Deepwater Port License Application
Blue Marlin Offshore Port (BMOP) Project

Volume IIb – Onshore Project Components Environmental Evaluation (Public)

Topic Report 7: Soils and Geologic Resources

Submitted to:

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September 2020

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Deepwater Port License Application
Blue Marlin Offshore Port (BMOP) Project

Volume I:	General (Public), including Deepwater Port License Application and Appendices (*under separate cover*)
Volume IIa:	Offshore Project Components Environmental Evaluation (Public) (*under separate cover*)
Volume IIb:	**Onshore Project Components, Environmental Evaluation (Public)** **(*herein*)**
Volume III:	Technical Information [***Confidential***] (*under separate cover*)
Volume IV:	Company and Financial Information [***Confidential***] (*under separate cover*)

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ABBREVIATIONS AND ACRONYMS

Applicant	Blue Marlin Offshore Port LLC
ATWS	Additional Temporary Workspace
BMOP	Blue Marlin Offshore Port
BMPs	best management practices
bph	barrels per hour
CALM	Catenary Anchor Leg Mooring
CFR	Code of Federal Regulations
DWP	Deepwater Port
DWPA	Deepwater Port Act
EC	East Cameron
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
g	gravity
GOM	Gulf of Mexico
HDD	horizontal directional drill
LQ	living quarters
MARAD	United States Maritime Administration
mm	millimeter
MLV	mainline valve
MP	milepost
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NT	Nederland Terminal
OCS	Outer Continental Shelf
OD	outer diameter
PHMSA	Pipeline and Hazardous Materials Safety Administration
PLEMs	Pipeline End Manifolds
Project	Blue Marlin Offshore Port Project
ROW	right-of-way
SPAR	Spill Prevention and Response
SSURGO	Soil Survey Geographic
U.S.	United States
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
USFWS	United States Fish and Wildlife Service
VBT	Vent Boom Tripods
VLCCs	very large crude carriers
WC	West Cameron
WEG	wind erodibility group

PROJECT FAST FACTS

General Project Terminology	
Applicant	Blue Marlin Offshore Port LLC
Project Name	Blue Marlin Offshore Port (BMOP)

BMOP Location and General Information	
Nederland Terminal (NT)	The location where the oil for BMOP originates. This is the existing Sunoco Partners Marketing & Terminals L.P. facility located in Nederland, Jefferson County, Texas
New 42-inch Pipeline	37.02 miles of 42-inch pipeline from NT to Station 501
Existing Mainline from Cameron parish Louisiana to WC 509	Cameron Parish, Louisiana Louisiana State Blocks: WC 11, 20, 21 OCS Blocks: WC 21, 44, 43, 58, 79, 78, 95, 114, 113, 132, 133, 148, 169, 170, 183, 196, 205, 212, 213, 224, 230, 241, 245, 246, 255, 258, 259, 266, 269, 276, 275, 277, 282, 408, 431, 432, 433, 456, 459, 482, 483, 484, 508, 509
Deepwater Port Location (Platform – CALM Buoys)	West Cameron Block 509 (WC 509) West Cameron 508 (WC 508) East Cameron 263 (EC 263)
Deepwater Port Water Depth	156 to 162 feet water depth
Loading Capacity	80,000 barrels per hour (bph)

BMOP Deepwater Port Components	
Existing Stingray Pipeline (Mainline)	One existing 36-inch Outer Diameter (OD) pipeline, approximately 104 miles long from Station 501 in Cameron Parish, Louisiana to WC 509. This line consists of the existing 36-inch OD subsea line from WC 509 to Station 701 and the existing 36-inch OD onshore line from Station 501 to Station 701.
Deep Water Port (DWP)	The offshore loading facility site located in WC 509, WC 508, and EC 263. The facilities consist of the existing WC 509 Platform Complex; two new PLEMs and CALM Buoys in WC 508 and EC 263; two new Crude Oil Loading Pipelines from the WC 509 Platform Complex to the PLEMs and the flexible hoses attached to the CALM Buoys. The WC 509 Platform Complex will be converted from gas service to oil and gas service. The converted platforms will support oil export and natural gas transportation.
WC 509 Platform Complex (509 Complex)	The existing WC 509 Platform Complex consists of three platforms and two Vent Boom Tripods (VBT). The WC 509A Platform is the natural gas gathering platform. This will also house the 36-inch riser and pig barrel of the crude oil Mainline. The WC 509B Platform currently is the natural gas compression and control platform. It houses natural gas compressors, separators, the Control Room and Platform Complex's utilities. The WC 509B Platform will continue to house the natural gas separation facilities and the Platform Complex's utilities. It will also house the crude oil Control Room, metering facilities, and pig barrels for the two Crude Oil Loading Lines. The WC 509C Platform is the Living Quarters (LQ) platform and will continue in that role. The WC 509 VBTs are utilized to bridge the natural gas vent piping to a point approximately 660 feet from the 509B Platform and will continue in this role for any planned and emergency natural gas blowdowns.

BMOP Deepwater Port Components	
WC 148 Platform	The existing WC 148 Platform will be converted from natural gas transportation service to oil transportation service. All gas piping facilities on the deck will be removed and replaced with new pipe and a new Mainline Valve (MLV). This valve will be able to be remotely operated.
Catenary Anchor Leg Mooring (CALM) System	There will be two floating Calm Buoys installed approximately 4,710 feet and 6,085 feet from the WC 509B Platform. The CALM Buoys will be installed with a minimum of 5,000 feet separation. Each Buoy will be moored in place with 6 or more anchor chains connected to engineered anchors installed at locations around the Buoy. Flexible hoses will be connected from the PLEMs to the Calm Buoys. Floating flexible hoses will also be connected to the CALM Buoy and, during loading, the opposite end will be connected to the ship. CALM Buoy No. 1 will be installed in WC 508 and CALM Buoy No. 2 will be installed in EC 263.
Crude Oil Loading Pipelines	Two 36-inch diameter pipelines from the existing WC 509B Platform to the PLEMs.
Pipeline End Manifold (PLEM)	One PLEM will be installed on the seafloor at each CALM Buoy. Each PLEM will be connected to a 36-inch Crude Oil Loading Pipeline from the WC 509B Platform and a CALM Buoy floating above the PLEM. The two PLEMs will be in WC 508 and EC 263.
VLCC or other Crude Carrier	Very Large Crude Carriers (VLCCs), Suezmax, Aframax or other large capacity seafaring vessels.
Meter for Measuring Departing Crude Oil	The DWP will have two-meter stations with associated prover and lab facilities. One of the meter stations will be located at the new BMOP Pump Station adjacent to the NT and one will be located on the offshore crude export platform (WC 509B Platform).
Pre-fabrication Yards	Existing yards will be used along the northern Gulf of Mexico (GOM) coast.
Support Facility	An onshore support base will be established at an existing port facility to provide the necessary security to support the DWP operations.

BMOP Onshore Pipeline Components	
BMOP Pump Station	The onshore metering, pumping, and pig launcher station will be located in Nederland, Texas, adjacent to the existing NT.
Onshore Crude Oil Pipeline	A new, approximate 37.02-mile, 42-inch OD pipeline connecting the existing NT in Jefferson County, extending across Orange County, Texas to the existing 36-inch OD Mainline at Station 501 in Cameron Parish, Louisiana.
Station 501	The existing NGPL/Stingray interconnect facility (Station 501) will be abandoned and demolished. A new pig receiver and launcher will be installed to connect the new 42-inch OD onshore pipeline with the existing 36-inch OD onshore Stingray Mainline.
Station 701	The existing compressor Station 701 in Cameron Parish, Louisiana will be demolished. All existing natural gas equipment will be removed from the Station except for several large 10,000-barrel storage tanks. Approximately 1,000 feet of new 36-inch pipe, surge tanks, surge valves, and a new MLV will be installed. The existing 10,000-barrel tanks located at Station 701 will be converted to surge relief tanks.
Stingray ANR Tap Removal Site	BMOP will remove the tap and install 36-inch pipe in its place.

BMOP Onshore Pipeline Components	
Mainline Valves (MLV)	Six new MLVs will be installed within the permanent pipeline right-of-way (ROW) of the new build pipeline. MLVs will also be installed at the BMOP Pump Station, Station 501, and Station 701. These valves will be used for isolation and spill control purposes.
Pipeline Pig Launchers and Receivers	Pig Launchers/Receivers will be located at the BMOP Pump Station, Station 501, and the DWP. These are utilized for cleaning the pipelines and running intelligent devices to assess pipeline integrity.
Access Roads and Canals	The Project will utilize existing access roads and canals. One new temporary access road and four new permanent access roads will be required.
Pipe and Contractor Yards	BMOP will utilize existing facilities along the northern GOM coast, U.S. or international locations for manufacturing pipe and for fabricating the PLEMs, CALM Buoys, and end connectors. Pipe coating activities will be performed at existing facilities along the northern GOM coast. Selection of the marine contractor will be completed after the MARAD filing; however, the successful contractor(s) will utilize existing fabrication and logistical facilities located along the northern GOM coast.

PROJECT ENVIRONMENTAL EVALUATION ASSESSMENT CRITERIA

Environmental Evaluation Assessment Criteria		
Criteria	**Values**	**Definition**
Outcome	**Direct**	***Direct effects*** are "caused by the action and occur at the same time and place" of the Project (40 CFR § 1508.8).
	Indirect	***Indirect*** impacts are "caused by an action and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect impacts may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 CFR § 1508.8). Indirect impacts are caused by the Project, but do not occur at the same time or place as the direct impacts.
	Cumulative	***Cumulative impact*** is "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR § 1508.7).
Type	**Adverse (Negative)**	***Adverse*** would cause unfavorable or undesirable outcomes for the natural or social environment. Negative impacts result in a net loss to the resource.
	Beneficial (Positive)	***Beneficial*** impact would cause positive or desirable outcomes for the natural or social environment. Beneficial impacts result in a net benefit to the resource.
Duration	**Short-term (Temporary)**	***Short-term (or temporary)*** impacts are those that would occur only during a specific phase of the proposed Project, such as noise during construction or certain installation activities. Short-term impacts would end at the time, or shortly after, construction activities ceased. The duration of most short-term impacts would be a few hours to a few days.
	Long-term	***Long-term*** impacts would occur either continually or periodically throughout the life of the Project (e.g., operational air emissions, stormwater discharge), or would last for years after an impact-producing activity occurred (e.g., removal of wildlife habitat).
Magnitude	**Negligible**	***Negligible*** impacts are generally those that might be perceptible, but in certain cases may be undetectable.
	Minor	***Minor*** effects are those that could be perceptible but are of very low intensity and may be too small to measure.
	Moderate	***Moderate*** impacts are more perceptible, can often be quantified, and may approach the thresholds for major impacts.
	Major	***Major*** impacts, based on their context and intensity (or severity), have the potential to meet the thresholds for significance set forth in CEQ regulations (40 CFR § 1508.27). Major impacts warrant additional attention in a NEPA analysis and a review of potential mitigation measures that would fulfill the policies set forth in NEPA, which include avoiding, minimizing, or mitigating major impacts.
Likelihood	**Unlikely**	Low probability.
	Potential	Possible or probable.
	Likely	Certain.

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7.0 SOILS AND GEOLOGIC RESOURCES

7.1 PROJECT OVERVIEW

Blue Marlin Offshore Port LLC (the Applicant) is proposing to develop the Blue Marlin Offshore Port (BMOP) Project (Project) in the Gulf of Mexico (GOM) to provide crude oil transportation and loading services for crude oil produced in the continental United States (U.S.). A Project overview map is provided in **Figure 7-1**. The Deepwater Port (DWP) will be utilized to load the transported crude oil onto very large crude carriers (VLCCs) (and other crude oil carriers) for export to the global market. The Applicant is filing this application for a license to construct, own, and operate the Deepwater Port (DWP) pursuant to the Deepwater Port Act (DWPA) of 1974, as amended, and in accordance with U.S. Coast Guard (USCG) and U.S. Maritime Administration (MARAD) implementing regulations.

The primary purpose of the Project will be to provide for safe and reliable long-term supply of crude oil for export to the global market. Oil for export will be transported out of the existing Sunoco Partners Marketing and Terminals, L.P., a terminal and storage facility in Jefferson County, Texas (Nederland Terminal or NT). This terminal is connected to multiple crude oil pipelines connecting to production from across the U.S. In addition, an affiliate of the Applicant owns the Stingray Pipeline System and has confirmed that its subsea pipeline and offshore platforms are suitable for converting to facilitate crude oil export from a DWP in the northern GOM. The Applicant has the exclusive right to lease or purchase the Stingray Pipeline System for use in the Project.

