48-355-0025	2015–2017	62 ppb
PM_{10}	24-hr	Corpus Christi, TX	48-355-0034	2016–2018	79.0 µg/m^3
$PM_{2.5}$	24-hr	Corpus Christi, TX	48-355-0034	2016–2018	25.7 µg/m^3
	Annual				8.7 µg/m^3
SO_2	1-hr	Corpus Christi, TX	48-355-0025	2016–2018	4 ppb
CO	1-hr	Deer Park, TX	48-201-1039	2018	1.3 ppb
	8-hr			2018	1 ppb

13.2.2.4.2 AIR QUALITY IMPACTS FROM EXISTING CRUDE OIL LOADING OPERATIONS IN PROJECT AREA

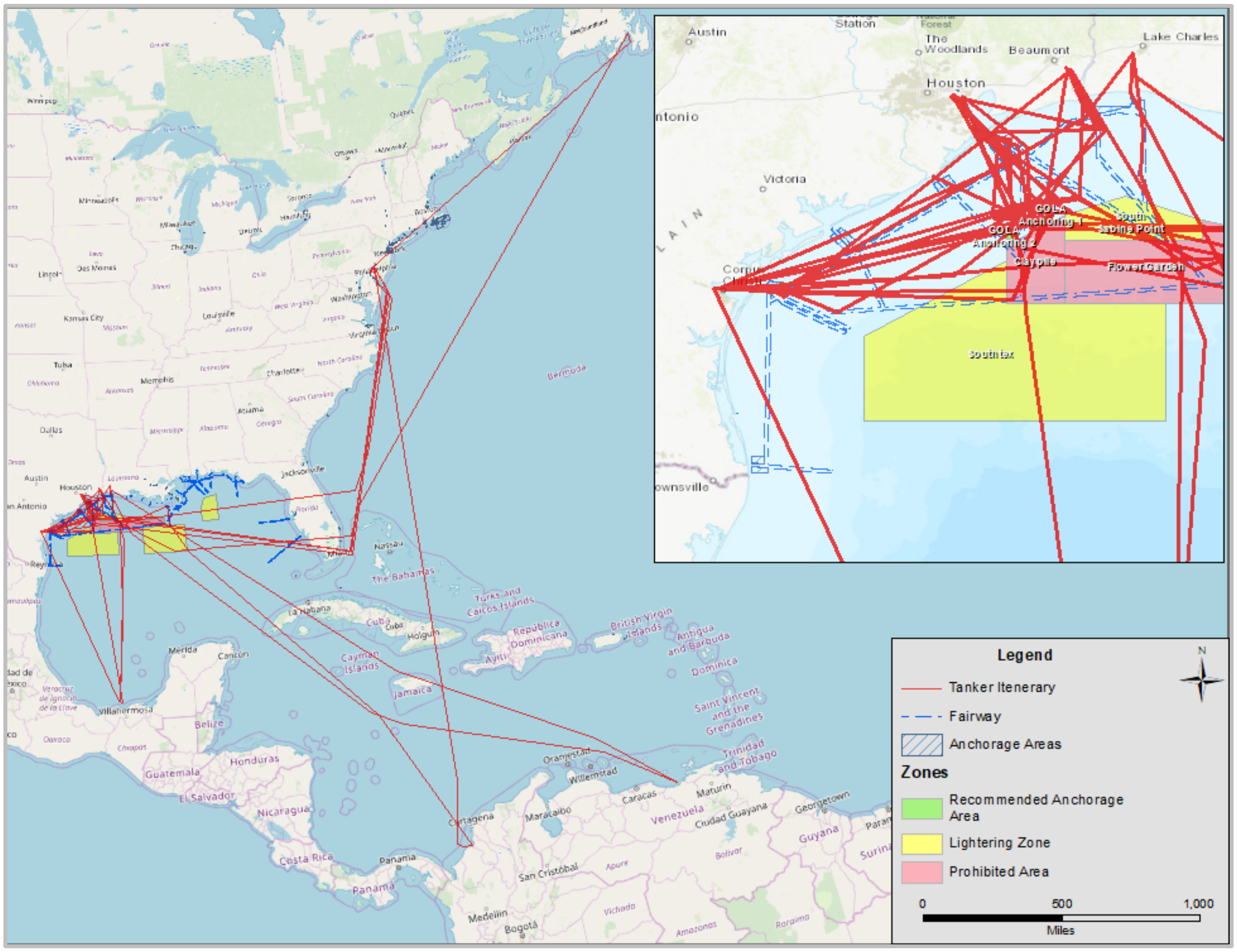
In addition to data from onshore air quality monitors, a second source of information about existing conditions is an estimate of air emissions that occur from current, prevailing means of conducting crude oil export activities, which rely on the use of shuttle tankers for long-haul voyages. Because NO_X and VOC are the only pollutants for which significant Project impacts are anticipated, the following discussion is confined to these two pollutants only.

The activities of shuttle tankers are illustrated in Figure 13-3, which shows daily automatic identification system (AIS) positions signaled by the *Eagle Kinarut*, a foreign-flagged shuttle tanker in the Aframax size class, over the course of a one-year period.

[7] Monitor ID's correspond to identifiers used in EPA's AirData website (https://www.epa.gov/outdoor-air-quality-data).

[8] Design values correspond to the form used to determine attainment of a standard, as described in 40 CFR § 50.4–50.13. For example, an area's classification with respect to the 8-hr CO standard is based on the second-highest monitored concentration during a given year (40 CFR § 50.8(a)(1)).

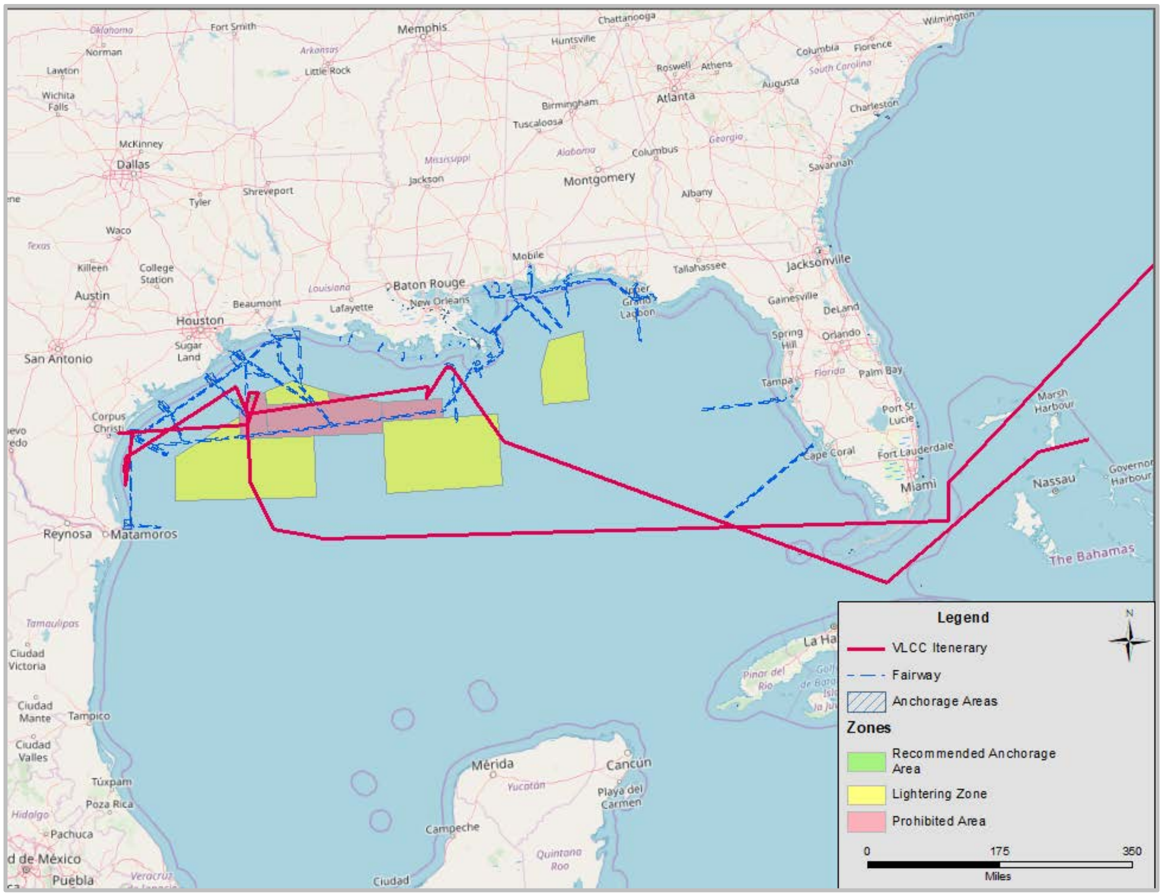
Figure 13-3: Tanker itinerary: North America (left) and Offshore Gulf of Mexico (right).



The tanker frequents crude oil export terminals at various locations along the Texas Gulf Coast (including Corpus Christi, Houston, and Beaumont) and also occasionally calls at crude oil export terminals in Mexico, Colombia and Venezuela. It calls at refinery terminals along the Texas and Louisiana Gulf Coasts, as well as in Paulsboro, NJ, Delaware City, DE, and Come by Chance, Newfoundland. However, the tanker also makes numerous stops in an area known as the Galveston Offshore Lightering Area (GOLA). In GOLA, the tanker is involved in ship-to-ship transfers, either loading export cargoes onto larger tankers, typically VLCCs, or unloading cargoes from larger tankers for delivery to refineries. Since it is not a Jones Act vessel, it cannot carry crude oil between U.S. ports. Such a tanker is referred to as a shuttle tanker because it moves cargoes a short distance between a terminal and a larger vessel. The practice of loading VLCCs by means of shuttle tanker is referred to as "reverse lightering." Aframax sized vessels are most frequently used in reverse lightering practices due to their ability to enter most coastal ports with restricted draft depths.

VLCCs are the preferred means of exporting crude oil on long-haul voyages, and the majority of VLCC loading in the Gulf of Mexico takes place via reverse lightering. For, example, 65% of *all* crude oil export volumes were loaded via reverse lightering during the week ending January 8, 2019 (RBN 2019). Reverse lightering is required due to the lack of deep draft ports in the Gulf of Mexico. For illustration, the trajectory of the VLCC *Maran Ares* is shown in Figure 13-4 over a five-week period. The tanker enters the Gulf, proceeds to the Louisiana Offshore Oil Port (LOOP), presumably taking on a partial load; it then proceeds to the Moda Midstream crude oil terminal in Ingleside, TX (one of two onshore terminals currently capable of partial VLCC loadings), presumably taking on additional cargo; finally, it travels to GOLA, signaling “restricted maneuverability” during a presumed reverse lightering operation. This itinerary illustrates the three current means available for loading of VLCCs. As a whole, VLCCs receive the majority of their cargo offshore via reverse lightering.

Figure 13-4: VLCC Itinerary



The prevalent use of shuttle tankers for Gulf of Mexico oil exports illustrates an important aspect of the U.S. crude oil export market. The market includes crude oil destined for export that is generally loaded twice. Crude oil is first loaded onto a shuttle tanker at a shoreside terminal along the Gulf Coast, with emission controls, and then onto a VLCC, in an offshore lightering area, without emission controls.

Of the three means of loading a VLCC illustrated in Figure 13-4 (partial loading onshore, deepwater port, or reverse lightering), reverse lightering is the least efficient means of exporting crude oil from an economic standpoint, since the exporter must charter and fuel one or more shuttle tankers in addition to the VLCC. Therefore, the expected impact of the Project on the crude oil export logistics market will be to displace reverse lightering operations that would otherwise occur. Although the Project will be a source of VOC emissions, it will displace VOC emissions that would otherwise result from reverse lightering. It will also reduce diesel combustion emissions by reducing port traffic (tug and shuttle tanker) and offshore shuttle tanker traffic that would otherwise occur during lightering activities.

Emissions associated with reverse lightering are quantified below, and can be understood as arising from five distinct operations: uncontrolled loading of the VLCC during the reverse lightering operation; controlled loading of each shuttle tanker at a shoreside terminal; emissions from ship engines during transit of a shuttle tanker between the shoreside terminal and the offshore lightering area; emissions from ship engines from both the shuttle tanker and the VLCC during the lightering operation itself; and finally, emissions from tractor tugs used to assist with shoreside mooring of the shuttle tanker within shoreside harbors.

13.2.2.4.3 EMISSION FACTORS FOR LOADING OPERATIONS

VOC emission factors associated with loading during reverse lightering operations are assumed to be equal to those that would result from loading at the deepwater port, i.e., 120.3 lb VOC/MBbl crude oil loaded (methodology shown below).

VOC emission factors for controlled loading are based on a capture efficiency of 99% for the shoreside closed vent system, and a destruction efficiency of 99% for the shoreside control device (TCEQ 2016; TCEQ 2011). The emission factor for controlled loading is therefore 1.99% of the corresponding uncontrolled emission factor, or 2.39 lb VOC/MBbl.

Emissions of NO_X from the shoreside control device are estimated based on a net heating value of 20,000 Btu/lb for crude oil vapors, and a NO_X emission factor of 0.1 lb/MMBtu for the control device, or 0.24 lb NO_X/MBbl.

13.2.2.4.4 EMISSION FACTORS FOR SHIP ENGINES

MARPOL Annex VI specifies tiered NO_X emission limits (figure 13-4, below) for marine diesel engines which vary based on the engine's year of construction, its rated speed, and whether it operates in a designated Emission Control Area (ECA). To estimate emissions from reverse lightering operations, VLCC and Aframax engines are assumed to be subject to a limit of 14.4 g/kW·h, based on a low-speed engine (less than 130 rpm), constructed between 2011 and 2016 ("Tier II"). For tractor tugs, an engine speed of 750 rpm is assumed, corresponding to a Tier II emission factor of 9.6 g/kW·h. The engine power at 100% load for an Aframax and a VLCC at 100% load is assumed to be 13,000 kW and 26,000 kW, respectively (MAN Diesel and Turbo 2013). The tractor tugs used for shoreside mooring of the Aframax are assumed to have a maximum load of 7460 kW (10,000 hp) each, based on operational experience.

Figure 13-5: MARPOL Annex VI NO_X Emission Limits

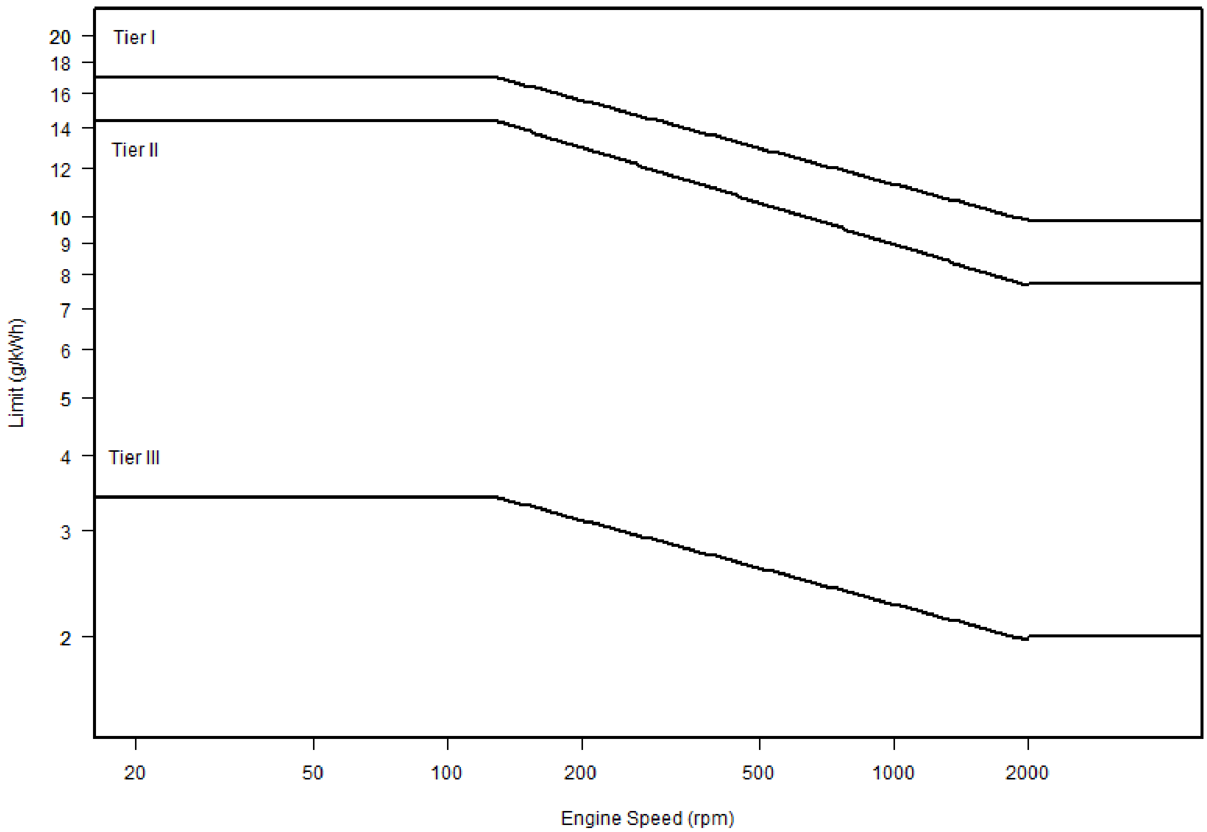


Table 13-6: Assumed Engine Loads and NO_X Emission Rates for Vessel Propulsion Systems

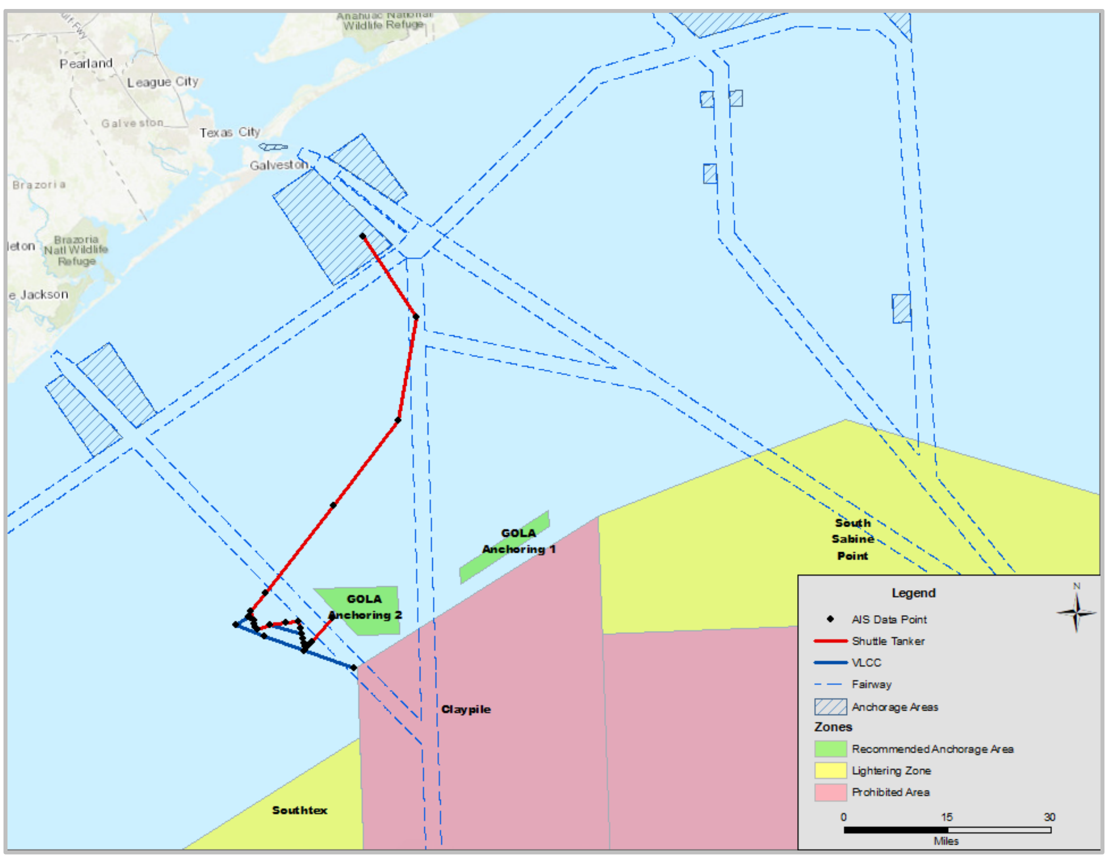
Vessel	Mode	Engine Load (%)	NO_X emission rate (lb/hr)
Aframax	In transit (loaded)	90%	371
Aframax	In transit (unloaded)	60%	248
Aframax	Lightering	90%	371
Aframax	Docked (loading)	10%	41
VLCC	Lightering	25%	206
VLCC	Docked (loading)	10%	83
Tractor Tug	Mooring assist	100%	158

The assumed load and implied NO_X emission rate for different operating modes is given in Table 13-6. Lightering operations generally take place with both ships underway at low speeds, moored side-by-side. For the VLCC, a load factor of 25% is assumed based on use of propulsion engines and operation of ballast pumps. For the Aframax, a higher load factor of 90% is assumed based on the use of propulsion engines, operation of the cargo pumps at their maximum rate, and operation of the vessel's inert gas generation system at its maximum rate. The assumed load is consistent with operational experience indicating that an Aframax tanker consumes similar amounts of fuel when underway laden, and when discharging cargo at a shoreside terminal. Tractor tugs operate at high power (assumed 100% load) while assisting with mooring operations.

Tankers typically consume auxiliary power while docked at a terminal or while anchored and awaiting instructions. During loading, the ship's ballast pumps are in operation, but not its cargo pumps or its inert gas generator. This analysis assumes that auxiliary power operations are equivalent to 10% load. Emissions from auxiliary power operation are estimated during times when a ship is docked and loading. Periods when a vessel is at an offshore anchorage area awaiting instructions are not included in the analysis.

In order to estimate the time to complete a reverse lightering rendezvous, itineraries for pairs of vessels known to have completed a reverse lightering operation were studied using AIS data. When two crude oil tankers (one a VLCC, the other a shuttle tanker) signal the same location, course, and speed, and both signal their status as "restricted maneuverability," they are presumed to be engaged in a reverse lightering operation. The diagram in Figure 13-6 illustrates the method for estimating the duration of a reverse lightering operation. The two vessels first begin to travel along the same course, signaling "restricted maneuverability," at 0300 hours, and the last such transmission occurs at 1800 hours on the same day. At the end of the rendezvous, the shuttle tanker returns north to a shoreside terminal, and the VLCC continues on an east-southeast course out of the Gulf of Mexico. The paths appear to diverge at one point during the rendezvous, but this is because the VLCC does not signal it position for three hours.

Figure 13-6: Trajectories for shuttle tanker (red) and VLCC (blue) lightering within GOLA (left)



For the lightering rendezvous depicted in Figure 13-6, a total duration of 15 hours is observed. Other operations have been observed with apparent durations ranging from 12–24 hours. The duration of a lightering rendezvous is therefore conservatively assumed to be 12 hours for purposes of estimating emissions from the vessel engines. AIS data has also been used to estimate 12 hours as the time it takes for a shuttle tanker to travel between a shoreside location in Corpus Christi or Houston and the corresponding offshore lightering area. Therefore, each reverse lightering operation is assumed to involve 24 hours of transit for the Aframax shuttle tanker (12 hours unloaded and 12 hours loaded).

The duration of a loading operation at a terminal is assumed to be 12 hours for an Aframax loading at a shoreside terminal (similar to the duration of a lightering rendezvous). Tractor tug assist operations during mooring of an Aframax typically require 2–3 hours per unique operations, so a duration of 2.5 hours per tug is used for this analysis.

Assuming that each reverse lightering operation involves the transfer of 500,000 Bbl from an Aframax shuttle tanker to a VLCC, NO_X emission factors for each reverse lightering event are shown in Table 13-7.

13.2.2.4.5 TOTAL AIR QUALITY IMPACTS FOR EXISTING CONDITIONS

Table 13-7: Summary of NO_X Emission Factors for Lightering

Activity	NO_X Emission Rate (lb/event)	NO_X Emission Factor (lb/MBbl)
Controlled Loading Onshore	120	0.24
Onshore tanker engines	492	0.98
Onshore assist tugs	790	1.58
Transit	7428	14.86
Lightering	6924	13.85
Total	15754	31.51

Total emissions for reverse lightering are summarized in Table 13-8. VOC emissions for reverse lightering are similar to those expected to result from the deepwater port (cf. estimates below). The most important aspect of existing air quality in the context of the Project is the prevalent use of shuttle tankers and associated inner-harbor traffic. Crude oil exports are currently facilitated to a large extent by shuttle tankers whose primary function is to ferry cargoes of crude oil between VLCC's and shoreside terminals. The net effect of the Project will be to reduce the extent to which traffic from these vessels is necessary to support crude oil exports.

Table 13-8: Total VOC and NOX emissions from export of Project-equivalent Volume of Crude Oil via Reverse Lightering

Activity	VOC Emissions (tpy)	NO_X Emissions (tpy)
Uncontrolled Loading	23,098	
Controlled Loading at terminal	231	46
Lightering Vessel Engines		6,004

Total	23,329	6,050

13.2.3 Proposed Project Construction Impacts

13.2.3.1 Noise

Details of factors that may produce impacts are described in Appendix A: Construction, Operation and Decommissioning Procedures. The environmental consequences of the Proposed Project will vary in duration and significance. Four levels of impact duration were considered: temporary, short-term, long-term, and permanent. Temporary impacts generally occur during construction & decommissioning, with the resource returning to pre-construction conditions almost immediately afterward. Short-term impacts are considered to be those that may continue for up to 3 years following construction. Impacts are considered long-term if the resource will require more than 3 years to recover. A permanent impact could occur as a result of any activity that modified a resource to the extent that it will not return to pre-construction conditions during the life of the Project, such as within the footprint of Project. When determining the significance of an impact, we consider the duration of the impact, the geographic and biological context in which the impact will occur, and the magnitude and intensity of the impact. The duration, context, and magnitude of impacts vary by resource and therefore significance varies accordingly.

Construction and operation of the Proposed Project are expected to result in temporary and permanent impacts on sound levels in the Proposed Project vicinity. Installation of the Harbor Island Booster Station will generate noise due to operation of construction equipment. Temporary noise during installation of the pipelines will result from typical pipeline construction, HDDs, and vessel activity (including the pipeline lay barge). Construction of the SPM buoy systems will also generate airborne noise from pile-driving and construction and support vessels. Because the SPM buoys will be located about 17.0 mi (27.4 km) from shore, impacts on land-based noise sensitive receptors are anticipated to be limited to the temporary period of onshore and nearshore pipeline installation.