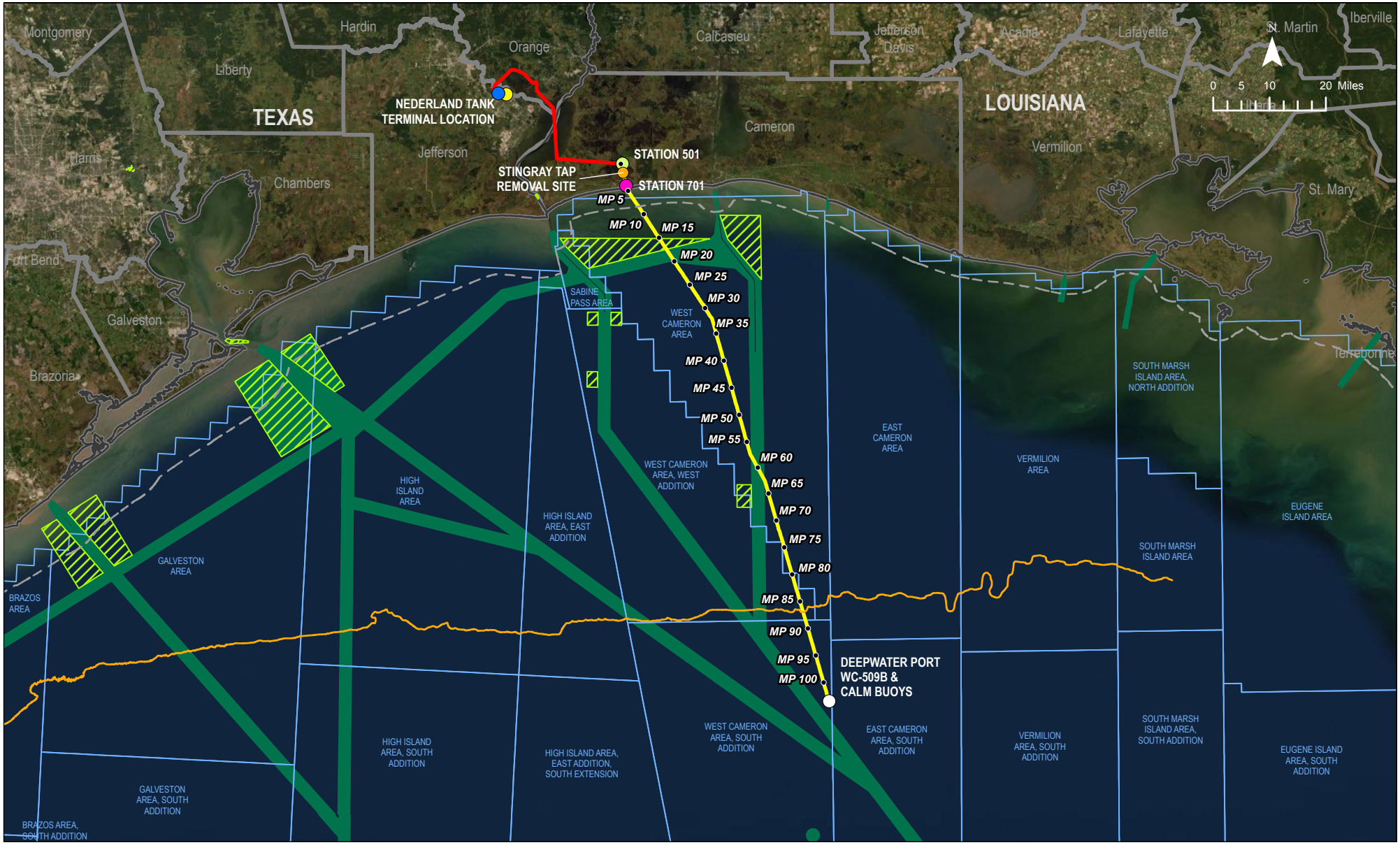
The DWP will be located in federal waters within and adjacent to the Outer Continental Shelf (OCS) in West Cameron Lease Blocks (WC) 509 and 508 and East Cameron Block 263. The DWP will be approximately 99 statute miles off the coast of Cameron Parish, Louisiana, with an approximate water depth of 162 feet. Crude oil will be routed from pumps at Nederland, through a new 42-inch outer diameter (OD) onshore pipeline to the existing Stingray Mainline at Station 501 (see Section 7.1.1), and from there through the existing Stingray Mainline to the DWP.

As depicted in **Figure 7-1**, the BMOP facilities consist of the pumps and meters at NT; a new approximate 37-mile, 42-inch OD pipeline; the existing 36-inch OD Mainline; an existing fixed, manned platform complex at WC 509; an existing platform at WC 148; two new Crude Oil Loading Pipelines; and two new PLEM and CALM Buoys located in WC 508 and EC 263. A Project overview map of the onshore Project components is provided in **Figure 7-2.** Details of the Project's offshore facilities are provided in Topic Report 1, "Project Description, Purpose, and Need" (Volume IIa). This Topic Report includes details of the onshore Project facilities.

This topic report describes existing soils and geologic resources, conditions and characteristics of existing soils, and challenges to construction that may be affected by the onshore Project components. This report also includes applicable regulations, the existing pre-development environment, potential environmental impacts due to construction and operation, cumulative impacts, and proposed mitigation measures for the onshore Project components.

To avoid and minimize impacts to soils and geologic resources during construction and operation of the Project, the Applicant will implement construction and operation Best Management Practices (BMPs) included in the Project's Onshore Construction BMP Plan (**Appendix C-1**), Revegetation Plan (**Appendix C-2**), and Spill Prevention and Response (SPAR) Plan (**Appendix C-3**).

BMOP PROJECT - FIGURE 7-1 - PROJECT OVERVIEW MAP



LEGEND

- EXISTING OFFSHORE PIPELINE MILEPOSTS
- STINGRAY TAP REMOVAL SITE
- NEDERLAND TANK TERMINAL LOCATION
- NEDERLAND PUMP STATION
- STATION 701 (TO BE CONVERTED TO OIL SERVICE)
- STATION 501 (TO BE CONVERTED TO OIL SERVICE)
- DEEPWATER PORT WC-509B AND CALM BUOYS
- EXISTING PIPELINE TO BE CONVERTED TO OIL SERVICE
- PROPOSED ONSHORE PIPELINE (NEW BUILD)
- DEPTH CONTOUR -108'
- STATE WATERS BOUNDARY
- SAFETY ANCHORAGES
- PROTRACTION AREA
- SHIPPING FAIRWAY
- COUNTY / PARISH
- STATE BOUNDARY

BLUE MARLIN OFFSHORE PORT PROJECT

PROJECT OVERVIEW MAP

COUNTY/PARISH:	VARIOUS	DRAWN BY:	CA
STATE:	TX/LA	CHECKED BY:	CW

DATE:	2020/09/17
PROJECTION:	NAD 1983 UTM Zone 15N

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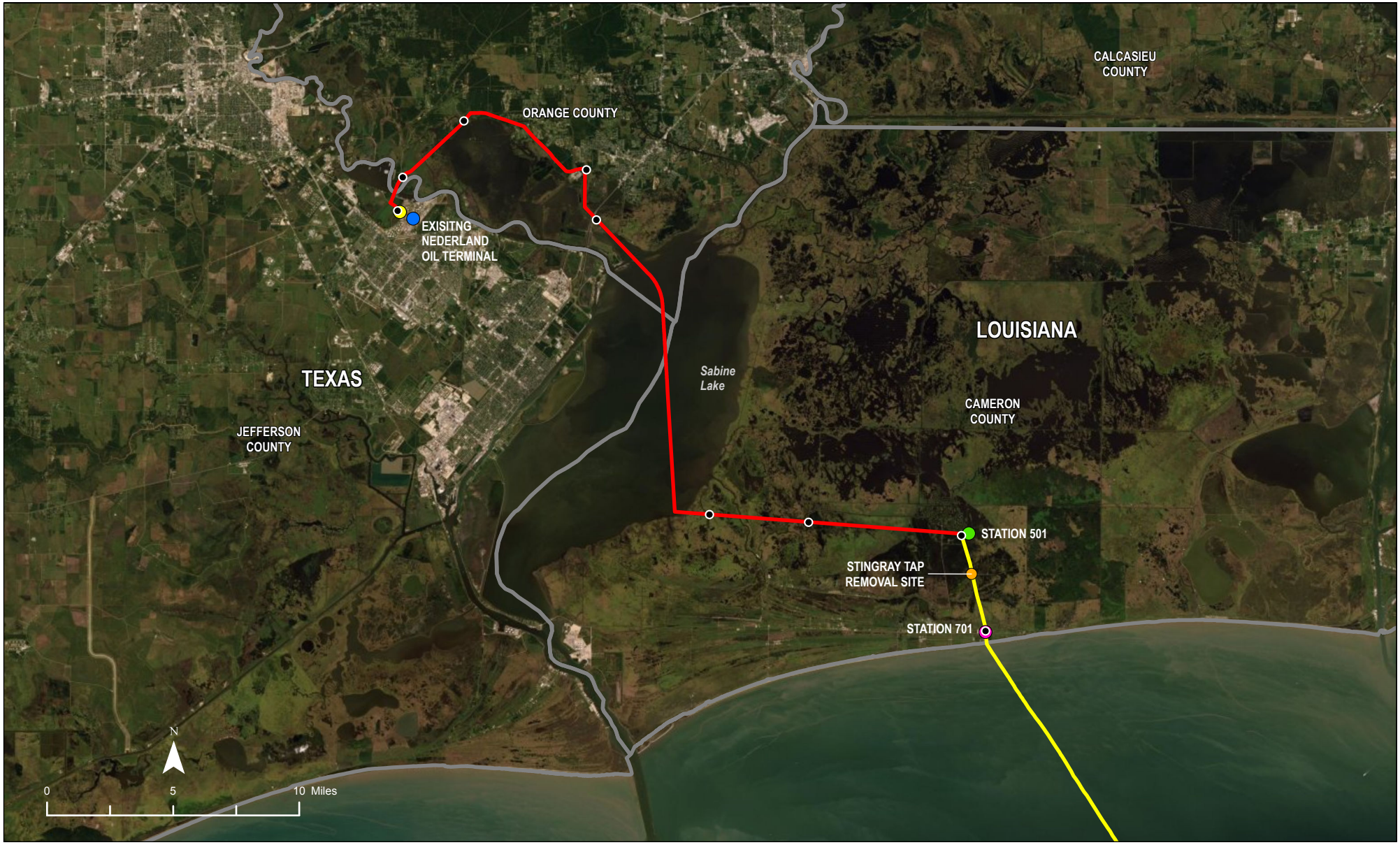
BLUE MARLIN OFFSHORE PORT PROJECT
FIGURE 7-1

DWG:	0802-01-005	SHEET:	1 OF 1

BMOP PROJECT - FIGURE 7-2 ONSHORE PROJECT COMPONENT OVERVIEW MAP



LEGEND

- MAINLINE VALVE
- NEDERLAND PUMP STATION
- STATION 501 (TO BE CONVERTED TO OIL SERVICE)
- STATION 701 (TO BE CONVERTED TO OIL SERVICE)
- EXISITNG NEDERLAND OIL TERMINAL
- STINGRAY TAP REMOVAL SITE
- EXISTING PIPELINE TO BE CONVERTED TO OIL SERVICE
- PROPOSED 42-INCH PIPELINE
- COUNTY / PARISH

BLUE MARLIN OFFSHORE PORT PROJECT
FIGURE 7-2 - ONSHORE PROJECT COMPONENT OVERVIEW MAP

COUNTY/PARISH:	VARIOUS	DRAWN BY:	CA
STATE:	TX/LA	CHECKED BY:	CW
DATE:	2020/09/17	PROJECTION:	NAD 1983 UTM Zone 15N

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BLUE MARLIN OFFSHORE PORT PROJECT
FIGURE 7-2

DWG:	0802-01-009	SHEET:	1 OF 1

7.1.1 Abandonment and Conversion of Existing Facilities

The Stingray Pipeline is currently comprised of a 36-inch pipeline (Mainline) that is fed natural gas and natural gas liquids by multiple lateral pipelines from various suppliers and producers that feed natural gas into the Mainline. Stingray transports natural gas and liquids on the Mainline from the WC 509 Platform Complex to the onshore compressor station facility (Station 701) near Holly Beach in Cameron, Louisiana, and northward approximately four additional miles to the NGPL/Stingray interconnect (Station 501). The Stingray facilities from WC 509 to Station 501 will be abandoned through a FERC 7(b) Order This work will be completed by Stingray. Stingray will assign the existing right-of-way (ROW) Grant (and associated facilities—platforms at WC 148 and WC 509) to BMOP or another affiliate of ET for use in the BMOP Project. The Applicant intends to operate the new facilities under 49 Code of Federal Regulations (CFR) Part 195. Details of the existing offshore Stingray Mainline facilities are provided in Topic Report 1 (Volume IIa).

7.1.2 Major Offshore Project Components

All facilities for the proposed BMOP Project will be designed, constructed, tested, operated, and maintained in accordance with the U.S. Department of Transportation (USDOT) regulations in 49 CFR Part 195 (Transportation of Hazardous Liquids by Pipeline) and all other applicable federal and state regulations. Details of the offshore supply components are provided in Topic Report 1 (Volume IIa). The Project will consist of construction and operation of the following onshore components:

<u>New Onshore Facilities</u>

- A new, approximate 37-mile, 42-inch OD pipeline connecting the existing NT in Jefferson County, Texas, to the existing 36-inch OD Mainline at Station 501 in Cameron Parish, Louisiana.
- A new pump station (BMOP Pump Station) located adjacent to the existing NT in Jefferson County, Texas at MP 0.0. The land where the BMOP Pump Station site is located is to be filled as part of the "Nederland Terminal Buildout Project," which is anticipated to commence construction in January 2021, prior to construction of the BMOP Project. The pump station will include:
    - A pipeline header;
    - MLV;
    - Metering and pump equipment;
    - Electrical substation; and
    - Permanent access road.
- Six new MLVs will be installed within the permanent pipeline right-of-way (ROW) of the new build pipeline. MLVs will also be installed at the BMOP Pump Station, Station 501, and Station 701. These valves will be used for isolation and spill control purposes.

<u>Conversion of Existing Onshore Facilities</u>

- The existing Station 501 is located at approximate MP 37 of the new 42-inch pipeline in Cameron Parish, Louisiana. All existing natural gas-related equipment owned by BMOP will be removed from the Station and new pipeline facilities will be installed. The new 42-inch pipeline will tie into the existing 36-inch Mainline at the site. The conversion of Station 501 will be expanded to include:
    - A pig receiver for the new 42-inch pipeline termination;
    - Pig launcher for existing 36-inch Mainline; and
    - MLV.

- The existing compressor Station 701 in Cameron Parish, Louisiana, located at approximate MP 3.9 on the converted Stingray Mainline in Cameron Parish, Louisiana, will be demolished. All existing natural gas equipment will be removed from the Station except for several large 10,000-barrel storage tanks. Approximately 1,000 feet of new 36-inch pipe, surge tanks, surge valves, and a new MLV will be installed. The existing 10,000-barrel tanks located at Station 701 will be converted to surge relief tanks.
- The existing ANR Tap (Stingray Tap Removal Site) is located at approximate MP 1.6 on the converted Stingray Mainline in Cameron Parish, Louisiana (approximate MP 38.6 on the BMOP pipeline system). BMOP will install a 36-inch OD pipe segment following removal of the tap.
- The existing Mainline from Station 501 to the Station 701 will be converted to crude oil service.

Onshore Support Facilities

- Temporary use of existing pipe and contractor yards; and
- Use of existing public roads, highways, and canals and construction of new temporary and permanent access roads.

7.2 EXISTING ENVIRONMENT

7.2.1 Soils

The onshore Project components are located in Cameron Parish, Louisiana, and Jefferson and Orange Counties, Texas (see **Figure 7-2**). Soil map unit descriptions and characteristics were compiled from the Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SSURGO) database. Soils that exhibit similar characteristics are generally organized into a soil series. A soil series is comprised of soils with similar physical, chemical, horizon composition, thickness, and layering. NRCS organizes soils into map units for display in the SSURGO database and in county soil surveys. Soil map units consist of one or more components, usually a soil series and, sometimes, miscellaneous areas such as urban areas. An individual soil series may be a whole or a part of a soil map unit. Map units are often named for one or more component series, each of which indicate important/major features of the soil, such as the range of slope and rock content. Properties such as slope, texture (i.e., the proportions of sand, silt, and clay), mineralogy, stone composition, acidity, water content, and depth to bedrock are used to differentiate soil map units. The onshore project components cross 18 unique soil map units or map unit complexes over 37 miles. The soil map units crossed by the onshore project are shown in **Appendix A-4** of Volume IIb and are described below and in **Table 7-1**.

7.2.1.1 *Soil Map Unit Descriptions*

BA Bancker muck, 0 to 0.2 percent slopes, very frequently flooded. This level, very poorly drained, very fluid, mineral soil is in brackish marshes. It is ponded most of the time and is frequently flooded. Areas are irregular in shape and are several hundred acres in size. Slope is less than 1 percent.

CR Creole mucky clay. This level, very poorly drained, very fluid, mineral soil is in brackish marshes. It is ponded for long periods and is frequently flooded. Areas are elliptical and range from 40 to several thousand acres in size. Because of limited accessibility, the number of observations made in these areas was fewer than in areas that were mapped at a more detailed level. The detail of mapping, however, is adequate for the expected use of the soil. Slope is less than 1 percent.

Hm Hackberry-Mermentau complex, gently undulating. These nearly level gently undulating, somewhat poorly drained soils are found near the coast of the Gulf of Mexico. The Hackberry soil is on low ridges, and the Mermentau soil is in depressions between the ridges. The ridges are 1 to 3 feet high and

50 to 300 feet wide. The depressions are about 50 to 300 feet wide. The soils are subject to flooding during hurricanes and tropical storms. Elevation is about 5 feet above sea level. Most areas are about 60 percent Hackberry and similar soils and 30 percent Mermentau soil. Slope is 0 to 1 percent in the depressions and 1 to 3 percent on the ridges.

ME Mermentau clay. This level, poorly drained soil is on low ridges near the coast of the Gulf of Mexico and in broad areas of brackish marsh. Areas are elliptical and range from 5 to several thousand acres in size. Slope is less than 1 percent.

BaA Bancker mucky peat, 0 to 1 percent slopes, frequently flooded, tidal. This level very poorly drained, very fluid soils are permanently saturated with frequent ponding. Soils are found in Gulf Coast Marsh of southeast Texas in the Fluid Brackish Marsh ecological site. Elevation is about 0 to 13 feet above sea level

BbA Barbary mucky clay, 0 to 1 percent slopes, frequently flooded. This level, very poorly drained, very fluid soils are located in the flood plains of southeast Texas in freshwater swamps dominated by cypress deposits. Elevation is about 0 to 49 feet above sea level.

CsA Creole mucky peat, 0 to 1 percent slopes, frequently flooded, tidal. This level, very poorly drained soil is found in Gulf Coast Marsh of southeast Texas in the Firm Brackish March ecological site. Elevation is about 0 to 3 feet above sea level.

IjmB Ijam clay, 0 to 2 percent slopes, frequently flooded, tidal. This nearly level to gently sloping, very deep, poorly drained, very slowly permeable soils occur on slightly concave flats or mounds and ridges adjacent to coastal waterways ditches and canals and flats. Found mainly along the upper Gulf Coast of Texas in the Gulf Marsh. Elevation is about 0 to 10 feet above sea level. These soils have endosaturation from April through December from 46 to 102 cm.

NuC Neel-Urban land complex, 2 to 5 percent slopes, rarely flooded, tidal. This level moderately well drained. Very high runoff soil is found in urban plain areas of Coast Prairie of Southeast Texas. Soils are 60 percent Neel and 25 percent Urban Land and small areas of Ijam and League soils. A seasonal high-water table occurs from a depth of 3.0 to 6.0 feet from September through May. Elevation is about 3 to 10 feet above sea level

OrdB Orcadia silt loam, 0 to 2 percent slopes, rarely flooded. These nearly level soils are very deep, somewhat poorly drained, very slowly permeable soils found on flat coastal plains in Gulf Coast Prairies in Southeast Texas and possibly Louisiana. Elevation is about 10 to 100 ft above sea level. Flooding occurs as a result of storm surge during tropical storms which occurs in areas less than 15 feet elevation.

OriA Orcadia-Anahuac complex, 0 to 1 percent slopes. These nearly level and nearly level to very gently sloping soils are very deep, moderately well drained, very slowly permeable, and runoff is very high. Soils are on a broader landform, point bars, croplands, and flat coastal plains in Southeast Texas and generally east of the Trinity River; and possibly Louisiana. Elevation is about 10 to 100 ft above sea level. Soils are about 60 percent Orcadia and 35 percent Anahuac and small amounts of Aris, Morey, and Labelle soils.

OrnA Orcadia-Anahuac complex, 0 to 1 percent slopes, rarely flooded. These nearly level and nearly level to gently sloping, very deep, somewhat poorly drained, very slowly permeable soils are found in flat coastal plains in Southeast Texas and generally east of the Trinity River; and possibly Louisiana. Soils are about 60 percent Orcadia and 35 percent Anahuac and small amounts of Aris, Morey, and Labelle soils. Elevation is about 10 to 100 ft above sea level. Flooding occurs as a result of storm surge during tropical storms which occurs in areas less than 15 feet elevation.

TABLE 7-1
SSURGO Soil Map Unit Characteristics Crossed by the Onshore Project Components

Map Unit Symbol [a]	Map Unit Name[a]	Prime Farmland [b]	Hydric Soil	Drainage Class	Land Capability Class[c]	Poor Revegetation Potential[d]	Wind Erodibility Group[e]	Project Components	Acres Temporary Impact[f]	Acres Operational Impact[g]
BA	Bancker muck	N	Y	Very Poorly Drained	8	N	8	Onshore Pipeline	122.9	58.3
								MLVs	0.0	0.2
								Staging Areas	0.0	0.0
								Access Roads	0.0	0.0
								BMOP Pump Station	0.0	0.0
								Station 501	1.2	1.6
								Station 701	0.0	0.0
								Stingray Tap Removal	2.4	0.8
CR	Creole mucky clay	N	N	Very Poorly Drained	7	Y	8	Onshore Pipeline	5.3	2.8
								MLVs	0.0	0.0
								Staging Areas	0.0	0.0
								Access Roads	0.0	0.0
								BMOP Pump Station	0.0	0.0
								Station 501	0.0	0.0
								Station 701	0.2	0.0
								Stingray Tap Removal	0.3	0.0
Hm	Hackberry-Mermentau complex	N	N	Somewhat Poorly Drained	3	N	3	Onshore Pipeline	0.0	0.0
								MLVs	0.0	0.0
								Staging Areas	0.0	0.0
								Access Roads	0.0	0.0
								BMOP Pump Station	0.0	0.0
								Station 501	0.0	0.0

TABLE 7-1
SSURGO Soil Map Unit Characteristics Crossed by the Onshore Project Components

Map Unit Symbol [a]	Map Unit Name[a]	Prime Farmland [b]	Hydric Soil	Drainage Class	Land Capability Class[c]	Poor Revegetation Potential[d]	Wind Erodibility Group[e]	Project Components	Acres Temporary Impact[f]	Acres Operational Impact[g]
								Station 701	32.1	0.0
								Stingray Tap Removal	0.4	0.0
ME	Mermentau clay	N	Y	Poorly Drained	7	Y	4	Onshore Pipeline	5.7	3.0
								MLVs	0.0	0.0
								Staging Areas	0.0	0.0
								Access Roads	0.0	0.0
								BMOP Pump Station	0.0	0.0
								Station 501	0.0	0.0
								Station 701	0.0	0.0
								Stingray Tap Removal	0.0	0.0
BaA	Bancker mucky peat	N	Y	Very Poorly Drained	8	N	8	Onshore Pipeline	10.9	6.8
								MLVs	0.0	0.0
								Staging Areas	0.0	0.0
								Access Roads	0.0	0.0
								BMOP Pump Station	0.0	0.0
								Station 501	0.0	0.0
								Station 701	0.0	0.0
								Stingray Tap Removal	0.0	0.0
BbA	Barbary mucky clay	N	Y	Very Poorly Drained	8	N	8	Onshore Pipeline	27.1	14.3
								MLVs	0.0	0.0
								Staging Areas	0.0	0.0
								BMOP Pump Station	0.0	0.0

TABLE 7-1
SSURGO Soil Map Unit Characteristics Crossed by the Onshore Project Components

Map Unit Symbol [a]	Map Unit Name[a]	Prime Farmland [b]	Hydric Soil	Drainage Class	Land Capability Class[c]	Poor Revegetation Potential[d]	Wind Erodibility Group[e]	Project Components	Acres Temporary Impact[f]	Acres Operational Impact[g]
								Station 501	0.0	0.0
								Station 701	0.0	0.0
								Stingray Tap Removal	0.0	0.0
CsA	Creole mucky peat	N	Y	Very Poorly Drained	7	Y	8	Onshore Pipeline	7.7	4.7
								MLVs	0.0	0.0
								Staging Areas	4.8	0.0
								Access Roads	0.0	0.0
								BMOP Pump Station	0.0	8.2
								Station 501	0.0	0.0
								Station 701	0.0	0.0
								Stingray Tap Removal	0.0	0.0
ZumA	Zummo muck	N	N	Poorly Drained	6	N	8	Onshore Pipeline	8.6	3.5
								MLVs	0.0	0.1
								Staging Areas	1.4	0.0
								Access Roads	0.2	0.0
								BMOP Pump Station	0.0	0.0
								Station 501	0.0	0.0
								Station 701	0.0	0.0
								Stingray Tap Removal	0.0	0.0
IjmB	Ijam clay	N	Y	Poorly Drained	7	Y	4	Onshore Pipeline	28.6	13.8
								MLVs	0.0	0.2
								Staging Areas	1.7	0.0