During operations, equipment at the Harbor Island Booster Station will result in localized noise. No airborne noise impacts will occur for pipelines and noise from the offshore and inshore underwater pipelines will be limited to the sound of liquid flow underwater (see Section 8: Wildlife and Protected Resources). Ongoing operation of equipment on the SPM buoys, as well as loading and support vessel activity, will also generate noise. Airborne noise can adversely affect human activity; both underwater and airborne noise can interfere with biological resources including marine mammals, sea turtles, fish, and birds. Airborne and underwater noise impacts on fauna are addressed in Section 8: Wildlife and Protected Resources.

13.2.3.1.1 HARBOR ISLAND BOOSTER STATION

The primary sources of noise for construction of the Harbor Island Booster Station will be operation of internal combustion engines in construction equipment including cranes, compressors, generators, welders, excavators. During construction, sound levels will temporarily increase in the immediate vicinity of the site.

Using an estimated number of construction equipment for construction of the Harbor Island Booster Station, the composite sound level associated with the construction was estimated. A composite sound level is typically used to describe the overall noise generated by multiple noise-generating units operating at the same time and was generated by adding the sound level of each piece of operating equipment. A standard formula to calculate sound attenuation over distance (assuming no attenuation due to damping from vegetation or other barriers) was used to estimate the composite sound level at the nearest NSA.

$L(R2) = L(R1) - 20 \cdot Log10(R2/R1)$

L(R1) = Sound level at initial location

L(R2) = Sound level at the new location

R1 = Distance from the noise source to initial location

R2 = Distance from noise source to the new location

Table 13-9 identifies the sound levels associated with typical construction equipment and the estimated composite construction noise levels at a distance of 50 ft (15 m) and at the nearest NSA (a park) to construction of the Harbor Island Booster Station. One piece of equipment of each type was assumed to be operating simultaneously at any given time for the calculation of composite noise levels; the estimate is conservative, since it is unlikely that all equipment will be operated simultaneously. The construction equipment types are based on currently available information; the specific equipment required for installation of each Proposed Project component will be determined by the construction contractor. Based on the assessment in Table 13-9, and since most construction at the Harbor Island Booster Station will occur during daylight hours, we do not anticipate that construction noise will exceed the level recommended in USEPA's guidance (55 dBA L_{dn}). Construction contractors of the Booster Station should follow general best management practices and noise control practices by operating only necessary equipment simultaneously and limiting the operation of idle equipment when not required.

Table 13-9: Representative Construction Equipment Noise Sources for the Harbor Island Booster Station Construction (L_{max})[a]

Equipment	Sound Pressure Level (dBA) at 50 ft	Equipment Count[c]	Composite Sound Level (50 ft/15 m)	Composite Sound Level at the nearest NSA (4,400 ft/1,341 m)
Backhoe	78	1	78	39.1
Bulldozer	82	1	82	43.1
Dump Truck	76	1	76	37.1
Front End Loader	79	1	79	40.1
Generator	87	1	87	48.1
Grader	89	1	89	50.1
Pickup Truck	75	1	75	36.1
Composite Sound Level			**92.2**	**53.3**

a L_{max} is the highest measured sound level observed during a measurement period.
b The sound level in dBA at 50 ft (15 m) is a measured value; the estimate at the nearest NSA is a conservative modeled estimate assuming no attenuation other than by distance.
c one piece of equipment of each type assumed to be operating at any given time for calculation of composite sound level at the site
Sources: FHWA 2006, Hoover and Keith, Inc. 2000.

13.2.3.1.2 PIPELINES

Sources of noise associated with construction of the pipelines are expected to include internal combustion engines of equipment supporting typical pipeline construction, HDDs, vessel activity (including the pipeline lay barge), and jetting to bury the Offshore Pipelines after they are laid on the seafloor.

ONSHORE/INSHORE PIPELINE INSTALLATION

The primary sources of noise during Onshore Pipeline construction will be generated by internal combustion engines in construction equipment and the HDD drill rigs. The equipment used for installation of the pipelines will be similar to the equipment used for construction of the Harbor Island Booster Station.

Table 13-10 estimates the composite sound levels associated with typical pipeline construction at various distances from construction. The estimate is conservative, since it is unlikely that all equipment will be operated simultaneously. The construction equipment counts are an estimate based on currently available information; the specific equipment required for installation of each Proposed Project component will be determined by the construction contractor. Composite construction noise could exceed the USEPA-recommended 55 dBA L_{dn} (which is equivalent to a continuous sound level of 48.6 dBA when nighttime construction is planned) along the pipelines. Pipeline construction is expected to occur over a 4-month period for the Onshore Pipelines, and over an 8.5-month period for the Inshore Pipelines; however, active pipeline construction at any location will be temporary. Construction will occur primarily during daylight hours. Typical pipeline construction is expected to move along the pipelines' route, such that any single area experiences only a short duration of construction noise. Because land-based pipeline installation will be temporary and limited to the period of active construction, impacts on noise receptors will be localized and negligible.

Table 13-10: Representative Construction Equipment Noise Sources for Typical Pipeline Construction (L_{max})[a]

Equipment	Sound Pressure Level (dBA) at 50 ft	Equipment Count	Composite Sound Level (50 ft/15 m)	Composite Sound Level (1,000 ft/ 305 m)	Composite Sound Level (2,500 ft/762 m)	Composite Sound Level (1 mi/1.6 km)
Excavator	81	6	88.8	62.8	54.8	48.3
Generator	87	3	91.8	65.8	57.8	51.3
Crane/ Sideboom	85	5	92.0	66.0	58.0	51.5
Pickup Truck	75	2	78.0	52.0	44.0	37.5
Welder/Torch	74	5	81.0	55.0	47.0	40.5
Composite Sound Level			**96.1**	**70.0**	**62.1**	**55.6**

a L_{max} is the highest measured sound level observed during a measurement period

b The sound level in dBA at 50 ft (15 m) is a measured value; the estimate at the nearest NSA is a conservative modeled estimate assuming no attenuation other than by distance.

Sources: FHWA 2006, Hoover and Keith, Inc. 2000.

HDD pipeline installation requires stationary drilling equipment to operate for a longer timeframe to allow for the drilling of a borehole and installation of the pipelines without digging a trench. BWTT will use HDD construction to install the pipelines at four locations along the Onshore Pipelines and six locations along the Inshore Pipelines. HDD activities will require up to an estimated 9 weeks at each location, although often less, in addition to time required for pre-laying the pipeline, and could require 24-hour construction. Table 13-11 quantifies the sound levels due to HDD construction measured at the nearest NSAs within 0.5 mi of each HDD entry and exit location. Detail regarding the methods used to assess HDD construction noise, as well as figures depicting each HDD and the nearest NSAs, are included in Appendix S.

Table 13-11: Noise Impacts for the Nearest NSA within 0.5 mi of Each HDD[a]

HDD No	Entry/Exit Location	NSA Description	Distance and Direction to Construction Workspace (ft/m)	Ambient Sound Level (L_{dn} dBA)	L_{dn} due to HDD Construction (dBA)	L_{dn} (HDD + Ambient; dBA)	Increase Above Ambient (dB)
Onshore Pipelines							
2	entry	Residence	1,700 ft (518 m; W)	54.4	53.5	57.0	2.6
	exit	Residence	1,650 ft (503 m; NW)	54.4	42.4	54.7	0.3
4	entry	Residences	150 ft (46 m; W)	56.7	78.6	78.6	21.9
	exit	Residence	450 ft (137 m; SW)	53.5	54.3	56.9	3.4
Inshore Pipelines							
5	entry	Residences	2,200 ft (671 m; W)	60.5	48.8	60.8	0.3
	exit	Residence	150 ft (46 m; S)	57.5	66.8	67.3	9.8
6	entry	Residences (RV Park)	700 ft (213 m; S)	61.3	62.7	65.0	3.7
	exit	Residences (RV Park)	1,100 ft (335 m; SE)	61.3	46.6	61.4	0.1
7	entry	Residences (RV Park)	700 ft (213 m; S)	61.3	62.7	65.0	3.7
	exit	Residence	900 ft (274 m; SE)	65.7	48.6	65.8	0.1
10	entry	Piping plover critical habitat	1,300 ft (396 m; E)	59 .0	57.7	61.4	2.4

a No NSAs were identified within 0.5 mi of HDDs 1, 3, and 8. HDD 9 will affect the same NSA as HDD 10; given the limited sound contribution from HDD 10, which is located nearer to the NSA, additional analysis is not provided. The entry location for HDDs 6 and 7 is at the same site.

Estimated noise from HDD construction could exceed the USEPA's guideline level of 55 dBA L_{dn} at the nearest residential NSAs to four locations (the HDD 4 entry, HDD 5 exit, HDD 6 entry, and HDD 7 entry sites) without additional noise mitigation. As described in Appendix S and Table 13-12, if additional recommended noise mitigation measures are employed at each location, the sound level at the NSA nearest to each HDD will be below 55 dBA L_{dn} and the sound level increases above ambient will not be perceptible (less than 3 dB). Because HDD construction will be limited to 9 weeks or less at each location and given noise mitigation measures identified in Appendix S, noise impacts from HDD construction would be temporary and minor.

Table 13-12: Noise Impacts for the HDDs with Additional Recommended Mitigation

HDD No	Entry/Exit Location[a]	NSA Description	Distance and Direction to Construction Workspace (ft/m)	Ambient Sound Level (L_{dn} dBA)	L_{dn} due to HDD Construction with Mitigation (dBA)[b,c]	L_{dn} (HDD + Ambient; dBA)	Increase Above Ambient (dB)
Onshore Pipelines							
4	entry	Residences	150 ft (46 m; W)	56.7	54.4b	58,7	2.0
Inshore Pipelines							
5	exit	Residence	150 ft (46 m; S)	57.5	53.5a	58.9	1.4
6	entry	Residences (RV Park)	700 ft (213 m; S)	61.3	52.6a	61.9	0.6
7	entry	Residences (RV Park)	700 ft (213 m; S)	61.3	52.6a	61.9	0.6

a The entry location for HDDs 4 and 5 is at the same site.
b Mitigation includes a 20-ft (6-m) high temporary barrier between the construction workspace and the nearest NSA.
c Mitigation includes a 24-ft (7-m) high temporary barrier between the construction workspace and the nearest NSA and enclosures surrounding equipment.

Where the entry location for HDD 10 will be near designated critical habitat for the piping plover, HDD construction is estimated to exceed 55 dBA L_{dn}; however, the estimated sound level increase during HDD construction at the nearest critical habitat will be 2.4 dBA, which is less than the 3 dB limit for a perceptible change. HDD 9 is within 0.5 mi of the same designated critical habitat; however, it is further from the habitat and impacts will therefore be less. Given the negligible change and short (maximum 9-week-long) period for HDD construction at each location, sound level impacts on this habitat will be temporary and negligible. Impacts of construction noise on terrestrial wildlife, including piping plovers and sea turtles that could use the beach near HDDs 9 and 10, are addressed in Section 8: Wildlife and Protected Resources.

OFFSHORE (UNDERWATER) PIPELINE INSTALLATION

Typically, installation of the pipelines in the GOM will be conducted by jetting/trenching using a pipe laying barge and support vessels. The Offshore Pipelines will be installed by the pipe laying barge for about 26.4 mi (42.5 km). Trenching and backfilling for installation of the pipelines will be completed using a submersible pipeline jetting sled operated from a pipe laying barge. Similar to onshore construction, underwater pipeline installation will progress along the route such that construction at any one location is of short duration. However, pipe laying may occur up to 24 hours per day.

The Proposed Project is in an area subject to noise impacts by commercial vessels operating in the Intracoastal Waterway and navigational fairways in the GOM. Airborne noise from construction and support vessels will be consistent with other vessel activity in the Proposed Project vicinity. Sound levels from the pipe laying barge are estimated to be about 90 dBA (consistent with OSHA's 8-hour permissible noise exposure level of 90 dBA) and will be consistent with other vessels operating in the GOM and Intracoastal Waterway. Therefore, nearshore underwater pipeline construction will have localized, negligible impacts on the airborne noise environment.

13.2.3.1.3 SPM BUOY SYSTEMS

Construction of the SPM buoy systems will use equipment similar to that used to install other offshore platforms and structures. Installation of the facilities will occur over 16 weeks. Offshore construction of the Project will only require that a portion of the construction equipment operate at a given time, and equipment is expected to vary for different construction stages. Sources of noise associated with construction of the SPM buoy systems are expected to include pile-driving equipment, as well as the operation of internal combustion engines used to power barges and service vessels. Sound levels are expected to be similar to the levels associated with onshore use of combustion-powered construction equipment; however, sound levels for offshore facility installation have not been measured. Vessels used to transport construction equipment and personnel will also generate airborne noise; however, limited vessel activity will occur near shore and most will be at the SPM buoy systems site. Given the distance from shore, construction of the Proposed Project will not exceed the 55 dBA L_{dn} recommended in USEPA's guidance to minimize impacts on NSAs. Construction of the Proposed Project will result in temporary, minor noise level increases in the immediate vicinity of the SPM buoy systems.

Pile-driving will be used for installation of the pipeline end manifold (PLEM) foundation and anchor piles, at each SPM buoy system, and will occur in depths between 88.5 and 89.5 feet (27.0 and 27.3 m). The intensity of sound produced during pile-driving is dependent on the material and size of the pile, depth of water, and method of pile-driving. A total of 10 steel or concrete 18-inch (0.5-m) diameter piles will be installed using an impact hydraulic hammer for the PLEMs. In addition, 24 steel or concrete 72-inch- (1.8-m-) diameter piles will be installed using an impact hydraulic hammer for the anchor piles (6 pairs of 2 piles at each SPM buoy system). Pile-driving will occur over the 16-week-long installation timeframe for the SPM buoy systems, and only one pile will be driven at a time. The airborne sound level associated with pile-driving is estimated to be about 104 dBA at a distance of 50 ft (15 m) but, given the temporary period planned for pile-driving and the distance of the Proposed Project from shore, will not affect onshore NSAs (Hoover & Keith, Inc. 2000).

Offshore noise from installation of the SPM buoy systems will be temporary and limited to the period of active construction. Given the intermittent, temporary nature of construction noise and distance from shore, impacts on human receptors will be negligible.

13.1.1.1 Air Quality

During construction of the offshore portions of the project, air emissions would result from construction equipment, including pipe laying vessels, vessels used for installation of the SPM buoys, and supply vessels. For vessels subject to MARPOL Annex VI, the most significant air pollutant emissions would be NO_X emissions from vessel engines. Since construction vessels would not remain in a particular location for an extended period of time during the construction phase, air quality impacts from the construction phase are expected to be of short-term duration, insignificant, and not adverse. Loading operations, which represent the most significant air quality impact during operations, would not occur during the construction phase.

Air quality impacts associated with Onshore and Inshore Construction activities would consist of emissions from construction equipment as well as possible particulate emissions from excavation and land clearing activities. These impacts would be of a short-term duration, would be subject to control measures (summarized below), and are assumed to be insignificant and not adverse.

Diesel-fired construction equipment must be manufactured in accordance with EPA regulations applying to non-road compression ignition engines (40 CFR Parts 89, 1039), which limit emissions of NO_X, CO, SO_2, particulate and non-methane hydrocarbons from such equipment. The formation of dust during construction operations is subject to TCEQ regulations at 30 TAC § 111.145, which establishes minimum required measures to suppress dust formation. These include the use of water to control dust formation during construction and land clearing operations, and the use of enclosures during sandblasting operations.

13.2.4 Proposed Project Operation Impacts

13.2.4.1 Noise

13.2.4.1.1 HARBOR ISLAND BOOSTER STATION

Noise sources during operations at the Harbor Island Booster Station will include engines, pumps, and other mechanical equipment. The major noise-generating equipment present on site will include four 5,500 horsepower electric motor-driven crude oil pumps. The Harbor Island Booster Station pumping systems will be located within noise abatement housings to minimize noise during operations to the maximum extent practicable. Because all of the equipment will not be operated simultaneously, and since the Harbor Island Booster Station will only be operated during loading, operational sound levels will vary. As a worst-case estimate during each very large crude carrier (VLCC) loading event, the Harbor Island Booster Station will operate for about 40 hours (a maximum of about 320 days a year for the maximum export volume of 192 VLCCs per year); additional pigging runs will require about 4 hours of operation and could be conducted as frequently as every month. Appendix S includes an acoustical assessment, with methodology, used to estimate the sound contribution of operation of the Harbor Island Booster Station at the nearest NSAs; impacts are summarized in Table 13-13. Operation of the Harbor Island Booster Station will not result in an audible increase (3 dB) above ambient sound levels at the nearest NSAs; therefore, impacts due to operations will be permanent but negligible.

Table 13-13: Operational Noise for the Harbor Island Booster Station

NSA Description	Distance and Direction to Construction Workspace(ft/m)	Ambient Sound Level (L_{dn} dBA)	L_{dn} due to the Booster Station	L_{dn} (Booster Station + Ambient)	Increase Above Ambient
Park	4,400 ft (1,341 m; S)	51.2	42	51.3	0.1
Residences	5,000 ft (1,524 m; SSW)	44.9	40.5	45.2	0.3

Because operations will emit continuous sound, the Harbor Island Booster Station could affect nearby wildlife. Noise could affect animal behavior, and cause wildlife species to move away from the noise or relocate to avoid the sound. However, given the availability of similar habitat near the facility, given the negligible impact on sound levels at NSAs less than 1 mi from the site, the use of noise abatement housings, and because operational noise will quickly attenuate with distance from the facility, the increased noise will result in permanent, but negligible impacts on wildlife. See Section 8: Wildlife and Protected Resources for additional detail regarding wildlife impacts.

13.2.4.1.2 PIPELINES

Because the SPM buoy systems will be located about 17.0 mi (27.4 km) from shore, impacts on land-based noise sensitive receptors are anticipated to be limited to the temporary period of onshore and nearshore pipeline installation. No onshore or inshore operational noise impacts are anticipated for the pipelines.

Operation of the valve station will be limited to activation of shut off valves during emergencies and routine maintenance. A motor for operation of the valve will be the source of operational sound; no pumps will be installed. Activation of the valve will emit a short burst of sound that could startle wildlife and/or cause them to leave the immediate vicinity. Sound levels will immediately return to previous conditions following activation of the valve, and wildlife will be expected to return to nearby habitat shortly thereafter. Given the short duration of sound associated with operation of the onshore valve station and its infrequent operation, impacts on wildlife will be negligible.

13.2.4.1.3 SPM BUOYS

Noise from operation of the SPM buoy systems will be virtually non-existent because the SPM buoy systems do not contain any mechanical engines, pumps, or generators that will be running continuously during operation. The only noise sources located at the SPM buoy systems will be assistant vessels such as tugs and the VLCC while it is moored to the SPM buoy system. Because noise from operations of the SPM buoy systems will be minimal, and any noise produced will be controlled to meet standards established for worker protection, impacts on airborne noise at the SPM buoy systems site will be localized, minor, and limited to the times when vessels are moored. Given the distance of the Project facilities from shore, no airborne noise impacts on land-based receptors from operation of the SPM buoy systems will occur. While noise from operation of the vessels at the SPM buoy systems could impact recreational boating and fishing in the vicinity of the site, establishment of the 3,609-ft (1,100-m) Safety Zone around each of the SPM buoy systems will exclude recreational vessels from the immediate area. Therefore, noise from SPM buoy systems operations is not expected to impact recreational activity.

Intermittent noise will be generated by support tugs and VLCCs calling at the SPM buoy systems (about 192 times per year). Noise from service vessels and VLCCs will be transient in the immediate Project vicinity, limited to the time when they are approaching, loading, and leaving the SPM buoy systems. VLCCs that will call at the SPM buoys are similar to other vessels operating in the GOM, as described in Section 13.2.2.2.2. Further, supply vessels and VLCCs transiting to the SPM buoy systems will generally use established shipping lanes. A minimum of two support tugs and one smaller support vessel will be on location at the SPM buoy systems during operations. No significant increase in vessel traffic is anticipated in the Project area, and therefore airborne noise impacts from vessel traffic during operations will be localized and negligible.

13.1.1.2 Air Quality

Air emissions are not expected during operation of the pipelines. Air emissions from operation of the Harbor Island Booster Station are expected to be of an insignificant nature, as noted above, emitting equipment and activities, such as storage tanks wastewater treatment, and pipeline pigging, would be subject to control requirements under the Texas SIP, and will qualify for a Permit by Rule. The remainder of the discussion on air quality impacts from the operation phase of the project is confined to the SPM buoys.

During operation of the SPM buoys, air emissions will result from vessel operations and from loading with submerged fill and vessel VOC management operations. While loading with submerged fill and vessel VOC management emission rates would be of a similar magnitude to existing conditions (reverse lightering), the project would have a reduced impact compared to existing conditions in that it would be associated with a relatively lower level of vessel traffic.

Total air emissions associated with the project, including emissions from stationary sources (loading operations) and mobile sources (vessel traffic), are summarized below, and their impacts on air quality are estimated using computerized dispersion modeling. Dispersion modeling results are summarized in the present section, while a more detailed discussion of the methodology employed appears in Appendix T (Air Dispersion Modeling Report). A separate air quality analysis, based on photochemical modeling, has been conducted as part of the required Prevention of Significant Deterioration permit application. This analysis is confined to emissions from stationary sources, and appears in in the PSD Permit Application submitted for the Proposed Project (Volume I).

In the context of characterizing project air quality impacts, impacts for a particular pollutant are deemed “significant” if they could result in a concentration in excess of a USEPA Significant Impacts Level (SIL), and are deemed “adverse” if they could result in a violation of an applicable NAAQS. When air emissions of criteria pollutants from the project itself are considered, air quality impacts are of a long-term nature and are not adverse for any air pollutant. Air quality impacts may be significant for Ozone, NO_X and $PM_{2.5}$, but not for any other criteria pollutant. When the impact of the project is considered in light of existing conditions (discussed above), the net impact is not expected to be significant for any pollutant.

13.2.4.1.4 EMISSION FACTORS FOR LOADING OPERATIONS

Emissions are generated during loading operations when vapors in the headspace of a ship's cargo tank are displaced. A loading loss emission factor, expressed in units of lb/Mgal liquid loaded, is estimated following EPA Publication AP-42, Section 5.2, equation (1) (USEPA 1995):

$$L_L = 12.46\frac{SPM}{T}$$

S is a dimensionless saturation factor, assumed to be 0.2 for ship loading. P, M, and T represent the VOC vapor pressure, vapor phase molecular weight, and liquid surface temperature, respectively. The constant 12.46 is the inverse of the ideal gas constant, when expressed in units of (Mgal·psia)/(lb-mol·°R). For units of (MBbl·psia)/(lb-mol·°R), the leading coefficient is multiplied by 42. In order to obtain the VOC emission rate, the loading loss is multiplied by the crude oil throughput in the appropriate units.

In order to estimate the vapor phase molecular weight, data collected by Hendler et al. are considered (Hendler 2009). Hendler et al. report the complete speciation of vapors emitted from breather vents at tank batteries in 33 crude oil gathering stations in Texas (11 oil tank batteries and 22 condensate tank batteries). The 11 samples corresponding to the oil tank batteries were used as the basis for estimation. Estimates were made based on the VOC species present, rather than total hydrocarbons (including methane and ethane). This is appropriate since methane, ethane, nitrogen and carbon dioxide in a crude oil may weather out before it is exported. This assumption also makes the estimated VOC emission rate more conservative, since these constituents have low molecular weights. One sample was discarded since its speciation was reported as 100% methane. The molecular weight of each of the VOC species reported was weighted by that species' mass fraction in the sample. When vapor phase molecular weights were calculated in this manner, they ranged from 53.0 lb/lbmol to 109.8 lb/lbmol, with an average of 72.4 lb/lbmol. The loading loss factor is therefore calculated assuming a vapor phase molecular weight of 72.4 lb/lbmol.

T is taken as the monthly average annual ambient temperature for Corpus Christi, as reported in AP-42, Chapter 7, or 531.72°R (72.1°F).

The vapor pressure of the liquid is based on a maximum Reid Vapor Pressure of 9.5. This value is a specification in the tariff for the crude oil pipeline which will feed the deepwater port. Reid Vapor Pressure is converted to True Vapor Pressure using AP-42, Chapter 7, Equation 7.1-13b. At 72.1°F, RVP 9.5 corresponds to 8.44 psia. Therefore, P is taken to be 8.44 psia.

The loading loss factor is therefore calculated as 120.3 lb VOC/MBbl crude oil loaded. When the expected maximum throughput of 384 MMBbl/yr is considered, total VOC emissions are 23,098 tons per year (tpy). While loaded crude oil is expected to be predominantly "sweet," hydrogen sulfide (H_2S) are conservatively estimated based on a vapor phase content of 130 ppmw H_2S in the emitted crude oil vapors,[9] or 2.9 tpy.

13.2.4.1.5 EMISSION FACTORS FOR SHIP ENGINES

As noted above, emission factors for NO_X from marine diesel engines are based on MARPOL Annex VI limits. Emissions of SO_2 from marine fuel oil combustion are based on MARPOL Annex VI, Regulation 14, which limits the

[9] Cf. the submitted Prevention of Significant Deterioration (PSD) permit application (Volume I) for additional details on the methodology for estimating H_2S emissions.

total sulfur content of marine fuel oils to 1,000 ppmw in the North America ECA. Emissions for other products of combustion are based on EPA AP-42 emission factors, Section 3.4, Table 3.4-1.

Table 13-14: Emission Factors and Total Emissions from Ship Engines during Project Operations

Pollutant	Emission Factor (lb/hp-hr)	Total Emissions (tpy)
NO_X (VLCC)	0.0237	723
NO_X (Tug and Workboat)	0.0158	397
CO	0.0055	307
SO_2	0.001	43
Particulate	0.0007	39
VOC	0.0007	39

Engine loads used to estimate emission rates are based on an assumed worst-case operating scenario. The worst-case scenario is one where there are two VLCC's present at the facility, and both are undergoing loading operations. During loading, the VLCC propulsion system is on standby, but its ballast pumps will be operating at near full capacity. It is assumed that the VLCC's onboard diesel generators are operating at a peak load during this operation, and this is estimated as equivalent to power consumption at 10% load for the propulsion system. During loading operations, the tractor tug is moored to the VLCC stern and applies assist when necessary to prevent the VLCC from making contact with the SPM. Since the wind and weather often provides the necessary force to keep the VLCC the proper distance from the SPM, the tug is not continually applying thrust, and its representative load is assumed to be 25%. The smaller workboat assists with hose handling and other light duty assist operations and is also modeled as having a 25% load during operations.