TABLE 7-1
SSURGO Soil Map Unit Characteristics Crossed by the Onshore Project Components

Map Unit Symbol [a]	Map Unit Name[a]	Prime Farmland [b]	Hydric Soil	Drainage Class	Land Capability Class[c]	Poor Revegetation Potential[d]	Wind Erodibility Group[e]	Project Components	Acres Temporary Impact[f]	Acres Operational Impact[g]
								Access Roads	0.0	0.4
								BMOP Pump Station	0.0	0.0
								Station 501	0.0	0.0
								Station 701	0.0	0.0
								Stingray Tap Removal	0.0	0.0
NuC	Neel-Urban land complex	N	N	Moderately Well Drained	4	Y	4	Onshore Pipeline	0.2	0.2
								MLVs	0.0	0.0
								Staging Areas	0.3	0.0
								Access Roads	0.0	0.0
								BMOP Pump Station	0.0	0.0
								Station 501	0.0	0.0
								Station 701	0.0	0.0
								Stingray Tap Removal	0.0	0.0
OrdB	Orcadia silt loam	SWI	N	Somewhat Poorly Drained	3	N	5	Onshore Pipeline	3.4	2.1
								MLVs	0.0	0.0
								Staging Areas	0.6	0.0
								Access Roads	0.0	0.0
								BMOP Pump Station	0.0	0.0
								Station 501	0.0	0.0
								Station 701	0.0	0.0
								Stingray Tap Removal	0.0	0.0
OriA		SWI	N		3	N	5	Onshore Pipeline	12.7	6.7

TABLE 7-1
SSURGO Soil Map Unit Characteristics Crossed by the Onshore Project Components

Map Unit Symbol [a]	Map Unit Name[a]	Prime Farmland [b]	Hydric Soil	Drainage Class	Land Capability Class[c]	Poor Revegetation Potential[d]	Wind Erodibility Group[e]	Project Components	Acres Temporary Impact[f]	Acres Operational Impact[g]
	Orcadia-Anahuac			Somewhat Poorly Drained				MLVs	0.0	0.0
								Staging Areas	6.3	0.0
								Access Roads	0.2	0.0
								BMOP Pump Station	0.0	0.0
								Station 501	0.0	0.0
								Station 701	0.0	0.0
								Stingray Tap Removal	0.0	0.0
OrnA	Orcadia-Anahuac, rarely flooded	SWI	N	Somewhat Poorly Drained	3	N	5	Onshore Pipeline	10.0	5.7
								MLVs	0.0	0.0
								Staging Areas	2.8	0.0
								Access Roads	0.0	0.0
								BMOP Pump Station	0.0	0.0
								Station 501	0.0	0.0
								Station 701	0.0	0.0
								Stingray Tap Removal	0.0	0.0
OsdA	Orcadia-Aris complex	SWI	Y	Poorly Drained	4	Y	3	Onshore Pipeline	21.7	8.8
								MLVs	0.0	0.0
								Staging Areas	0.0	0.0
								Access Roads	0.0	0.0
								BMOP Pump Station	0.0	0.0
								Station 501	0.0	0.0
								Station 701	0.0	0.0

TABLE 7-1
SSURGO Soil Map Unit Characteristics Crossed by the Onshore Project Components

Map Unit Symbol [a]	Map Unit Name[a]	Prime Farmland [b]	Hydric Soil	Drainage Class	Land Capability Class[c]	Poor Revegetation Potential[d]	Wind Erodibility Group[e]	Project Components	Acres Temporary Impact[f]	Acres Operational Impact[g]
								Stingray Tap Removal	0.0	0.0
OsuB	Orcadia-Urban land complex	N	N	Somewhat Poorly Drained	3	N	6	Onshore Pipeline	3.5	1.9
								MLVs	0.0	0.0
								Staging Areas	0.0	0.0
								Access Roads	0.0	0.0
								BMOP Pump Station	0.0	0.0
								Station 501	0.0	0.0
								Station 701	0.0	0.0
								Stingray Tap Removal	0.0	0.0
OsvB	Orcadia-Urban land complex, rarely flooded	N	N	Somewhat Poorly Drained	3	N	5	Onshore Pipeline	17.9	8.1
								MLVs	0.0	0.1
								Staging Areas	2.3	0.0
								Access Roads	0.0	0.0
								BMOP Pump Station	0.0	0.0
								Station 501	0.0	0.0
								Station 701	0.0	0.0
								Stingray Tap Removal	0.0	0.0

Source: NRCS, 2020

Notes:

[a] Map unit symbol and name from the NRCS SSURGO database.
[b] Prime Farmland Soils: Y = Yes; Y if D = Yes if drained; N = No; SWI=statewide importance; UI = unique importance; NR = not rated.
[c] Land capability classes are defined as follows:
Class 1 – soils with moderate limitations that restrict their use
Class 2 – soils with moderate limitations that reduce the choice of plants or that require moderate conservation practices

TABLE 7-1
SSURGO Soil Map Unit Characteristics Crossed by the Onshore Project Components

Map Unit Symbol [a]	Map Unit Name[a]	Prime Farmland [b]	Hydric Soil	Drainage Class	Land Capability Class[c]	Poor Revegetation Potential[d]	Wind Erodibility Group[e]	Project Components	Acres Temporary Impact[f]	Acres Operational Impact[g]

Class 3 – soils with severe limitations that reduce the choice of plants or that require moderate conservation practices, or both
Class 4 – soils with very severe limitations that reduce the choice of plants or that require very careful management
Class 5 – soils that are not likely to erode but have other limitations that limit their use, impractical to remove
Class 6 – soils that have severe limitations that make them generally unsuitable for cultivation
Class 7 – soils that have very severe limitations that make them unsuitable for cultivation
Class 8 – soils with limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply or to aesthetic purposes

[d] Poor Revegetation Potential: assuming soils with poor revegetation potential are those with greater than 9 percent slopes or with land capability class between 4 and 7, or with available water storage less than 2.5 inches

[e] The wind erodibility group is a numerical value indicating the susceptibility of soil to wind erosion, based on the predominant soil texture class of surface layer:
1 - Very fine sand, fine sand, sand, or coarse sand
2 - Loamy very fine sand, loamy fine sand, loamy sand, loamy coarse sand, sapric organic soil materials, and all horizons that meet andic soil properties as per Criteria 2 in Soil Taxonomy, regardless of the fine earth texture
3 - Very fine sandy loam, fine sandy loam, sandy loam, coarse sandy loam, and non-calcareous silt loam with 35 to 50% very fine sand and <10% clay
4 - Clay, silty clay, non-calcareous clay loam, or silty clay loam with more than 35% clay
4L - Calcareous loam and silt loam or calcareous clay loam and silty clay loam
5 - Non-calcareous loam and silt loam with more than 20% clay (but does not meet WEG 3 criteria), or sandy clay loam, sandy clay, and hemic organic soil materials
6 - Non-calcareous loam and silt loam with more than 20% clay, or non-calcareous clay loam with less than 35% clay or silty clay loam with less than 35% clay
7 - Silt and fibric organic material
8 - Soils not susceptible to wind erosion because of surface rock and pararock fragments or wetness

[f] Construction Impacts include temporary workspace, ATWS, permanent workspace, mainline valves. Does not include "water" impacts.

[g] Permanent Impacts include permanent workspace, mainline valves. Does not include "water" impacts."

OsdA Orcadia-Aris complex, 0 to 1 percent slopes, rarely flooded. These nearly level, very deep, somewhat poorly drained, very slowly permeable soils are found on broader landforms: flats, coastal plains, and bars. Orcadia soils are ridges and Aris soils are depressions. Elevation is about 10 to 100 ft above sea level. Soils are about 60 percent Orcadia and 30 percent Aris and small areas of Morey and Labelle soils. perched water table occurs at a depth of 0.8 to 1.5 feet from January through March.

OsuB Orcadia-Urban land complex, 0 to 2 percent slopes. These level, somewhat poorly drained, very high runoff on ridges around Gulf Coast Prairie of Southeast Texas. Soils are about 60 percent Orcadia and 30 percent Urban land and small areas of Texla soils. Elevation is about 7 to 39 feet above sea level.

OsvB Orcadia-Urban land complex, 0 to 2 percent slopes, rarely flooded. These level, somewhat poorly drained, very high runoff on ridges around Gulf Coast Prairie of Southeast Texas. Soils are about 60 percent Orcadia and 30 percent Urban land and small areas of Texla soils. Elevation is about 7 to 39 feet above sea level. A perched water table occurs at a depth of 0.8 to 1.5 feet from January through March.

ZumA Zummo muck, 0 to 1 percent slopes, frequently flooded, frequently ponded.
This very slow permeability, very poorly drained soil is found in freshwater marsh areas of Gulf Coast Marsh of Southeast Texas. Frequently flooded by runoff from the uplands and storm tides throughout the year, frequently ponded from the surface to 1.5 feet above the surface throughout the year, high water table occurs from the surface to more than 6 feet throughout the year. Soils are 85 percent Zummo soils and similar soils with areas of Allemands and Beaumont soils, and water bodies. Elevation is about 0 to 3 feet above sea level.

7.2.1.2 *Soil Compaction*

Soil compaction is the process in which soil particles are pressed together more closely than in the original state. Typically, soil must be moist to be compacted to allow mineral grains to slide together. Compaction reduces the abundance of large pores in the soil by damaging soil structure. Soils are rated by NRCS based on susceptibility to compaction from the operation of ground-based equipment for planting, harvesting, and site preparation activities when soils are moist. This produces several effects that are unwanted in agricultural soils since large pores are most effective at transmitting water and air through the soil. Compaction also increases soil strength which can limit root penetration and growth. The ability of soil to hold water is adversely affected by compaction because smaller pore spaces hold less water. The degree of compaction of a soil is measured by its bulk density, which is the mass per unit volume, generally expressed in grams per cubic centimeter.

Compacted soils are less favorable for plant growth because of high bulk density and hardness, reduced pore space, and poor aeration and drainage. Supplies of air, water, and nutrients to roots are reduced in compacted soils. Root penetration and growth is decreased because the hardness or strength of these soils prevents the expansion of roots.

Susceptibility to compaction ratings are based on soil properties in the upper 12 inches (30.5 centimeters) of the profile. Factors considered are soil texture, soil organic matter content, soil structure, rock fragment content, and bulk density. Organic matter in the soil provides resistance to compaction and the resilience to ameliorate the effects with time. Soil structure adds strength as discrete aggregates, and it is the aggregates that are deformed or destroyed by compactive forces; thus, strong soil structure lowers susceptibility to compaction. Similarly, rock fragments in the soil can bridge and provide a framework to resist compaction. Bulk density is a factor because soils that contain less pore space are more resistant to further compaction.

NRCS rates soil susceptibility to compaction as low, medium, and high. A low rating indicates the potential for compaction is insignificant. This soil is able to support standard equipment with minimal compaction.

The soil is moisture insensitive, exhibiting only small changes in density with changing moisture content. A medium rating indicates the potential for compaction is significant. The growth rate of seedlings may be reduced following compaction. After the initial compaction (i.e., the first equipment pass), this soil is able to support standard equipment with only minimal increases in soil density. The soil is intermediate between moisture insensitive and moisture sensitive. A high rating indicates the potential for compaction is significant. The growth rate of seedlings will be reduced following compaction. After initial compaction, this soil is still able to support standard equipment, but will continue to compact with each subsequent pass. The soil is moisture sensitive, exhibiting large changes in density with changing moisture content.

Of the soils crossed by proposed onshore Project components, soil map units that are rated as having a high susceptibility to compaction, such as coarse, medium, and fine sand, loamy sands, very fine sand, and loamy very fine sand include Orcadia-Aris complex and Hackberry-Mermentau complex and account for approximately 55.9 acres of temporary disturbance during construction and approximately 8.8 acres of permanent Project footprint during operations. Temporary disturbance to soils that are susceptible to compaction is from the construction right-of-way (ROW) (23.4 acres, including 1.7 acres for horizontal directional drilling ((HDD)), temporary workspace at Station 701 (32.1 acres) and temporary workspace at the Stingray Tap Removal (0.4 acre). Permanent impacts to soils that are susceptible to compaction is from the permanent ROW (8.8 acres).

7.2.1.3 *Soil Characteristics*

Erosion

Erosion of soil by water is a natural process influenced by soil texture, soil structure, slope, vegetative cover, rainfall, and other climatic factors, topography, and soil management practices. Bare or sparse vegetative cover, non-cohesive soil particles, low infiltration rates, and/or moderate to steep slopes typify soils most susceptible to water erosion.