Table 13-15: Assumed Engine Loads and NO_X Emission Rates for Vessel Propulsion Systems

Vessel	Mode	Engine Load (%)
VLCC	Moored (loading)	10%
Tug	Mooring assist	25%
Workboat	Light duty assist	25%

13.2.4.1.6 EFFECTS ON AMBIENT CONCENTRATIONS OF AIR POLLUTANTS

In order to quantify the air quality impact of the operation phase of the project, modeling analyses were performed for criteria pollutants, and impacts were compared to the applicable NAAQS. Additional analysis was performed for crude oil vapors and for hydrogen sulfide. Estimated impacts were compared to health effects screening levels established by the TCEQ Toxicology Division, and to state ambient air quality standards (30 TAC Chapter 112), respectively.

Because ozone is not directly emitted but is formed in the atmosphere via secondary reactions between air pollutants, ozone impacts due to loading operations were estimated using photochemical grid modeling. A source-specific photochemical modeling analysis was conducted following EPA guidance (USEPA 2016). The Comprehensive

Air Quality Model with Extensions (CAMx) was used to generate estimates of the likely maximum impact of the source on design ozone values near the project location. Results are summarized below, in table 13-16.

Table 13-16: Ozone Analysis (Photochemical Model)

Receptor type	SIL (ppb)	Maximum impact (ppb)	Background concentration (ppb)	Cumulative impact (ppb)
Land-based	1.0	1.6	62	63.6
Over water	1.0	4.8	62	66.8

Source: Tsirigotis 2018

The maximum impact of 4.8 ppb from the project at any receptor occurs over water. The project impact at the maximally impacted land-based receptor is 1.8 ppb, and the land-based area of impact (i.e., region where project impacts may exceed the applicable significant impacts level [SIL]) is confined to Mustang Island. Based on the estimated worst-case impacts from the project, the project will not cause or contribute to any violation of the current NAAQS for ozone (40 CFR § 52.21(d).

For other pollutants, air impacts were estimated using the American Meteorological Society-EPA Regulatory Model (AERMOD), a gaussian plume dispersion model. Offshore meteorological data were pre-processed using the Coupled Ocean Atmosphere Response Experiment (COARE) procedure. For the criteria pollutants emitted by the site, impacts in excess of the SIL are predicted for the 1-hr and Annual NO_2 NAAQS. For other pollutants, estimated project impacts are below the applicable SIL.

Table 13-17: NAAQS Analysis (Dispersion Model)

Pollutant	Averaging Time	Predicted Impact (µg/m^3)	SIL (µg/m^3)
CO	1-hr	34.3	2,000
CO	8-hr	7.6	500
NO_2	1-hr	147.1	7.5
NO_2	Annual	9.5	1
SO_2	1-hr	3.4	7.8
PM_{10}	24-hr	0.5	5
$PM_{2.5}$	24-hr	0.4	1.2
$PM_{2.5}$	Annual	0.06	0.2

For pollutants where the project-specific modeled concentration exceeds an applicable SIL, USEPA guidance indicates a refined analysis. The refined analysis includes more detailed simulation procedures, consideration of existing air quality, and consideration of emissions from other stationary sources in the general vicinity of the project. In this case, the refined analysis has considered a representative monitored background concentration for NO_2 as well as NO_X emissions from offshore platforms within 25 km of the SPM buoys. The results of the refined analysis indicate that the project will not result in an exceedance of the NO_2 NAAQS at any offshore or onshore location meeting the definition of "ambient air" (40 CFR § 50.1(e)).

Table 13-18: Refined NO_2 NAAQS Analysis

Averaging Time	Background Concentration (µg/m³)	Project + Background (µg/m³)	Standard (µg/m³)
1-hr	53.3	174.7	188
Annual	4.5	14.0	100

Emissions of crude oil vapor and hydrogen sulfide were evaluated using dispersion modeling, and estimated impacts were compared to established TCEQ Effects Screening Levels (ESL's) and to State Property Line Standards for Sulfur Compounds (30 TAC Chapter 112).

Table 13-19: Crude Oil and H_2S Dispersion Modeling Results

Air Contaminant	Averaging Period	Project Impact (µg/m³)	ESL/Standard (µg/m³)
Crude oil (< 1 wt.% benzene)	1-hr	33,774	3500
Crude oil (< 1 wt.% benzene)	Annual	319	350
Hydrogen sulfide	30-min	21.9	162

Under TCEQ guidelines, air contaminant concentrations occurring over industrial waters are allowable if the maximum impact is no greater than 25 times the applicable ESL, and if impacts at the maximally impacted receptor do not exceed 10 times the ESL for more than 24 hours of annual meteorological data (Thomas 2001). Based on these guidelines crude oil impacts are allowable. No exceedance of the ESL is predicated at any land-based receptor. Maximum hydrogen sulfide impacts are less than the state standard that would apply if the impacts occurred in state jurisdictional waters.

The results of the quantitative analysis presented in this section indicate that no adverse air quality impacts are expected for the project. The modeling methodology and results for both analyses are presented more fully in Appendix T.

13.2.5 Proposed Project Decommissioning Impacts

13.2.5.1 Noise

At the end of its useful life (50 years), the Proposed Project will be decommissioned. Decommissioning of the Project will include abandonment in-place of the Onshore and Inshore Pipelines, removal of the Harbor Island Booster Station, and removal of the Offshore Pipelines (from a point about 3,900 ft [1,188.7 m] offshore) and SPM buoy systems. Removal of the components will result in minor sound level increases similar to those associated with installation; underwater pipeline removal will progress along the route such that activity at any one location is of short duration. The SPM buoy systems will be removed using divers and offshore cranes. The Offshore Components will generally be disconnected and hauled to shore for proper disposal. The anchor piles will either be removed by vibration or cutting the piles 15 ft (4.6 m) below the mudline. The removal by vibration involves utilizing a vibrating hammer to loosen and remove the pile, as opposed to the impact hammer that will drive in piles during construction. A crane will be attached to the top of the pile and will apply tension to retrieve the piling at the surface.

Decommissioning activity will result in a temporary sound level increase in the immediate vicinity of the SPM buoy systems due to increased vessel activity, and sound generated by disassembly and removal of the facilities. The need for blasting to remove Project facilities is not anticipated. Therefore, decommissioning of the Project will not result in significant noise impacts; impacts will be temporary and minor to negligible.

13.2.5.2 Air Quality

Decommissioning of the Project will include abandonment in-place of the Onshore and Inshore Pipelines, removal of the Harbor Island Booster Station, and removal of the Offshore Pipeline and SPM buoys. Removal of the components will result in short-term air emissions associated with the operation of construction and demolition equipment. Air Quality impacts for these activities would be of a short-term nature, have control requirements similar to construction activities (cf. above), and are not expected to be significant or adverse.

13.2.6 Summary of Proposed Project Impacts

13.2.6.1 Noise

Construction and operation of the Proposed Project are expected to result in temporary and permanent impacts on sound levels in the Proposed Project vicinity. Installation of the Harbor Island Booster Station will generate noise due to operation of construction equipment; however, noise is not expected to exceed the USEPA's guidance level (55 dBA L_{dn}) at the nearest NSA, which is about 0.8 mi (1.3 km) away.

Temporary noise during installation of the pipelines will result from typical pipeline construction, HDDs, and vessel activity (including the pipeline lay barge). Composite construction noise for typical land-based pipeline construction could exceed the USEPA-recommended 55 dBA L_{dn} (which is equivalent to a continuous sound level of 48.6 dBA when nighttime construction is planned) along the pipelines. Pipeline construction is expected to occur over a 4-month period for the Onshore Pipelines, and over an 8.5-month period for the Inshore Pipelines; however, active pipeline construction at any location will be temporary.

Estimated noise from HDD construction could exceed the USEPA's guideline level of 55 dBA L_{dn} at the nearest residential NSAs to four HDD locations (the HDD 4 entry, HDD 5 exit, HDD 6 entry, and HDD 7 entry sites) without additional noise mitigation. However, if additional recommended noise mitigation measures are employed at each location, the sound level at the NSA nearest to each HDD will be below 55 dBA L_{dn} and the sound level increases above ambient will not be perceptible (less than 3 dB). Because HDD construction will be limited to a maximum of 9 weeks at each location, and given BWTT's intent to implement noise mitigation measures identified in Section 13.5, noise impacts from HDD construction will be temporary and minor. Impacts from HDD construction on noise levels at sensitive wildlife habitat (including designated critical habitat for the piping plover) will be temporary and negligible.

Construction of the SPM buoy systems will also generate airborne noise from pile-driving and construction and support vessels. Offshore noise from installation of the SPM buoy systems will be temporary and limited to the period of active construction. Given the intermittent, temporary nature of construction noise and distance from shore, impacts on human receptors will be negligible.

During operations, equipment at the Harbor Island Booster Station will result in localized noise. Operation of the Harbor Island Booster Station will not result in an audible increase above ambient sound levels at the nearest NSAs; therefore, impacts due to operations will be permanent but negligible. Noise from operation of the SPM buoy systems will be virtually non-existent because the SPM buoy systems do not contain any mechanical engines, pumps, or generators that will be running continuously during operation. Intermittent noise will be generated by support tugs and VLCCs calling at the SPM buoy systems (about 192 times per year). No significant increase in vessel traffic is anticipated in the Proposed Project area, and therefore airborne noise impacts from vessel traffic during operations will be localized and negligible.

Decommissioning of the Proposed Project will result in minor sound level increases during removal of Proposed Project facilities similar to those associated with installation; activity at any one location is of short duration. Therefore, decommissioning of the Proposed Project will not result in significant noise impacts; impacts will be temporary and minor to negligible.

13.2.6.2 Air Quality

Air Quality could be impacted during construction of the Project due to emissions of dust and products of combustion from construction equipment and excavation/land clearing activities onshore/inshore and emissions of products of combustion from construction and supply vessels offshore.

There are anticipated to be insignificant emissions from storage tanks, pipeline pigging and wastewater treatment facilities. The operational impacts to air quality include emissions of hydrocarbons from loading of the vessels with a work-practice of submerged fill loading and vessel VOC management and emissions of products of combustion from VLCC and support vessels.

During decommissioning, there is potential for air quality impacts due to emissions of dust and products of combustion from construction equipment and demolition/ land clearing activities and emissions of products of combustion from demolition and supply vessels.

13.3 Alternative Project

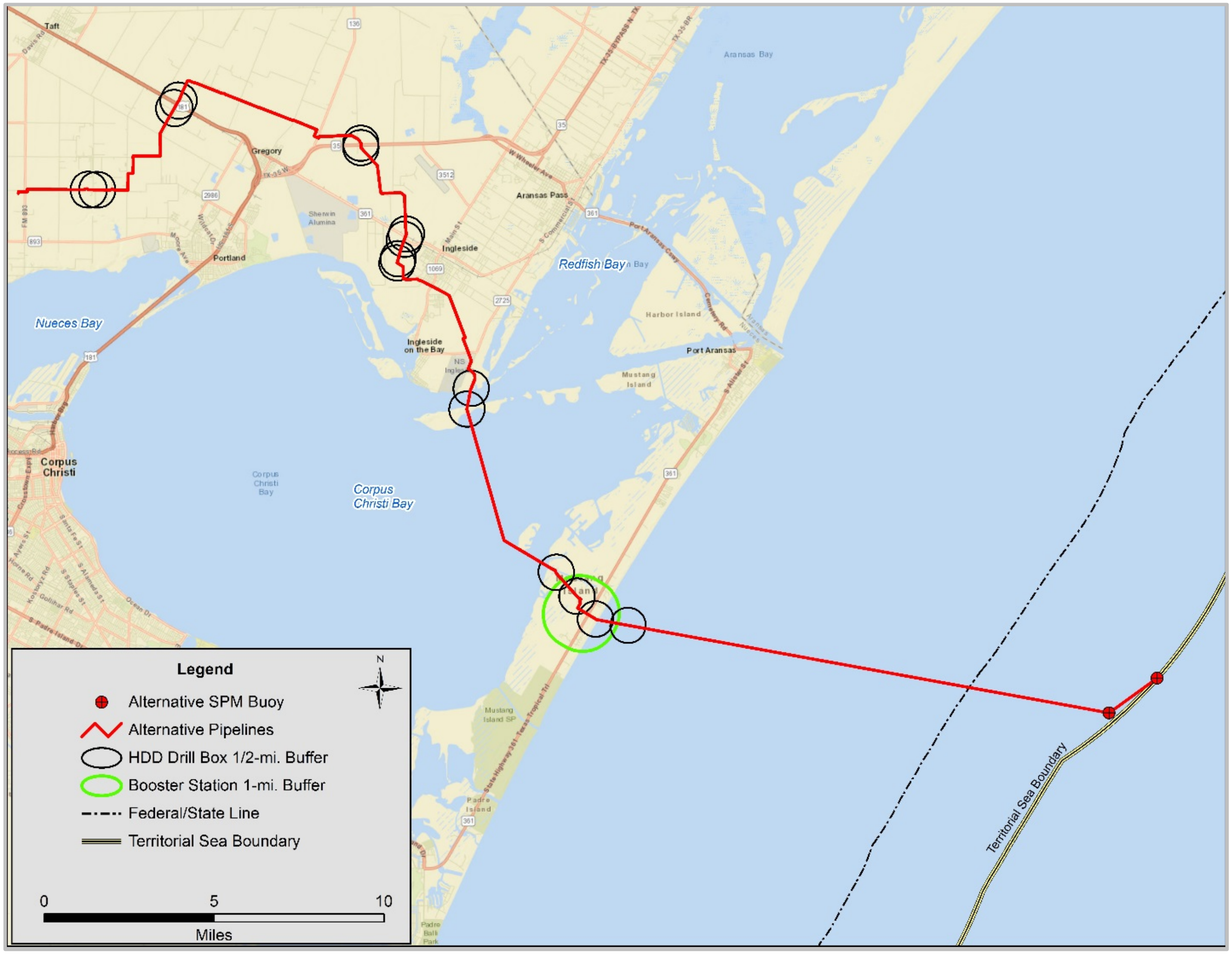
The Alternative Project would include installation of approximately 48.6 mi (78.2 km) of dual, 30-inch-diameter pipeline and the offshore SPM buoy systems located in 87 ft (27 m) of water, within the Exclusive Economic Zone (EEZ). Impacts on airborne noise would occur during construction, operations, and decommissioning of the Alternative Project components in the vicinity of NSAs ; those impacts are discussed below. Refer to Appendix A: Construction, Operation and Decommissioning Procedures, for a detailed description of techniques, procedures, and phases of the Alternative Project that were used to evaluate environmental consequences in the following sections.

13.3.1 Alternative Project Area

13.3.1.1 Noise

The Alternative Project area considered for ambient sound and noise impacts includes the nearest NSAs within 0.5 mi of HDD construction and within 1 mi of the Alternative Booster Station, as well as other potential noise receptors in the immediate vicinity of the Onshore Pipelines, Inshore Pipelines, Offshore Pipelines, and both SPM buoys (which make up the SPM buoy systems). The Alternative Project area is depicted in Figure 13-7. Underwater sound is addressed in Section 8: Wildlife and Protected Resources.

Figure 13-7: Alternative Project Area, Noise Analysis



13.3.1.1.1 AMBIENT NOISE

The Alternative Project crosses similar land uses and is located within about 10 mi (16 km) southwest of the Proposed Project in onshore and inshore areas. Therefore, the Alternative Project would be subject to similar existing ambient noise sources, including local road traffic, high altitude aircraft overflights, helicopters, commercial and recreational vessels, and natural sounds such as wildlife vocalizations, wind, and vegetation. Land uses and their associated human activities have different ambient sound levels.

NSAs in the vicinity of the Alternative Project are similar to those near the Proposed Project, including residences in the communities crossed by the pipelines, such as Ingleside. HDDs would be used to cross sensitive environmental features, major roads, and, where feasible, inshore and nearshore waters, similar to the Proposed Project. Field surveys were not conducted along the Alternative Project to quantify ambient sound levels; however, the nearest NSAs within 0.5 mi of each HDD entry and exit location and within 1 mi of the Alternative Booster Station were identified using available aerial imagery. Ambient sound levels at these locations would be similar to those identified for the Proposed Project, and Table 13-20, below, identifies the nearest NSAs within 0.5 mi of each Alternative HDD and the nearest NSAs to the Alternative Booster Station. NSAs are depicted in Figure 13-8; however, HDD 2 is the same as HDD 2 along the Proposed Project and NSAs in the vicinity are assessed in Appendix S.

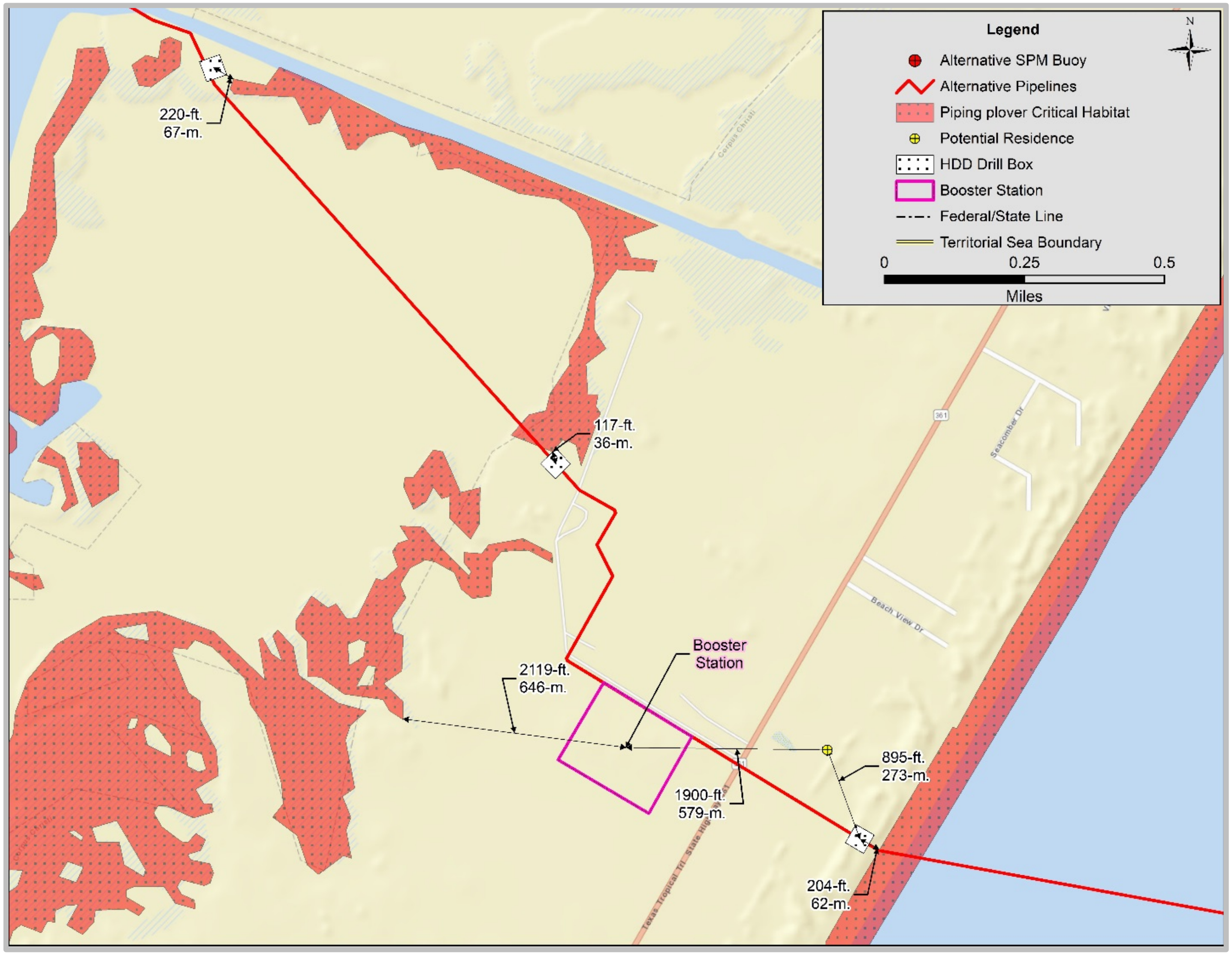
Table 13-20: Nearest Noise Sensitive Areas within 0.5 mi of Alternative HDDs and 1 mi of the Alternative Booster Station

Facility/ HDD Number	HDD Entry/ Exit Location	NSA Description[a]	Distance and Direction to Construction Workspace (ft/m)	Ambient Sound Level (L_{dn} dBA)[b]
Alternative Booster Station				
Booster Station		Potential Residence	1,900 ft (579 m; S)	51.2
		Piping plover critical habitat	2,119 ft (646 m; NW)	59.0
Alternative Onshore Pipelines				
2	entry	Residence	1,700 ft (518 m; W)	54.4
	exit	Residence	1,650 ft (503 m; NW)	54.4
Alternative Inshore Pipelines				
7	entry	Piping plover critical habitat	117 ft (32 m; NW)	59.0
	exit	Piping plover critical habitat	220 ft (67 m; SE)	59.0
8	entry	Piping plover critical habitat	204 ft (62 m; E)	59.0
		Potential Residence	895 ft (273 m; SE)	51.2

[a] No NSAs were identified within 0.5 mi of HDDs 1, 3, 4, 5, and 6. The final identification of HDD entry and exit pits along the Alternative Pipelines are pending. HDD 2 is the same as HDD 2 along the Proposed Project.

[b] Sound levels are based on similar NSAs where noise measurements were collected for the Proposed Project, as presented in Table 13-3.

Figure 13-8: NSAs in the Vicinity of the Alternative Project HDDs and Booster Station



The Alternative Onshore Pipelines would cross predominantly developed areas in Ingleside. Outside of incorporated areas, the Alternative Onshore Pipelines cross predominantly open and agricultural land, as well as some areas of wetlands. Where the Alternative Booster Station would be installed on Mustang Island, the nearest potential NSA is about 0.4 mi (0.6 km) away from the site center. The facility site is on undeveloped, open land (see Section 12: Coastal Zone Uses, Recreation, and Aesthetics). Similarly, where onshore construction activities are planned on Mustang Island, the Alternative Inshore Pipelines would cross primarily undeveloped land, but adjacent to existing disturbance (e.g., roadways, powerlines).

13.3.1.2 Climatology/Meteorology

The Alternative Project is in the same region as the Proposed Project; therefore, the climate and meteorological conditions are similar to the conditions at the Proposed Project site described above in Section 13.2.2.1.

13.3.1.3 Air Quality

The Alternative Project area differs from the Proposed Project in the specific onshore location of project components however, for the sake of this analysis, the area and scope of analysis are considered the same due to the general location of the Alternative Project in the Corpus Christi area and the Western Gulf of Mexico.

13.3.2 Alternative Project Construction Impacts

13.3.2.1 Noise

13.3.2.1.1 BOOSTER STATION

The primary sources of noise for construction of the Alternative Booster Station would be operation of internal combustion engines in construction equipment including cranes, compressors, generators, welders, excavators. During construction, sound levels would temporarily increase in the immediate vicinity of the site, and impacts would be similar to those described in Section 13.2.2.2.2 for the Proposed Project.

Using an estimated number of construction equipment for construction of the Alternative Booster Station, the composite sound level associated with the construction was estimated using the method described above for the Proposed Project.

Table 13-21 identifies the sound levels associated with typical construction equipment and the estimated composite construction noise levels at a distance of 50 ft (15 m) and at the nearest NSA (a potential residence) to construction of the Alternative Booster Station. The estimates are conservative, since it is unlikely that all equipment would be operated simultaneously. The construction equipment counts are an estimate based on currently available information; the specific equipment required for installation of each Alternative Project component would be determined by the construction contractor. Based on the assessment in Table 13-21, we estimate that construction at the Alternative Booster Station could exceed the level recommended in USEPA's guidance (55 dBA L_{dn}) if all equipment operates simultaneously.

Table 13-21: Representative Construction Equipment Noise Sources for Alternative Booster Station Construction (L_{max})[a]

Equipment	Sound Pressure Level (dBA) at 50 ft	Equipment Count	Composite Sound Level (50 ft/15 m)	Composite Sound Level at the nearest NSA (1,900 ft/579 m)
Backhoe	78	1	78	46.4
Bulldozer	82	1	82	50.4
Dump truck	76	1	76	44.4
Front end loader	79	1	79	47.4
Generator	87	1	87	55.4
Grader	89	1	89	57.4
Pickup truck	75	1	75	43.4
Composite Sound Level			**92.2**	**60.6**

a L_{max} is the highest measured sound level observed during a measurement period

b The sound level in dBA at 50 ft (15 m) is a measured value; the estimate at the nearest NSA is a conservative modeled estimate assuming no attenuation other than by distance.

Sources: FHWA 2006, Hoover & Keith, Inc. 2000.

13.3.2.1.2 PIPELINES

ONSHORE/INSHORE PIPELINE INSTALLATION

Similar to the Alternative Project, the primary sources of noise during construction of the Alternative Onshore Pipelines would be generated by internal combustion engines in construction equipment and the HDD drill rigs. Table 13-10 estimates the composite sound levels associated with typical pipeline construction at various distances from construction for the Proposed Project, and construction noise associated with the Alternative Project would be similar. Composite construction noise could exceed the USEPA-recommended 55 dBA L_{dn} (which is equivalent to a continuous sound level of 48.6 dBA when nighttime construction is planned) along the pipelines. Pipeline construction would be expected to occur over a schedule similar to the Proposed Project and active pipeline construction at any location would be temporary. The exception would be installation of the pipelines within Corpus Christi Bay via underwater jetting/trenching methods, described below for offshore pipeline installation, which would have a slightly longer construction duration as compared to the Proposed Project. Construction would be scheduled to occur primarily during daylight hours. Typical pipeline construction is expected to move along the pipeline route, such that any single area experiences only a short duration of construction noise. Because Alternative Onshore Pipeline installation would be temporary and limited to the period of active construction, impacts on noise receptors would be localized and negligible.

BWTT would use HDD construction to install the pipelines along the Alternative Project. HDDs would be used to cross sensitive environmental features, major roads, and, where feasible, inshore and nearshore waters, similar to the Proposed Project. Impacts at nearby NSAs would be similar to those identified in Table 13-10 for the Proposed Project.