Erosion potential of soils within onshore Project component are available in the NRCS SSURGO database. The NRCS rates each map unit according to the water-erosion hazard that may result in soil loss from construction of forest roads. Ratings are given as either severe, moderate, or slight. Water erosion potential for all soil units crossed by the onshore Project components is rated as slight.

Erosion of soil by wind is also a natural process, influenced by soil properties, including grain size and carbonate content, climate, land management, soil surface roughness, unsheltered distance, and wind velocity and turbulence. Clearing vegetation, grading, and equipment movement can accelerate the erosion process and, without adequate protection, result in the transportation of soils into adjacent wetlands and waterbodies. In addition, accelerated erosion can reduce soil fertility and revegetation potential. Wind erosion often occurs when dry, non-cohesive soils, especially sands and silts, are exposed to high-velocity wind. NRCS assigns soil map units a wind erodibility group (WEG) rating between 1 and 8, with 1 representing soils most susceptible to wind erosion and 8 representing soils least susceptible to wind erosion. WEG ratings are relative and are largely a function of grain size, with WEG categories of 1 through 3 representing sandy soils; categories 4 through 7 representing clay, silt, and non-sandy loam; and category 8 representing soils not susceptible to wind erosion due to coarse fragments or wetness. For soils in the State of Texas, NRCS also assigns soils to a qualitative wind erosion potential category ranging from “very low” to “very high.” Soils that have favorable surface particle size, high organic matter content, or protective coarse fragments will have a “very low” wind erosion potential. Soils that have a “very high” wind erosion potential are those with a surface layer that has a sandy particle size, high carbonate content, low organic matter content, or no coarse fragment protection.

To assess the potential for wind erosion, the Applicant queried the SSURGO WEG data and the wind erosion potential data. **Table 7-1** identifies WEG ratings and wind erosion potential of soil map units crossed by the onshore Project components. Acreages of soils crossed by the onshore Project components that fall in WEG categories 1 through 3 include Orcadia-Aris complex and Hackberry-Mermentau complex (both rated as WEG category 3). Temporary disturbance to soils that are susceptible to erosion is from the construction right-of-way (ROW) (23.4 acres, including 1.7 acres for HDD), temporary workspace at Station 701 (32.1 acres) and temporary workspace at the Stingray Tap Removal (0.4 acre). Permanent impacts to soils that are susceptible to compaction is from the permanent ROW (8.8 acres).

Revegetation

Soils are considered to have poor revegetation potential if they occur on steep slopes (9 percent or greater) or have less than 2.5 inches available water storage capacity or have been assigned NRCS land capability classification 4 through 7. Soil hydrologic group is also considered when determining revegetation potential for purposes of this analysis. NRCS Hydrologic groups are described as follows:

- Group A – Soils in this group have low runoff potential when thoroughly wet. Water is transmitted freely through the soil. Group A soils typically have less than 10 percent clay and more than 90 percent sand or gravel and have gravel or sand textures;
- Group B – Soils in this group have moderately low runoff potential when thoroughly wet. Water transmission through the soil is unimpeded. Group B soils typically have between 10 percent and 20 percent clay and 50 to 90 percent sand and have loamy sand or sandy loam textures;
- Group C – Soils in this group have moderately high runoff potential when thoroughly wet. Water transmission through the soil is somewhat restricted. Group C soils typically have between 20 percent and 40 percent clay and less than 50 percent sand and have loam, silt loam, sandy clay loam, clay loam, and silty clay loam textures; and
- Group D – Soils in this group have high runoff potential when thoroughly wet. Water movement through the soil is restricted or very restricted. Group D soils typically have greater than 40 percent clay, less than 50 percent sand, and have clayey textures.

Soils that are either poorly vegetated or that have no vegetative cover are susceptible to erosion by rainfall, storm water runoff, and wind. Disturbed areas that are not successfully revegetated may also be at increased risk for the establishment of invasive plant species and noxious weeds (see Volume IIb, Topic Report 3, "Land Cover and Vegetation"). **Table 7-2** presents acreages of soils crossed by the new onshore Project components with poor revegetation potential. Temporary impacts to soils with poor revegetation potential would occur from construction of the pipeline ROW (69.2 acres), sites where HDD would take place (7.5 acres), staging areas (6.8 acres), the tie-in to Station 701 (0.2 acres). Permanent impacts to soils with poor revegetation potential would occur from the installation of the MLVs (0.2 acres) and permanent access roads (0.4 acres). Approximately 33.3 acres of the permanent ROW would be in soils with poor revegetation potential.

TABLE 7-2
Soils with Poor Revegetation Potential Impacted by Onshore Project Components

Map Unit Name	Acres Temporary Impact	Acres Operational Impact
Creole mucky clay	5.8	2.8
Mermentau clay	5.7	3.0
Creole mucky peat	12.5	12.9
Ijam clay	30.3	14.4

TABLE 7-2 Soils with Poor Revegetation Potential Impacted by Onshore Project Components		
Map Unit Name	**Acres Temporary Impact**	**Acres Operational Impact**
Neel-Urban land complex	0.5	0.2
Orcadia-Aris complex	21.7	8.8
Source: NRCS, 2020		

Stony/Rocky Soils

Introducing stones or rocks into surface soil layers during construction can reduce soil moisture holding capacity, resulting in a reduction of soil productivity and damage to agricultural equipment. The process of excavating stony/rocky subsoil or bedrock (through ripping or blasting) can potentially introduce rocks into surface soil. Soils with 15 percent by weight or greater of the surface soil horizon occupied by rock fragments more than 3 inches in size and/or soils with bedrock within approximately 3 feet of the ground surface present the greatest risk of introducing rocks into surface soil. To assess the potential for the presence of stony or rocky soils or bedrock within approximately 3 feet of the ground surface, the Applicant queried the NRCS SSURGO database for soil particle size and coarse fragments. No stony/rocky soils and soils overlying shallow bedrock are crossed by the onshore Project components.

Hydric Soils

Hydric soils are "soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (USDA, 1996). Soils that are artificially drained or protected from flooding (e.g., by levees) are still considered hydric if the soil in its undisturbed state meets the definition of a hydric soil. Generally, hydric soils are those identified by the NRCS data as being poorly and very poorly drained. Hydric soils are often associated with wetlands and are frequently found in areas with high water tables, which can have an effect on trenching design and construction. In areas with hydric soils, dewatering of trenches and bore pits may be necessary when groundwater is encountered during pipeline installation. Hydric soils, whether or not they occur in wetlands, are generally more susceptible to compaction and rutting than non-hydric soils. **Table 7-3** identifies acreages of hydric soils crossed by the new onshore Project components. Hydric soils impacted during construction include pipeline ROW (224.6 acres, including 13.5 acres for HDD), staging areas (6.5 acres) and temporary workspace at Station 501 (1.2 acres). Hydric soils impacted during operations include four MLVs (0.4 acres), the current soils at the BMOP Pump Station site (8.2 acres) and two permanent access roads (0.4 acres). Approximately 110 acres of the permanent ROW would be in hydric soils.

TABLE 7-3 Hydric Soils Impacted by New Onshore Project Components		
Map Unit Name	**Acres Temporary Impact**	**Acres Operational Impact**
Bancker muck	126.5	60.9
Mermentau clay	5.7	3.0
Bancker mucky peat	10.9	6.8
Barbary mucky clay	34.8	19.0
Creole mucky peat	12.5	12.9
Ijam clay	30.3	14.4
Orcadia-Aris complex	21.7	8.8

TABLE 7-3 Hydric Soils Impacted by New Onshore Project Components		
Map Unit Name	**Acres Temporary Impact**	**Acres Operational Impact**
Source: NRCS, 2020		

Agricultural Soils

The NRCS, in cooperation with other interested federal, state, and local government organizations, has inventoried the extent and location of agricultural soils that could be used for production of the nation's food supply. Agricultural soils consist of prime farmland, unique farmland, and farmland of statewide or local importance. However, not all of these soils are used for farming. Designations are based on soil properties, not on current or past use. This section discusses the types, locations, and acreages of agricultural soils crossed by the onshore storage/supply components.

The NRCS defines prime farmland as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Such farmland may include cultivated land, pastureland, forestland, or other land that is not urban, built-up land, or inundated by water. Soil quality, growing season, and adequate moisture supply are factors needed for soil to economically produce sustained high yields of crops when proper management, including water management and acceptable farming methods, are applied.

Unique farmland is land other than prime farmland that is used for production of specific high value food and fiber crops (e.g., tree nuts, cranberries, and other fruits and vegetables). It has the unique combination of soil quality, growing season, moisture supply, temperature, humidity, air drainage, elevation, and aspect needed for the soil to economically produce sustainable high yields of these crops when properly managed. Farmlands of statewide importance generally include areas of soils that nearly meet the requirements of prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Farmland locations that are not identified as having statewide or local importance can be designated by local agricultural agencies as statewide or local importance for the production of food, feed, fiber, forage, and oilseed crops.

No unique farmland is crossed by the Project components. As stated above, the designation as prime farmland, unique farmland, or farmlands of statewide importance is not indicative of current land use. Volume IIb, Topic Report 8, "Land Use, Coastal Zone Use, Recreation, and Aesthetics," provides a description of current uses of lands crossed by the onshore Project components. **Table 7-4** identifies acreages of agricultural soils crossed by new onshore Project components. Agricultural soils would be impacted during construction of the pipeline ROW (47.8 acres, including 2.8 acres for HDDs), staging areas (9.7 acres) and the temporary access road (0.2 acres). There are approximately 23.2 acres of agricultural soils within the permanent pipeline ROW.

TABLE 7-4 Agricultural Soils Impacted by New Onshore Project Components Pipeline		
Map Unit Name	**Acres Temporary Impact**	**Acres Operational Impact**
Orcadia silt loam	4.0	2.1
Orcadia-Anahuac	19.2	6.7
Orcadia-Anahuac, rarely flooded	12.8	5.7
Orcadia-Aris complex	21.7	8.8
Source: NRCS, 2020		

Potential Environmental Contamination

To date, no known areas of contamination have been identified in the proposed Project area. The U.S. Environmental Protection Agency (EPA) Facility Registry Service was queried for facilities or sites subject to environmental regulation within 0.25 miles of onshore Project components. The search revealed only one facility within 0.25 miles of onshore Project components. The Entergy GSI Sabine Plant is located near MP 10.5 of the onshore pipeline. The facility is listed with EPA as needing no further action.

The Applicant has developed an Unanticipated Discovery of Contamination Plan that describes the procedures for dealing with unanticipated discoveries of contamination during construction of the Project (**Appendix C-4**). The Plan is intended to provide direction and guidance to Project personnel by establishing the procedures to be followed and notifications to be made in the event of contamination.

7.2.2 Geologic Resources

7.2.2.1 *Geologic Setting*

The onshore Project area would be located within the Chenier Plain of Southwest Louisiana, classified as a low-profile, microtidal, storm-dominated coast, located west and down drift of the Mississippi River deltaic plain. This Late-Holocene, marginal-deltaic environment is 200 km long and up to 30 km wide and is composed primarily of mud deposits capped by marsh interspersed with thin sand- and shell-rich ridges (chenier") that have elevations of up to 4 meters (McBride et al., 2007). Onshore elevations range from approximately ten feet to sea level throughout the coastline, and Sabine Lake, portion of the Project. The Chenier Plain strata is comprised of quaternary sediments deposited by shallow water marine areas, Sabine and Calcasieu river channels, and their corresponding deltas. Both the Sabine and Calcesieu Rivers provide sources of sediment transit to the GOM. Sediment rates from channelization and canal construction have declined in recent years. Depositional in origin and reflecting the long-term domination of sediment supply over subsidence, the Cenozoic continental margins of the northern Gulf record numerous phases of shelf edge and slope retreat and erosion (Edwards, 2000; Galloway et al., 2000). The morphology of the modern shoreline reflects the complex history of deltaic and marine processes during the Holocene. These environments are undergoing some of the highest erosion and subsidence rates in the nation, resulting in shoreline retreat, wetland loss, and reduction in barrier-island area (Penland et al., 2005; Kindinger, 2013).

7.2.2.2 *Project Area Geology*

McClelland Engineers Inc. performed a geotechnical investigation in Johnson Bayou, Louisiana on behalf of Stingray Pipeline Company, in 1973. Borings were taken in Johnson Bayou, Louisiana, along Highway 82, north of Mae beach (site of the current Station 701). Borings generally revealed 2-foot thick fine-grained soil of silty clays, underlain by 19 feet of sands. The sands are underlain by a five to six-foot-thick layer of soft clay. Underneath the soft clay is stiff Pleistocene (2.6 million to 11,700 years ago) clay and sandy clay down to the 100-foot depth investigated. Water level observations in boreholes indicate high groundwater levels that are within 2-3 feet of existing ground surface. Based on field and laboratory data, soils at the site are suitable for support of light loaded facilities on shallow foundations. The geotechnical report is presented in Appendix C of Volume III (*Confidential*). Geotechnical bores are scheduled for locations of the onshore pipeline that will be installed using the HDD method and will be provided upon completion of the associated reports.