Field surveys were not conducted along the Alternative Project to quantify ambient sound levels; however, NSAs within 0.5 mi of each HDD entry and exit location along the Alternative Project were identified using available aerial imagery. Estimated noise impacts from HDD construction based on the data collected for the Proposed Project are presented in Table 13-11 using the standard formula to calculate sound attenuation over distance described above.

Table 13-12 quantifies the sound levels due to HDD construction measured at the nearest NSAs within 0.5 mi of each HDD entry and exit location.

Estimated noise from HDD construction would be expected to exceed the USEPA's guideline level of 55 dBA L_{dn} at the nearest residential NSAs to HDD construction. BWTT would likely implement mitigation measures similar to those identified in Section 13.2.3.1.2 for the Proposed Project to minimize impacts. Further, because HDD construction would be limited to an estimated maximum of 9 weeks at each location, noise impacts from HDD construction along the Alternative Project is expected to be temporary and minor.

Where HDD construction would occur near designated critical habitat for the piping plover, construction of the Alternative Project could result in more than a perceived doubling of sound (10 dB) as described in Table 13-22. Impacts due to noise from HDD construction would be temporary, and the use of HDD construction would avoid disturbance of critical habitat due to trenching. Impacts of construction noise on terrestrial wildlife, including piping plovers and sea turtles that could use the beach near the Alternative Project, are addressed in Section 8: Wildlife and Protected Resources.

BWTT would also install portions of the Alternative Pipelines using underwater jetting/trenching methods, as described below for offshore pipeline installation. Impacts from vessel activity in inshore areas along the Proposed Project will not occur. Impacts due to underwater trenching in inshore areas would be similar to those described for offshore pipeline installation along the Proposed Offshore Pipelines.

Table 13-22: Noise Impacts for the Nearest NSA within 0.5 mi of Each HDD[a]

HDD No	Entry/Exit Location	NSA Description	Distance and Direction to Construction Workspace (ft/m)	Ambient Sound Level (L_{dn} dBA)	L_{dn} due to HDD Construction (dBA)	L_{dn} (HDD + Ambient; dBA)	Increase Above Ambient (dB)
Onshore Pipelines							
2[b]	entry	Residence	1,700 ft (518 m; W)	54.4	53.5	57.0	2.6
	exit	Residence	1,650 ft (503 m; NW)	54.4	42.4	54.7	0.3
Inshore Pipelines							
7	entry	Piping plover critical habitat	117 ft (32 m; NW)	59.0	76.7	76.8	17.8
	exit	Piping plover critical habitat	220 ft (67 m; SE)	59.0	60.6	62.9	3.9
8	entry	Piping plover critical habitat	204 ft (62 m; E)	59.0	71.9	72.1	13.1
		Potential Residence	895 ft (273 m; SE)	51.2	59.1	59.7	8.5

a No NSAs were identified within 0.5 mi of HDDs 1, 3, 4, 5, and 6. The final locations of HDDs entry and exit pits along the Alternative Pipelines have not been determined.
b HDD 2 is the same as HDD 2 along the Proposed Project.

OFFSHORE (UNDERWATER) PIPELINE INSTALLATION

Typically, installation of the pipelines in the GOM would be conducted by jetting/trenching using a pipe laying barge and support vessels. The Alternative Offshore Pipelines would be installed by the pipe laying barge for about 16.2

mi (26.1 km). Trenching and backfilling for installation of the pipelines would be completed using a submersible pipeline jetting sled operated from a pipe laying barge. Similar to onshore construction, underwater pipeline installation would progress along the route such that construction at any one location is of short duration. However, pipe laying may occur up to 24 hours per day.

The Alternative Project is in an area subject to noise impacts by commercial vessels operating in the Intracoastal Waterway and navigational fairways in the GOM. Airborne noise from construction and support vessels would be consistent with other vessel activity in the Project vicinity. Sound levels from the pipe laying barge are estimated to be about 90 dBA (consistent with OSHA's 8-hour permissible noise exposure level of 90 dBA), and would be consistent with other vessels operating in the GOM and Intracoastal Waterway. Therefore, nearshore underwater pipeline construction would have localized, negligible impacts on the airborne noise environment.

13.3.2.1.3 SPM BUOYS

Similar to the Proposed Project, noise from operation of the Alternative SPM buoy systems would be virtually non-existent because the SPM buoy systems do not contain any mechanical engines, pumps, or generators that would be running continuously during operation. The only noise sources located at the Alternative SPM buoy systems would be assistant vessels such as tugs and the VLCC while it is moored to the SPM buoy system. Because noise from operations of the SPM buoy systems would be minimal, and any noise produced would be controlled to meet standards established for worker protection, impacts on airborne noise at the SPM buoy systems site would be localized, minor, and limited to the times when vessels are moored. Given the distance of the Alternative Project facilities from shore, no airborne noise impacts on land-based receptors from operation of the SPM buoy systems would occur. While noise from operation of the vessels at the SPM buoy systems could impact recreational boating and fishing in the vicinity of the site, establishment of the Safety Zone around each of the SPM buoy systems would exclude recreational vessels from the immediate area. Therefore, noise from SPM buoy systems operations is not expected to impact recreational activity.

As with the Proposed Project, intermittent noise would be generated by support tugs and VLCCs calling at the Alternative Project SPM buoy systems (about 192 times per year). Noise from service vessels and VLCCs would be transient in the immediate Alternative Project vicinity, limited to the time when they are approaching, loading, and leaving the SPM buoy systems. VLCCs that would call at the SPM buoy systems are similar to other vessels operating in the GOM, as described in Section 13.3.1.1.1. Further, supply vessels and VLCCs transiting to the Alternative SPM buoy systems would generally use established shipping lanes. A minimum of two support tugs ad one smaller support vessel would be on location at the SPM buoy systems during operations. No significant increase in vessel or traffic is anticipated in the Alternative Project area, and therefore airborne noise impacts from vessel traffic during operations would be localized and negligible.

13.3.2.2 Air

Air quality impacts associated with Onshore and Inshore Construction activities would consist of emissions from construction equipment as well as possible particulate emissions from excavation and land clearing activities. These impacts would be of a short-term duration, would be subject to control measures (summarized below), and are assumed to be insignificant and not adverse.

Diesel-fired construction equipment must be manufactured in accordance with EPA regulations applying to non-road compression ignition engines (40 CFR Parts 89, 1039), which limit emissions of NO_X, CO, SO_2, particulate and non-methane hydrocarbons from such equipment. The formation of dust during construction operations is subject to TCEQ regulations at 30 TAC § 111.145, which establishes minimum required measures to suppress dust formation. These include the use of water to control dust formation during construction and land clearing operations, and the use of enclosures during sandblasting operations.

13.3.3 Alternative Project Operation Impacts

13.3.3.1 Noise

13.3.3.1.1 BOOSTER STATION

Noise sources during operations at the Alternative Booster Station would include engines, pumps, and other mechanical equipment. Similar to the Proposed Project, the major noise-generating equipment present on site would include four 5,500 horsepower electric motor-driven crude oil pumps that would be located within noise abatement housings to minimize noise during operations. Because all of the equipment at the pump station would not be operated simultaneously, and since the Alternative Booster Station would only be operated during loading, operational sound levels would vary. Estimated noise impacts from operation of the Alternative Booster Station based on the data collected for the Proposed Project are presented in Table 13-23 using the standard formula to calculate sound attenuation over distance described above. Operation of the Alternative Booster Station would not result in an audible increase above ambient sound levels at the nearest residential NSA; therefore, impacts due to operations would be permanent but negligible.

Table 13-23: Operational Noise for the Alternative Booster Station

NSA Description	Distance and Direction to Construction Workspace(ft/m)	Ambient Sound Level (L_{dn} dBA)	L_{dn} due to the Booster Station	L_{dn} (Booster Station + Ambient)	Increase Above Ambient
Potential Residence	1,900 ft (579 m; S)	51.2	49.3	53.4	2.2
Piping plover critical habitat	2,119 ft (646 m; NW)	59.0	48.0	59.3	0.3

Because operations would emit continuous sound, the Alternative Booster Station could affect nearby wildlife. Noise could affect animal behavior, and cause wildlife species to move away from the noise or relocate to avoid the sound. However, given the availability of similar habitat near the facility, the minor impact on sound levels at designated critical habitat areas less than 1 mi from the site, the use of noise abatement housings, and because operational noise would quickly attenuate with distance from the facility, the increased noise would result in permanent, but negligible impacts on wildlife. See Section 8: Wildlife and Protected Resources for additional detail regarding wildlife impacts.

13.3.3.1.2 PIPELINES

Because the SPM buoy systems for the Alternative Project would be located 13.4 nautical miles (15.4 mi [24.8 km]) off the coast of Mustang Island), similar to the Proposed Project, impacts on land-based noise sensitive receptors are anticipated to be limited to the temporary period of onshore and nearshore pipeline installation. No onshore or inshore operational noise impacts are anticipated for the pipelines.

13.3.3.1.3 SPM BUOYS

Noise from operation of the Alternative SPM buoy systems would be virtually non-existent because the SPM buoy systems do not contain any mechanical engines, pumps, or generators that would be running continuously during operation. The only noise sources located at the SPM buoy systems would be assistant vessels such as tugs and the VLCC while it is moored to the SPM buoy system. Because noise from operations of the SPM buoy systems would be minimal, and any noise produced would be controlled to meet standards established for worker protection, impacts on airborne noise at the Alternative SPM buoy systems site would be localized, minor, and limited to the times when vessels are moored. Given the distance of the Alternative Project facilities from shore, no airborne noise impacts on land-based receptors from operation of the SPM buoy systems would occur. While noise from operation of the vessels at the Alternative SPM buoy systems could impact recreational boating and fishing in the vicinity of the site, establishment of the Safety Zone around each of the SPM buoy systems would exclude recreational vessels from the immediate area. Therefore, noise from operation of the Alternative SPM buoy systems is not expected to impact recreational activity.

Similar to the Proposed Project, Intermittent noise would be generated by support tugs and VLCCs calling at the Alternative SPM buoy systems. Noise from service vessels and VLCCs would be transient in the immediate Alternative Project vicinity, limited to the time when they are approaching, loading, and leaving the SPM buoy systems. VLCCs that would call at the SPM buoy systems are similar to other vessels operating in the GOM, as described in Section 13.3.1.1.1. Further, supply vessels and VLCCs transiting to the SPM buoy systems would generally use established shipping lanes. No significant increase in vessel traffic is anticipated in the Alternative Project area, and therefore airborne noise impacts from vessel traffic during operations would be localized and negligible.

13.3.3.2 Air Quality

The Alternative Project does not materially differ from the Proposed Project in terms of the level of air pollutant emissions expected. The activities that give rise to the most significant emissions of air pollutants (loading operations vessel traffic during operations) are substantially similar under both the Proposed Project and the Alternative Project. Since significant air quality impacts from the Project would be confined to the offshore areas in the vicinity of the SPM buoys, and offshore existing conditions are similar for both the Proposed and Alternative Projects, no qualitative difference in air impacts is anticipated for the alternative project.

Although significant onshore air quality impacts are not expected under either scenario, it is relevant to note that the SPM buoys are located closer to a populated area under the alternative project. To the extent onshore air quality impacts occur, they would be more likely to occur at a populated area under the alternative project.

13.3.4 Alternative Project Decommissioning Impacts

13.3.4.1 Noise

Similar to the Proposed Project, decommissioning of the Alternative Project would include abandonment in-place of the Onshore and Inshore Pipelines, removal of the Alternative Booster Station, and removal of the Offshore Pipelines and SPM buoys. Removal of the components would result in minor sound level increases similar to those associated with installation; underwater pipeline removal would progress along the route such that activity at any one location is of short duration. Decommissioning activity would result in a temporary sound level increase in the immediate vicinity of the Alternative SPM buoys due to increased vessel activity, and sound generated by disassembly and removal of the facilities. The need for blasting to remove Alternative Project facilities is not anticipated. Therefore, decommissioning would not result in significant noise impacts.

13.3.4.2 Air

Decommissioning of the Alternative Project will include abandonment in-place of the Onshore and Inshore Pipelines, removal of the Booster Station, and removal of the Offshore Pipeline and SPM buoys. Removal of the components will result in short-term air emissions associated with the operation of construction and demolition equipment. Air Quality impacts for these activities would be of a short-term nature, have control requirements similar to construction activities (above), and are not expected to be significant or adverse.

13.3.5 Summary of Alternative Project Impacts

13.3.5.1 Noise

Construction and operation of the Alternative Project are expected to result in temporary and permanent impacts on sound levels in the Project vicinity. Installation of the Alternative Booster Station would generate noise due to operation of construction equipment. The nearest potential NSA is about 0.4 mi (0.6 km) away from the site center and construction at the Alternative Booster Station could exceed the level recommended in USEPA's guidance (55 dBA L_{dn}) if all equipment operates simultaneously.

Temporary noise during installation of the Alternative Pipelines would result from typical pipeline construction, HDDs, and vessel activity (including the pipeline lay barge). Composite construction noise for typical land-based pipeline construction could exceed the USEPA-recommended 55 dBA L_{dn} (which is equivalent to a continuous sound level of 48.6 dBA when nighttime construction is planned) along the pipelines. Pipeline construction is expected to occur over a schedule similar to the Proposed Project and active pipeline construction at any location would be temporary. The exception would be installation of the pipelines within Corpus Christi Bay via underwater jetting/trenching methods; impacts from vessel activity in inshore areas along the Proposed Project will not occur.