7.2.2.3 *Geologic Hazards*

Faults

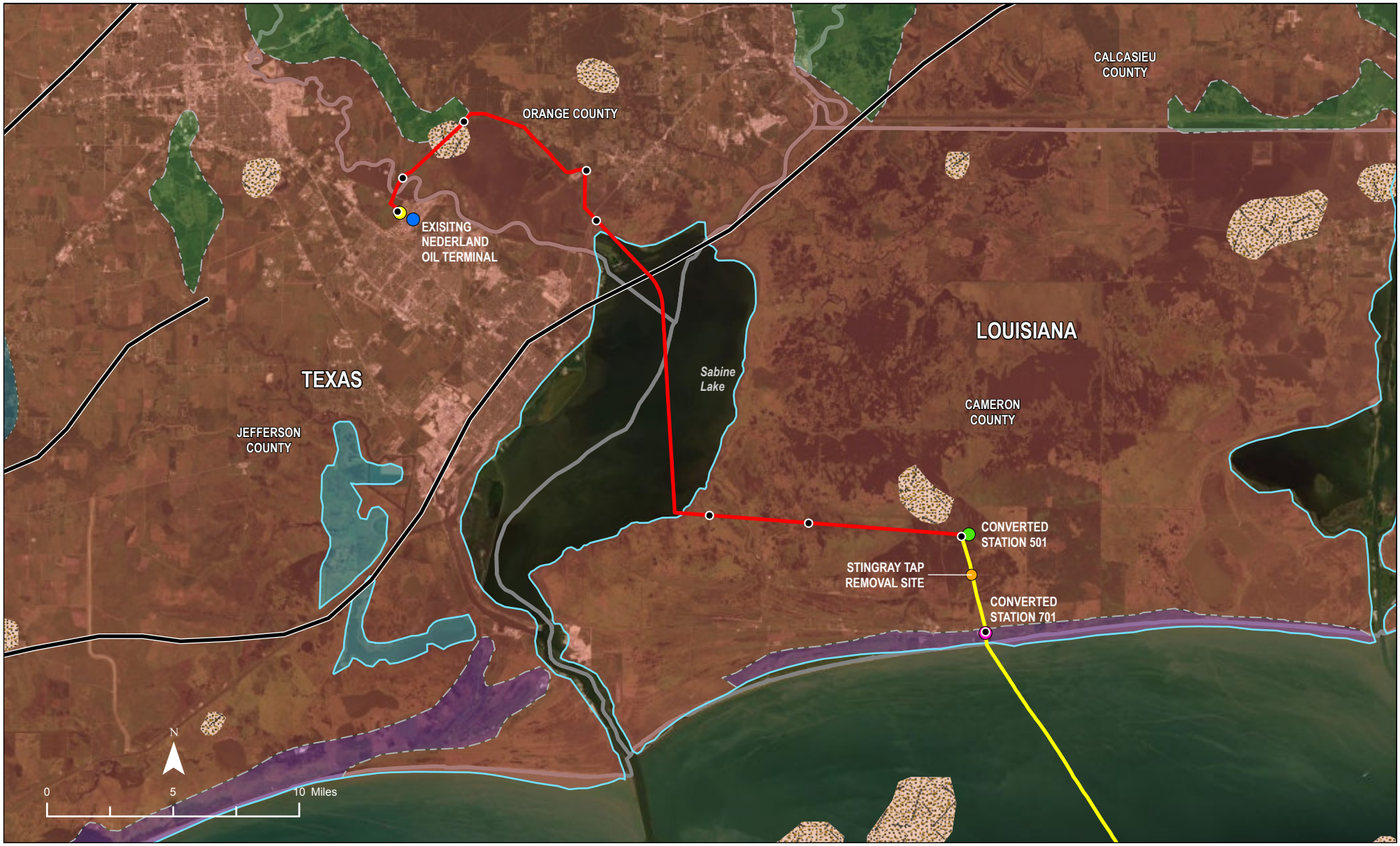
The Project area resides in proximity to the Planulina Fault zone, a series of strike aligned growth-faults beneath southern Louisiana and its adjacent continental shelf. Faults in this area originated due to gravity instabilities associated with sediment load and salt deformation. These faults have phases of dormancy and when active often move on the millimeter- (mm) per-year scale. **Figure 7-3** illustrates the approximate locations of salt domes and faults in the Project area. The pipeline crosses a salt dome between MPs 4 and 5.

Seismic Hazards

The Quaternary Fault and Fold Database of the United States, compiled by the U.S. Geological Survey (USGS), characterizes the seismicity of the region as sparse and of low magnitude. Low seismicity may be due to the post-rift sequence and its belt of gulf-margin normal faults being mechanically decoupled from the underlying crust. In addition, the salt and over-pressured shales may be too ductile to transmit tectonic stresses upward from the underlying crust into the post-rift sequence. Additionally, the post-rift sequence itself is young, only partly dewatered, and poorly lithified, particularly in its Cenozoic part. The post-rift sequence lacks the elastic strength to transmit tectonic stresses as efficiently as upper crustal metamorphic and igneous rocks. In particular, the postrift sequence may be unable to support the widespread, high stresses that are necessary to drive a large, seismogenic rupture. The sequence may be similarly unable to support the propagation of high stresses or seismogenic ruptures that might enter it from the underlying crust. This suggestion is consistent with the observation that low-velocity, near-surface materials, whether they are thick fault gouge or poorly lithified sediments, tend to suppress the propagation of seismic ruptures (Wheeler and Crone, 2000).

The USGS Earthquake Hazards Program maintains an Earthquake Catalog that includes information from numerous data sources. Each data source covers a unique time period. Additional details describing the information sources utilized and the timeframe covered by each are available online from the USGS. A query of the Earthquake Catalog data was conducted for events within 250 miles of the Project. The query revealed 42 records. The closest earthquake took place in 1983. It registered a magnitude 3.8 event with an epicenter located approximately 32 miles to the north. The farthest earthquakes within the search area took place in 2017 and 2019. They were magnitude 2.9 and 3.0 with epicenters located approximately 191 and 205 miles to the north and to the west, respectively. The greatest energy earthquake was a magnitude 5.3 event that took place in 2006. The epicenter of this earthquake was located approximately 176 miles to the southwest.

BMOP PROJECT - FIGURE 7-3 GEOLOGIC RESOURCES IN THE ONSHORE PROJECT AREA



LEGEND

- MAINLINE VALVE
- NEDERLAND PUMP STATION
- STATION 501 (TO BE CONVERTED TO OIL SERVICE)
- STATION 701 (TO BE CONVERTED TO OIL SERVICE)
- EXISITNG NEDERLAND OIL TERMINAL
- STINGRAY TAP REMOVAL SITE
- EXISTING PIPELINE TO BE CONVERTED TO OIL SERVICE
- PROPOSED 42-INCH PIPELINE

CONTACT

- MAJOR UNIT CLASS BOUNDARY
- MINOR UNIT CLASS BOUNDARY
- UNIT THICKNESS SCRATCH BOUNDARY
- WATER OR MAP AREA BOUNDARY
- NORMAL FAULT LINE
- SALT DOMES AND DIAPIRS

DEPOSITIONAL UNIT NAME

- ALLUVIAL SEDIMENTS, THIN
- CALCAREOUS BIOLOGICAL SEDIMENTS
- COASTAL ZONE SEDIMENTS, MOSTLY FINE-GRAINED
- COASTAL ZONE SEDIMENTS, MOSTLY MEDIUM-GRAINED
- COLLUVIAL AND ALLUVIAL SEDIMENTS
- RESIDUAL MATERIALS DEVELOPED IN ALLUVIAL SEDIMENTS
- WATER
- COUNTY / PARISH

BLUE MARLIN OFFSHORE PORT PROJECT
FIGURE 7-3 GEOLOGIC RESOURCES IN THE ONSHORE PROJECT AREA

COUNTY/PARISH:	VARIOUS	DRAWN BY:	JRA
STATE:	TX/LA	CHECKED BY:	CW
DATE:	2020/09/17	PROJECTION:	NAD 1983 UTM Zone 15N

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BLUE MARLIN OFFSHORE PORT PROJECT
FIGURE 7-3

DWG:	0802-01-056	SHEET:	1 OF 1

The most recent earthquake was a magnitude 2.5 event that took place in March 2020. The epicenter of this quake was located approximately 133 miles to the north. **Table 7-5** provides details on earthquakes that were identified within 250 miles from the Project.

TABLE 7-5
U.S. Geological Survey Earthquakes within 250 Statute Miles of the Project

Distance from Project Area (miles)	Latitude	Longitude	Date	Magnitude
132.90	31.9557	-94.3945	2020-03-23	2.5
117.95	31.6026	-94.8065	2019-10-12	2.4
126.34	31.8468	-94.4226	2019-07-27	2.6
204.75	29.0257	-97.2069	2019-03-04	3.0
97.85	31.4703	-94.1354	2019-01-20	3.3
158.20	32.351	-93.7648	2018-12-04	2.4
128.94	31.8921	-94.3874	2018-09-12	2.5
134.18	31.9613	-94.4343	2018-09-04	3.5
168.02	26.1169	-92.1408	2018-02-26	4.3
191.36	29.6797	-97.1635	2017-10-20	2.9
180.64	29.4721	-96.9411	2015-02-19	3.1
111.57	31.6761	-94.0554	2014-10-03	3.1
128.77	31.8831	-94.4222	2013-09-06	2.4
130.62	31.9095	-94.428	2013-09-02	4.3
135.74	31.9656	-94.526	2013-09-02	4.2
126.14	31.860	-94.332	2013-05-31	2.9
70.13	27.875	-92.043	2013-03-11	2.9
103.15	31.545	-94.162	2013-02-03	2.1
133.10	31.939	-94.466	2013-01-31	2.8
127.20	31.866	-94.389	2013-01-29	2.8
124.72	31.844	-94.300	2013-01-25	4.1
130.14	31.905	-94.414	2012-12-22	2.6
127.82	31.873	-94.401	2012-12-07	2.8
128.58	31.878	-94.434	2012-06-16	2.1
128.07	31.878	-94.394	2012-05-26	2.5
130.62	31.904	-94.458	2012-05-20	2.7
131.01	31.926	-94.369	2012-05-17	4.8
134.77	31.964	-94.465	2012-05-10	3.9
135.55	31.983	-94.427	2011-07-04	2.2
177.55	30.815	-90.854	2010-08-02	3
172.42	30.753	-96.755	2007-09-15	2.7
175.60	27.828	-90.210	2006-02-10	5.3
168.79	30.258	-90.708	2005-12-20	3.0

TABLE 7-5
U.S. Geological Survey Earthquakes within 250 Statute Miles of the Project

Distance from Project Area (miles)	Latitude	Longitude	Date	Magnitude
126.27	27.117	-94.442	2002-05-27	3.8
175.06	28.027	-90.171	2000-12-09	4.3
181.49	29.450	-96.950	1995-01-04	2.7
176.24	27.911	-90.177	1994-06-30	4.2
149.96	30.100	-96.500	1992-04-07	2.3
32.21	30.243	-93.393	1983-10-16	3.8
156.03	32.021	-95.262	1981-11-06	3.2
145.96	32.142	-94.399	1981-06-09	3.0
146.80	30.000	-91.000	1930-10-19	4.2

The 2014 USGS Hazard Mapping Program probabilistic seismic hazard analyses for peak ground acceleration expected near the proposed Project site, expressed as a factor of gravity (g), indicates a 10 percent probability of exceeding 0.01g within a 50-year period (see **Figure 7-4**). The program indicates a 2 percent probability of exceeding 0.02 to 0.04g within a 50-year period due to seismic events (see **Figure 7-5**) (USGS, 2014).

Subsidence

Subsidence of the ground surface, due to groundwater extraction, occurs on a regional scale. Withdrawal of subsurface fluids from clastic sediments has permanently lowered the elevation of over 10,000 square miles of land in the conterminous United States. Reduced fluid pressures in pores and cracks in aquifer systems or petroleum reservoirs leads to deformation of the granular structure, or skeleton, and lowering of the land surface (Baum et al., 2008).

Extraction of oil, gas, and associated fluids from petroleum reservoirs also causes subsidence. Land subsidence caused by hydrocarbon production has been documented in many basins of the world. Underground cavities can form when bodies of salt or other evaporites in the subsurface dissolve or when natural fluids are removed from underground reservoirs. If allowed to continue uncontrolled, unsupported roof spans can enlarge to a point where the strength of overlying rocks is exceeded and down warping or collapse of the unsupported roof occurs. Oil and gas field operations can lead to such effects due to extraction of petroleum or injection of brine or other fluids.