Estimated noise from HDD construction could exceed the USEPA's guideline level of 55 dBA L_{dn} at the nearest residential NSAs to one location without additional noise mitigation. However, BWTT would implement noise mitigation measures such that the sound level at the NSA nearest to each HDD would be below 55 dBA L_{dn} and the sound level increases above ambient would not be perceptible (less than 3 dB). Because HDD construction would be limited to a maximum of 9 weeks at each location, and given BWTT's intent to implement noise mitigation measures, noise impacts from HDD construction of the Alternative Project would be temporary and minor. Impacts from HDD construction on noise levels at sensitive wildlife habitat (including designated critical habitat for the piping plover) could result in more than a perceived doubling of sound (10 dB). Impacts due to noise from HDD construction would be temporary, and the use of HDD construction would avoid disturbance of critical habitat due to trenching.

Construction of the Alternative SPM buoy systems would also generate airborne noise from pile-driving and construction and support vessels. Offshore noise from installation of the Alternative SPM buoy systems would be temporary and limited to the period of active construction. Given the intermittent, temporary nature of construction noise and distance from shore, impacts on human receptors would be negligible.

During operations, equipment at the Alternative Booster Station would result in localized noise. Operation of the Alternative Booster Station would not result in an audible increase above ambient sound levels at the nearest NSA; the estimated increase is 2.2 dB. Therefore, impacts due to operations would be permanent but negligible. Noise from operation of the SPM buoy systems would be virtually non-existent because the Alternative SPM buoy systems do not contain any mechanical engines, pumps, or generators that would be running continuously during operation. Intermittent noise would be generated by support tugs and VLCCs calling at the Alternative SPM buoy systems (about 192 times per year). No significant increase in vessel traffic is anticipated in the Alternative Project area, and therefore airborne noise impacts from vessel traffic during operations would be localized and negligible.

Decommissioning of the Alternative Project would result in minor sound level increases during removal of Project facilities similar to those associated with installation; activity at any one location is of short duration. Therefore, decommissioning of the Alternative Project would not result in significant noise impacts; impacts would be minor to negligible.

13.3.5.2 Air Quality

Air Quality could be impacted during construction of the Project due to emissions of dust and products of combustion from construction equipment and excavation/land clearing activities onshore/inshore and emissions of products of combustion from construction and supply vessels offshore.

There are anticipated to be insignificant emissions from storage tanks, pipeline pigging and wastewater treatment facilities. The operational impacts to air quality include emissions of hydrocarbons from loading of the vessels with a work-practice of submerged fill loading and vessel VOC management and emissions of products of combustion from VLCC and support vessels.

During decommissioning, there is potential for air quality impacts due to emissions of dust and products of combustion from construction equipment and demolition/ land clearing activities and emissions of products of combustion from demolition and supply vessels.

13.4 Summary of Impacts

A summary of impacts for both the Proposed Project and Alternative Project is presented in Table 13-24 below.

13.4.1 Noise

Construction and operation of the Proposed and Alternative Projects are expected to result in temporary and permanent impacts on sound levels in the Project vicinity. Installation of the Harbor Island Booster Station and the Alternative Booster Station will generate noise due to operation of construction equipment. The nearest potential NSAs are about 0.8 mi (1.3 km) from the Harbor Island Booster Station and 0.4 mi (0.6 km) away from the Alternative Booster Station site center. At those distances, construction of the Harbor Island Booster Station is not expected to exceed the USEPA's guidance level (55 dBA L_{dn}); however, construction of the Alternative Booster Station would if all equipment operates simultaneously.

Temporary noise during installation of the Proposed and Alternative Pipelines will result from typical pipeline construction, HDDs, and vessel activity (including the pipeline lay barge). Composite construction noise for typical land-based pipeline construction could exceed the USEPA-recommended 55 dBA L_{dn} (which is equivalent to a continuous sound level of 48.6 dBA when nighttime construction is planned) along the pipelines. Pipeline construction is expected to occur over a similar schedule for each Project scenario. However, the installation of the Alternative Inshore Pipelines within Corpus Christi Bay via underwater jetting/trenching methods would result in temporary noise impacts from vessel activity; similar impacts in inshore areas along the Proposed Project will not occur.

Estimated noise from HDD construction could exceed the USEPA's guideline level of 55 dBA L_{dn} at the nearest residential NSAs to four locations along the Proposed Project and one location along the Alternative Project. However, BWTT would implement noise mitigation measures such that the sound level at the NSA nearest to each HDD would be below 55 dBA L_{dn} and the sound level increases above ambient would not be perceptible (less than 3 dB) under either Project scenario. Because HDD construction will be limited to a maximum of 9 weeks at each location, and given BWTT's intent to implement noise mitigation measures, noise impacts from HDD construction of the Proposed and Alternative Projects will be temporary and minor. Impacts from HDD construction on noise levels at sensitive wildlife habitat (including designated critical habitat for the piping plover) will be temporary and negligible for the Proposed Project; however, the Alternative Project could result in more than a perceived doubling of sound (10 dB).

Construction of the Proposed and Alternative SPM buoy systems will also generate airborne noise from pile-driving and construction and support vessels. Offshore noise from installation of the SPM buoy systems will be temporary and limited to the period of active construction. Given the intermittent, temporary nature of construction noise and distance from shore, impacts on human receptors will be negligible.

During operations, equipment at the Harbor Island and Alternative Booster Stations will result in localized noise. Operation of the Harbor Island and Alternative Booster Stations will not result in an audible increase above ambient sound levels at the nearest NSA; the estimated increase is up to 0.3 dB under the Proposed Project and 2.2 dB under the Alternative Project. Therefore, impacts due to operations will be permanent but negligible. Noise from operation of the SPM buoy systems will be virtually non-existent because the Alternative SPM buoy systems do not contain any mechanical engines, pumps, or generators that will be running continuously during operation. Intermittent noise will be generated by support tugs and VLCCs calling at the Alternative SPM buoy systems (about 192 times per year).

No significant increase in vessel traffic is anticipated in the Project area, and therefore airborne noise impacts from vessel traffic during operations will be localized and negligible.

Decommissioning of the Proposed and Alternative Projects will result in minor sound level increases during removal of Project facilities similar to those associated with installation; activity at any one location is of short duration. Therefore, decommissioning of the Proposed and Alternative Projects will not result in significant noise impacts; impacts will be minor to negligible.

In summary, construction and operation of the Proposed and Alternative Projects are expected to result in temporary and permanent impacts on sound levels in the Project vicinity. Installation of the Harbor Island and Alternative Booster Stations will generate noise due to operation of construction equipment. The nearest potential NSAs are about 0.8 mi (1.3 km) from the Harbor Island Booster Station and 0.4 mi (0.6 km) away from the Alternative Booster Station site center. At those distances, construction of the Harbor Island Booster Station is not expected to exceed the USEPA's guidance level (55 dBA L_{dn}); however, construction of the Alternative Booster Station would if all equipment operates simultaneously. In addition, greater noise impacts would occur on sensitive wildlife habitat during HDD construction of the Alternative Project. Finally, while neither of the Proposed and Alternative Booster Stations will result in an audible noise level increase at the nearest NSAs, the noise increase associated with the Alternative Booster Station would be greater. Therefore, the Proposed Project is the least environmentally damaging practicable alternative (LEDPA).

13.4.2 Air Quality

Air Quality could be impacted during construction of the Project due to emissions of dust and products of combustion from construction equipment and excavation/land clearing activities onshore/inshore and emissions of products of combustion from construction and supply vessels offshore.

There are anticipated to be insignificant emissions from storage tanks, pipeline pigging and wastewater treatment facilities.

The operational impacts to air quality include emissions of hydrocarbons from loading of the vessels with a work-practice of submerged fill loading and vessel VOC management and emissions of products of combustion from VLCC and support vessels. No exceedance of the ESL is predicated at any land-based receptor. Maximum hydrogen sulfide impacts are less than the state standard that would apply if the impacts occurred in state jurisdictional waters. The results of the quantitative analysis presented in this section indicate that no adverse air quality impacts are expected for the project.

During decommissioning, there is potential for air quality impacts due to emissions of dust and products of combustion from construction equipment and demolition/ land clearing activities and emissions of products of combustion from demolition and supply vessels.

Table 13-24: Summary of Impacts

		Construction	Operation	Decommissioning
NOISE				
Proposed Project	**Onshore**	Temporary, minor increased noise due to operation of construction equipment, including HDDs, along the pipelines for installation. With planned mitigation, HDDs will not result in perceptible sound increases at NSAs.	None.	None; the Onshore Pipelines will be abandoned in-place.
	Inshore	Temporary, minor increased noise due to operation of construction equipment, including HDDs, along the pipelines for installation and at the Harbor Island Booster Station; USEPA guidance levels are not expected to be exceeded for construction of the Harbor Island Booster Station. Temporary, negligible impacts on noise levels at sensitive wildlife habitat during HDDs.	Permanent, negligible impacts due to increased noise during Harbor Island Booster Station operation (0.3 dB increase at the nearest NSA).	Temporary, minor to negligible increased noise due to operation of construction equipment during removal of the Harbor Island Booster Station.
	Offshore	Temporary, negligible impacts on human receptors from increased noise due to operation of vessels and pile-driving for installation of the pipelines and SPM buoy systems.	Intermittent, localized, negligible increased noise due to operation of vessels during VLCC loading.	Temporary, minor to negligible increased noise due to operation of construction equipment and vessel activity.
Alternative Project	**Onshore**	Increased noise due to operation of construction equipment, including HDDs. With planned mitigation, HDDs would not result in perceptible sound increases at NSAs.	None.	None; the Alternative Onshore Pipelines would be abandoned in-place.
	Inshore	Temporary, minor increased noise due to operation of construction equipment, including HDDs, along the pipelines for installation and at the Alternative Booster Station. *Noise from construction of the Alternative Booster Station could exceed USEPA guidance levels at the nearest NSA. *Temporary, minor noise from vessel activity during installation of the pipelines across Corpus Christi Bay. *Temporary doubling of sound or more at sensitive wildlife habitat during HDDs.	Permanent, negligible impacts due to increased noise during Alternative Booster Station operation (2.2 dB increase at the nearest NSA).	Temporary, minor to negligible increased noise due to operation of construction equipment during removal of the Alternative Booster Station.
	Offshore	Temporary, negligible impacts on human receptors from increased noise due to operation of vessels and pile-driving for installation of the pipelines and SPM buoy systems.	Intermittent, localized, negligible increased noise due to operation of vessels during VLCC loading.	Temporary, minor to negligible increased noise due to operation of construction equipment and vessel activity.

Table 13-24: Summary of Impacts

		Construction	Operation	Decommissioning
AIR QUALITY				
Proposed Project	**Onshore**	Emissions of dust and products of combustion from construction equipment and excavation/land clearing activities.	None.	Emissions of dust and products of combustion from construction equipment and excavation/land clearing activities.
	Inshore	Emissions of dust and products of combustion from construction equipment and excavation/land clearing activities.	Insignificant emissions from storage tanks, pipeline pigging and wastewater treatment facilities.	Emissions of dust and products of combustion from construction equipment and excavation/land clearing activities.
	Offshore	Emissions of products of combustion from construction and supply vessels.	Emissions of hydrocarbons from loading with a work-practice of submerged fill loading and vessel VOC management; emissions of products of combustion from VLCC and support vessels.	Emissions of products of combustion from construction and supply vessels.
Alternative Project	**Onshore**	Emissions of dust and products of combustion from construction equipment and excavation/land clearing activities.	None.	Emissions of dust and products of combustion from construction equipment and excavation/land clearing activities.
	Inshore	Emissions of dust and products of combustion from construction equipment and excavation/land clearing activities.	Insignificant emissions from storage tanks, pipeline pigging and wastewater treatment facilities.	Emissions of dust and products of combustion from construction equipment and excavation/land clearing activities.
	Offshore	Emissions of products of combustion from construction and supply vessels.	Emissions of hydrocarbons from loading with a work-practice of submerged fill loading and vessel VOC management; emissions of products of combustion from VLCC and support vessels.	Emissions of products of combustion from construction and supply vessels.

*indicates an environmental consequence that is more impactful as compared to the other Project alternative.

13.5 Mitigation of Proposed Project Impacts

The Proposed Project is the least environmentally damaging practicable alternative (LEDPA) choice in regard to air quality and noise impacts. Therefore, mitigation measures for the anticipated air quality and noise from only the Proposed Project are discussed in this section.

Impacts from pipeline construction on nearby NSAs will be temporary during active construction in the immediate vicinity. Noise will be attenuated using housing structures on all pumps or mechanical engines that emit noise above the acceptable limit, meeting all regulations. As recommended in Appendix S, BWTT will investigate the use of site-specific noise mitigation at HDDs 4, 5, 6, and 7, including the use of temporary barriers between construction workspace and nearby NSAs and enclosures surrounding HDD equipment.

Given the distance of the SPM buoys and Harbor Island Booster Station from NSAs, impacts are not anticipated and additional noise mitigation measures are not necessary for the Project. However, the Harbor Island Booster Station pumping systems will be located within noise abatement housings to minimize noise during operations to the maximum extent practicable

For air quality purposes, mitigation measures correspond to control measures specified in an applicable regulation or in an enforceable construction or operating permit. Anticipated control requirements have been identified at various points in the preceding discussion and should be regarded as specific mitigation measures that will be undertaken.

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