The pipeline crosses a salt dome between MPs 4 and 5. However, subsidence hazards and subsidence due to fluid withdrawal is a low hazard in the area since there will be no underground extraction of fluids along the Project.

BMOP - FIGURE 7-4 SEISMIC HAZARD MAP, PEAK GROUND ACCELERATION (10% PROBABILITY OF EXCEEDANCE)

VICINITY MAP

LEGEND

- BMOP DEEPWATER PORT
- NEDERLAND TANK TERMINAL LOCATION
- EXISTING PIPELINE TO BE CONVERTED TO OIL SERVICE
- PROPOSED ONSHORE PIPELINE (NEW BUILD)
- COUNTY BOUNDARY
- STATE BOUNDARY

Peak Ground Acceleration
- 0%
- 1%

DRAWING INFORMATION

DRAWN BY:	CW	COUNTY/PARISH:	N/A
CHECKED BY:	DH	STATE:	TEXAS/LOUISIANA
DATE:	9/18/2020	SHEET:	1 OF 1
DWG #:	0802-01-047	SCALE:	1:1,687,500

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BLUE MARLIN OFFSHORE PORT PROJECT
FIGURE 7-4
Seismic Hazard Map, Peak Ground Acceleration (10% Probability of Exceedance)

BMOP - FIGURE 7-5 SEISMIC HAZARD MAP, PEAK GROUND ACCELERATION (2% PROBABILITY OF EXCEEDANCE)

VICINITY MAP

LEGEND

- BMOP DEEPWATER PORT
- NEDERLAND TANK TERMINAL LOCATION
- EXISTING PIPELINE TO BE CONVERTED TO OIL SERVICE
- PROPOSED ONSHORE PIPELINE (NEW BUILD)
- COUNTY BOUNDARY
- STATE BOUNDARY

Peak Ground Acceleration
- 0%
- 2%
- 4%

DRAWING INFORMATION

DRAWN BY:	CW	COUNTY/PARISH:	N/A
CHECKED BY:	DH	STATE:	TEXAS/LOUISIANA
DATE:	9/18/2020	SHEET:	1 OF 1
DWG #:	0802-01-046	SCALE:	1:1,687,500

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BLUE MARLIN OFFSHORE PORT PROJECT
FIGURE 7-5
Seismic Hazard Map, Peak Ground Acceleration (2% Probability of Exceedance)

Flooding and Storm Damage

Changes in relative sea level include both changes in the ocean surface elevation (eustatic sea level) and changes in ground elevation caused by subsidence or uplift. Eustatic sea level change rates are monitored at long-record tide gauge stations around the world and vary over a range of approximately 0.04 to 0.16 inches per year. Rates of sea-level rise at Sabine Pass, approximately 8 miles from the Project footprint, report relative sea-level rise at 6.04 mm per year with a 95% confidence interval of +/- 0.74 mm per year based on monthly mean sea level data from 1958 to 2019 which is equivalent to a rise of 1.98 feet in 100 years (NOAA, 2020a).

Records maintained by the National Oceanic and Atmospheric Administration (NOAA) reported three tropical storms and no hurricanes in Cameron Parish, Louisiana, five tropical storms and four hurricanes in Jefferson County, Texas and three tropical storms and three hurricanes in Orange County, Texas between 1970 and March of 2020 (NOAA, 2020b).

The onshore Project area is subject to coastal storms, hurricanes, flooding, and other coastal processes. The onshore Project components would lie within a wide variety of Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map Coastal Flood Zones and 100-year Flood Zones. As such, the onshore components would be designed to withstand severe weather and flooding events with adequate burial depths and use of HDD construction under major waterbodies and channels.

Shoreline Erosion

Shorelines along the GOM coast are dynamic. Conversion of the existing Stingray Mainline will result in no shoreline impacts. Erosion is a problem along the shore of Sabine Lake (CWPPRA, 2020). Shorelines of Sabine Lake will be crossed using HDD and push/pull methods.

7.2.3 Mineral Resources

The Applicant conducted an assessment of mineral resources (e.g., active mines and mineral processing plants, industrial mineral-mining operations, coal mines, abandoned mines, oil and gas wells, and well drilling permit locations) within 0.25 miles of the onshore Project components using publicly available mineral resource information. There are no mineral resource features (including oil and gas wells) located within 0.25 miles of the Project facilities.

7.2.4 Paleontological Resources

Paleontological resources include the preserved fossilized remnants and indirect traces or imprints of plants and animals. In the Project area, deposits from four geologic eras dating as far back as 65 million years ago could contain a wide variety of paleontological resources. Paleontological resources are addressed in Volume III, **Appendix E** and in Topic Report 6 of Volume IIb.

7.3 ENVIRONMENTAL CONSEQUENCES

This section includes a discussion of the impacts that would likely result from the construction and operation of the onshore components of the Project. The study area within which potential impacts were assessed includes the area that would be affected physically by Project activities during construction and operation. The Project's effects on soils and geologic resources have been evaluated based on their potential to:

- Degrade unique geologic features;

- Prevent recovery of mineral resources due to site(s) of facilities;
- Increase the potential for geologic hazards to occur, such as seismic events;
- Alter the lithology, stratigraphy, or geologic structures that control or contribute to groundwater quality, the distribution of aquifers and confining beds, and groundwater availability;
- Alter soil or sediment composition, structure, or function;
- Cause permanent loss or impairment of agricultural soils, or affect prime farmland; and/or
- Degrade or prevent the study or recovery of paleontological resources.

The following sections provide further information and discussion of potential environmental consequences.

TABLE 7-6
Potential Impacts on Geologic Resources

Activity	Details	Duration of Impact	Mitigation Measures	Anticipated Level of Impact
Construction				
Installation of Onshore Pipeline and Aboveground Facilities	• Alter soil or sediment composition, structure, or function; • Cause permanent loss or impairment of agricultural soils, or affect prime farmland • Inadvertent spill resulting in decreased water quality	Short-term to long-term	• Onshore Construction BMPs • Revegetation Plan • SPAR Plan • Compliance with USACE Permit Conditions • Pre-construction field surveys	Negligible to moderate and localized
Operations				
Onshore Pipeline and Aboveground Facility Operations	• Temporary disruption due to maintenance activities. • Periodic maintenance could involve ground-disturbing activities or result in a release of hazardous material	Lifetime of Project	• Onshore Construction BMPs • SPAR Plan • Compliance with Energy Transfer's Coastal Louisiana Pipeline Facility Response Plan (PHMSA Sequence No. 3202), modified to include BMOP • Compliance with MARAD license conditions	Negligible to minor and localized
Upsets and Accidents				
Onshore Pipeline and Aboveground Facility Operations	• Accidental spills • Soil and water quality impacts	Short-term to long-term	• Energy Transfer's Coastal Louisiana Pipeline Facility Response Plan	Minor to major and localized, depending on

TABLE 7-6
Potential Impacts on Geologic Resources

Activity	Details	Duration of Impact	Mitigation Measures	Anticipated Level of Impact
			(PHMSA Sequence No. 3202), modified to include BMOP • Continuous monitoring of pipeline operations, SCADA, early detection of abnormal operations, and remote shutdown	the volume of oil released
Decommissioning				
Onshore Pipeline Decommissioning (Abandonment in Place)	• Onshore pipeline will be abandoned in-place and maintenance of the ROW will stop	Short-term	• Onshore Construction BMPs • SPAR Plan • Comply with MARAD license conditions	Negligible and localized
Aboveground Facility Decommissioning	• All Station components and impervious surfaces will be removed, and the impacts involved with removal of the facility would be similar to those described for construction	Short-term	• Onshore Construction BMPs • SPAR Plan • Comply with MARAD license conditions	Beneficial to negligible and localized

7.3.1 Onshore Pipeline

The extent and duration of impacts to soils and geologic resources from Project construction and operations will vary depending on conditions of the resource and construction method.

Construction and operations of the Project will result in both short-term (or temporary) and long-term (or permanent) impacts to soils. In the open water of Sabine Lake, the Project will be constructed using a variety of construction methods including barge lay method (to cross open water), HDD method (to cross the northern shoreline and a foreign pipeline), and the push/pull technique (at the southern shoreline entry and exit locations). The use of these construction methods will minimize impacts to the surficial soils and sediments of Sabine Lake, and allow natural revegetation to successfully reclaim areas for protection of soil resources.

An accidental spill or release of hazardous materials (e.g., fuels, lubricants, solvents) during construction or operations could have a negative effect on soils and the surrounding environment. Potential impacts from accidental hazardous materials spills and releases will be avoided or minimized through implementation of the Project-specific SPAR Plan (see **Appendix C-3** of Volume IIb). The Applicant's SPAR Plan includes BMPs to avoid and minimize the potential for accidental releases and contains measures that will be implemented to cleanup any releases.

Before the pipeline will be placed into service, hydrostatic testing will be conducted to verify the structural integrity of all pipelines and terminal facilities. Hydrostatic testing will be conducted in accordance with Pipeline and Hazardous Materials Safety Administration (PHMSA) requirements (49 CFR §§ 195.505 and 195.588) to ensure the system is capable of withstanding the appropriate test pressure for 8 hours. Hydrostatic testing of the integrity of the pipeline will occur before final restoration and placing the Project into service.

Following satisfactory completion of hydrostatic testing, the test water will typically be discharged into the original source (see **Table 1-6** of Volume IIb, Topic Report 1, "Project Description and Purpose and Need"). If discharging directly to receiving waters, the Applicant will use diffusers (energy diverters) to minimize the potential for stream scour. All testing activities will be conducted within the parameter of the applicable water withdrawal and discharge permits. Onshore, the Applicant will not add any chemicals to the hydrostatic test water, and the discharged water will be tested in accordance with permitting requirements. In addition, the Applicant will implement the measures outlined in Construction BMPs (**Appendix C**, Volume IIb) including installing sediment barriers as necessary to prevent erosion, streambed scour, suspension of sediments, or excessive streamflow.

Overall, the impacts associated with construction and operations could result in impacts to soils and geologic resources, however these impacts are expected to be temporary and minor during construction. Permanent impacts to soils will be reduced as vegetation returns naturally over time. These impacts would be minor.

7.3.2 Aboveground Facilities

7.3.2.1 *Mainline Valves*

MLV sites are small, each approximately 0.1 acre in size within the permanent ROW, with aboveground piping and valves enclosed within a fenced gravel or platform area. Construction and operation of the MLVs will result in permanent conversion of soils within the facility fence lines. Additional impacts at the MLV sites could result from vehicle traffic, runoff, and inadvertent spills.

Impacts to soils and geologic resources will be similar to the pipeline construction but at a smaller scale. Although areas will be permanently converted to industrial land use due to placement of MLVs, these facilities are small in size, interspersed and will occur within the pipeline permanent ROW. Given the small size and placement of MLVs, it is expected that the permanent impact would be minor.

7.3.2.2 *BMOP Pump Station*

The BMOP Pump Station site is proposed to be developed on the existing Nederland Terminal (NT) site. Since the pump station will be built on land already filled in for the NT site, there will be no new permanent impacts to native soils or geologic resources.

7.3.2.3 *Station 501*

Station 501 is an existing fenced and graveled facility that will be converted to accommodate new oil service equipment. Impacts to soils and geologic resources during construction and operations at Station 501 will be similar to those for pipeline construction and operations. Impacts to soils and geologic resources could result from land disturbance, vehicle traffic, and inadvertent spills. Impacts will be minimized by implementing BMPs and restoration methods outlined in the Construction BMP Plan, Revegetation Plan, and SPAR Plan (see **Appendix C**, Volume IIb). Impacts are anticipated to be direct, localized, short-term to long-term, and negligible as temporary work areas around Station 501 will be regraded, topsoil replaced

and the area allowed to naturally revegetate. The existing station will continue to be a graveled site, and no new impacts to soil or geologic resources will occur from the permanent continued use of Station 501.

7.3.2.4 *Station 701*

Station 701 is an existing fenced and graveled compressor station facility that will be converted for oil service use. Existing natural gas equipment will be removed from the station and new equipment and pipe will be installed within the existing facility boundaries. Additional temporary workspace (ATWS) along the existing Mainline north and south of the facility boundary will be required during construction and will be returned, as closely as possible, to pre-construction contours and allowed to naturally revegetate.

Impacts to soils and geologic resources due to construction and operation of Station 701 could result from land disturbance, vehicle traffic, runoff, and inadvertent spills. Impacts to soils will be minimized by implementing BMPs and restoration methods outlined in Construction BMPs, Revegetation Plan, and SPAR Plan (see **Appendix C**, Volume IIb). Because Station 701 will continue to be used, and the temporary work areas restored, there will be no new permanent impacts to soil or geologic resources with the conversion of Station 701.

7.3.2.5 *Stingray Tap Removal*

The Stingray Tap is an existing natural gas facility located along the existing Mainline between Station 501 and 701. The existing tap is above ground and will be removed by TC Energy after Stingray abandons gas service on the Mainline. BMOP will remove the below-ground flange to remove the remainder of the tap on the Mainline. The impacts of BMOPs activities on soil and geologic resources are expected to be negligible and short-term.

7.3.3 Soil Compaction

Two soil map units susceptible to compaction—Orcadia-Aris complex and Hackberry-Mermentau complex—would be crossed by the onshore Project components.

7.3.3.1 *Construction and Installation*

Temporary disturbance to soils that are susceptible to compaction is from the construction right-of-way (ROW) (23.4 acres, including 1.7 acres for HDD), temporary workspace at Station 701 (32.1 acres) and temporary workspace at the Stingray Tap Removal (0.4 acre). Compaction during construction would be mitigated during construction through BMPs, see Volume IIb, **Appendix C-1**. Impacts from soil compaction would be minor for the ROW and temporary workspace and moderate at HDD sites, however these impacts are temporary and reversible.

7.3.3.2 *Operations*

Soils that are susceptible to compaction during operation of the Project account for 8.8 acres of the permanent pipeline ROW. Little additional soil compaction is anticipated during operation of the Project, beyond that which would occur during construction. If required however, soil compaction requiring mitigation during onshore pipeline operation could be conducted in accordance with the Construction BMPs, **Appendix C-1**, Volume IIb. Direct negative consequences would be unlikely and mitigated prior to operations, during construction. They would be temporary and reversible and would be negligible to moderate impacts.

7.3.3.3 *Upsets and Accidents*

Soil compaction that would occur during a response to an upset or accident, such as an inadvertent leak or spill, would be mitigated through coordinated spill response. Soil compaction impacts are unlikely and negligible. In the event of a large spill or accident that results in substantial soil compaction, mitigation would be conducted as necessary, in accordance with the Onshore Project Construction and Mitigation Plans (see **Appendix C**, Volume IIb). Potential impacts to soil compaction would be unlikely, negligible to moderate, temporary and reversible.

7.3.3.4 *Decommissioning*

Soil compaction that would take place during decommissioning of onshore Project components would be similar to impacts that would take place during construction. However, due to the less invasive nature resulting in a need for fewer pieces of heavy equipment and a shorter duration of decommissioning, consequences would be smaller in scale than during construction. Soil compaction mitigation would be conducted, as necessary, in accordance with the BMPs (see **Appendix C**, Volume IIb). Potential impacts to soil compaction would be likely, temporary, reversible, with negligible to moderate significance.

7.3.4 Erosion

Soils crossed by the onshore Project components that are susceptible to erosion include Orcadia-Aris complex and Hackberry-Mermentau complex. Temporary disturbance to soils that are susceptible to erosion is from the construction ROW (18.3 acres), HDDs (accounting for 1.7 acres) and the temporary workspace at the tie-in to Station 701 (0.7 acre). Permanent impacts to soils that are susceptible to erosion are in the permanent ROW (8.8 acres).

7.3.4.1 *Construction and Installation*

Soils identified as susceptible to erosion would be exposed to accelerated wind erosion during construction due to soil disturbance from activities such as vegetation clearing, grading, excavation, and equipment movement. While this impact is likely, it would be temporary, reversible and moderate. Construction BMPs would be implemented to reduce impacts from erosion (see **Appendix C-1** of Volume IIb). The pipeline ROW would be revegetated over time.

7.3.4.2 *Operations*

It is not anticipated there would be additional soil erosion during operation of the Project. Potential direct negative consequences would be unlikely following completion of construction due to establishment of vegetative cover.

7.3.4.3 *Upsets and Accidents*

Soil erosion that would occur during a response to an upset or accident, such as an inadvertent leak or spill, would be mitigated through coordinated spill response. Soil erosion impacts are unlikely and negligible. In the event of a large spill or accident that results in substantial erosion, mitigation would be conducted as necessary, in accordance with the Onshore Project Construction and Mitigation Plans (See **Appendix C** of Volume IIb). Potential impacts to soil erosion would be unlikely, temporary and reversible, and negligible to moderate.

7.3.4.4 *Decommissioning*

Soil erosion that would take place during decommissioning of onshore Project components would be similar to impacts that would take place during construction. However, due to the less invasive nature resulting in a need for fewer pieces of heavy equipment and a shorter duration of decommissioning, impacts would be smaller in scale than during construction. Soil erosion mitigation would be conducted, as necessary, in accordance with BMPs. Potential impacts to soil erosion would be likely, temporary, reversible, and negligible to moderate.

7.3.5 Revegetation Potential

Soils crossed by the onshore Project components with poor revegetation potential include Creole mucky clay, Mermentau clay, Creole mucky peat, Ijam clay, Neel-Urban land complex, and Orcadia-Aris complex.

7.3.5.1 *Construction and Installation*

Temporary impacts to soils with poor revegetation potential would occur from construction of the pipeline ROW (69.2 acres), sites where HDD would take place (7.5 acres), staging areas (6.8 acres), the tie-in to Station 701 (0.2 acres). The Applicant would restore all disturbed areas that would not be paved or graveled in accordance with the Revegetation Plan (see **Appendix C-2** of Volume IIb), including monitoring or revegetation of soils with poor revegetation potential. Revegetation of soils with poor revegetation potential would also be achieved by following recommendations of the local soil conservation authority, as necessary. Private property would be restored in coordination with requests from individual property owners. Potential impacts associated with revegetation would be likely temporary in most cases and long-term for revegetation of forest or woody wetlands, which account for approximately 37.1 acres of temporary pipeline ROW and staging areas.

7.3.5.2 *Operations*

Permanent impacts to soils with poor revegetation potential would be permanent and minor and would occur only from the installation and operation of two MLVs on approximately 0.22 acres and two permanent access roads on 0.43 acres. Approximately 33.3 acres of the permanent ROW would be in soils with poor revegetation potential; impacts would be minor, and any mitigation would take longer per the Revegetation Plan (see **Appendix C-2** of Volume IIb).

7.3.5.3 *Upsets and Accidents*

Impacts to soils with poor revegetation potential could result from soil excavation or other ground-intrusive activities. Revegetation of poor revegetation potential soils would be achieved by following recommendations of the local soil conservation authority, as necessary. Impacts from upsets and accidents would be temporary, reversible, and negligible.

7.3.5.4 *Decommissioning*

Impacts on soils with poor revegetation potential during decommissioning would be occur from the removal of two MLVs, which accounts for only 0.2 acres of impact. These potential impacts would be likely; however, they would be temporary, reversible and negligible.

7.3.6 Stony/Rocky Soils

No stony/rocky soils and soils overlying shallow bedrock are crossed by the onshore Project components.

7.3.7 Hydric Soils

Hydric soils crossed by the onshore Project components include Bancker muck, Mermentau clay, Bancker mucky peat, Barbary mucky clay, Creole mucky peat, Ijam clay, and Orcadia-Aris complex. Hydric soils impacted during construction include pipeline ROW (209 acres), locations where HDD would be used (13.5 acres) and staging areas (6.5 acres). Hydric soils impacted during operations include four MLVs (0.46 acres) and two permanent access roads (0.43 acres). Approximately 98 acres of the permanent ROW would be in hydric soils.

7.3.7.1 *Construction and Installation*

Wetlands would be marked with appropriate setbacks, with some of these encompassing hydric soils. Topsoil would be segregated across the full width of the construction workspace in wetlands that are not saturated or flooded. Subsoil would be stockpiled separately from topsoil. Topsoil and vegetative debris would be stripped to a typical depth of up to 12 inches over the trench and spoil storage areas. The segregated topsoil and subsoil stockpiles would be replaced in the proper order during backfilling and final grading. HDD would be used in specific locations, including in saturated and unsaturated wetlands and, by extension, hydric soils. HDD is a technique that would be used to avoid wetlands/hydric soils in some areas. The push/pull construction method is also used in flooded wetlands and minimizes the Project footprint of disturbance to just the trench line as the pipe is welded in upland areas and floated into the excavated ditch.

Through the use of appropriate construction techniques described in Topic Report 1, Volume IIb, impacts on hydric soils would be likely but temporary, reversible and minor since areas are allowed to fully revegetate and contours restored to maintain hydrologic regimes necessary for hydric soils to persist.

7.3.7.2 *Operations*

Impacts to hydric soils would be permanent and minor and would occur only at four MLVs on approximately 0.46 acres and two permanent access roads on 0.43 acres. Approximately 98 acres of the permanent pipeline ROW would be in hydric soils and impacts would be negligible during operations because they would only occur from maintenance or in response to a spill. The permanent ROW would be restored per the Revegetation Plan (see **Appendix C-2** of Volume IIb); contours would be restored to maintain hydrologic regimes necessary for hydric soils to persist.

7.3.7.3 *Upsets and Accidents*

Impacts on hydric soils could result from soil excavation or other ground-intrusive activities. Impacts on hydric soils depend on the location and magnitude of the upset or accident. Potential impacts would be temporary, reversible, and negligible to moderate.

7.3.7.4 *Decommissioning*

Impacts on hydric soils during decommissioning would be similar to those for construction. The impacts would be smaller in scale because they would be less invasive; fewer pieces of heavy equipment would be needed and the duration would be shorter. These potential impacts would be likely however they would be temporary, reversible and negligible.

7.3.8 Agricultural Soils

Soils identified as agricultural with Statewide importance include, Orcadia silt loam, Orcadia-Anahuac, Orcadia-Anahuac, rarely flooded, and Orcadia-Aris complex. There are no known agricultural uses of these

soils in the Project area. Uses identified as agricultural have been identified as pasture land and not farmed (see Topic Report 8 of Volume IIb).

7.3.8.1 *Construction and Installation*

Impacts on agricultural soils from onshore pipeline construction would be anticipated due to soil disturbance from vegetation clearing, grading, and excavating. In cases where soils are used for agricultural purposes, the construction contractor would strip up to 12 inches (or the entire topsoil layer if less than 12 inches) of soil during construction and segregate it from subsoil. The topsoil and subsoil would either be stored in separate windrows on the construction ROW to avoid mixing or may be stored in individual stockpiles along the ROW with an acceptable barrier placed between each layer. In addition to disturbance of soils by clearing, grading and excavating, movement of trucks and heavy equipment along the ROW could result in rutting and compaction. Agricultural soils would be impacted during construction of the pipeline ROW (47.8 acres, including 2.8 acres for HDDs), staging areas (9.7 acres) and the temporary access road (0.2 acres). These impacts would be likely; however, they would also be temporary and reversible, so the overall environmental consequence of onshore pipeline construction is moderate.

There are no impacts to agricultural soils from aboveground facilities.

7.3.8.2 *Operations*

Following completion of construction and installation, no impacts to agricultural soils are anticipated during operation. There are approximately 23.2 acres of agricultural soils within the permanent pipeline ROW.

7.3.8.3 *Upsets and Accidents*

Impacts on agricultural soils could result from soil excavation or other ground-intrusive activities. Impacts on agricultural soils depend on the magnitude of the upset or accident. Potential impacts would be temporary, reversible, and negligible to moderate.

7.3.8.4 *Decommissioning*

Impacts on agricultural soils during decommissioning would be similar to those for construction. The impacts would be smaller in scale because they would be less invasive, fewer pieces of heavy equipment would be needed, and the duration would be shorter. These potential impacts would be likely; however, they would be temporary, reversible and negligible.

7.3.9 Potential Environmental Contamination

No known areas of contamination have been identified in the proposed Project area. There is only one facility reported and regulated by the EPA within 0.25 miles of onshore Project components. The Entergy GSI Sabine Plant is located near MP 10.5 of the onshore pipeline and is listed with the EPA as needing no further action.

The Applicant has developed an Unanticipated Discovery of Contamination Plan (see **Appendix C-4** of Volume IIb) that describes the procedures for dealing with unanticipated discoveries of contamination during construction of the Project. The Plan is intended to provide direction and guidance to Project personnel by establishing the procedures to be followed and notifications to be made in the event of contamination. Impacts from potential contamination are unlikely as there are no known contaminated sites within 0.25 mile of the Project. Impacts will be minimized by implementing the SPAR Plan.

7.3.10 Faults and Seismic Hazards

Seismic hazards are considered unlikely during all Project phases. The Project would not increase the potential for geologic hazards to occur, such as seismic events. The Project would not alter stratigraphy or geologic structures. Construction and operation would be in accordance with applicable regulations and Construction BMPs (see **Appendix C**, Volume IIb).

7.3.11 Subsidence

Subsidence hazards are recognized hazards in the area and will be factored into all Project design and operational considerations. The proposed construction would not increase subsidence; the Applicant would not increase fluid withdrawals or similar actions that cause subsidence.

7.3.12 Flooding and Storm Damage

The onshore Project area is subject to coastal storms, hurricanes, flooding, and other coastal processes. The onshore components would be designed to withstand severe weather and flooding events through a combination of burial depths, use of HDDs, and concrete coating.

7.3.13 Shoreline Erosion

Shoreline erosion in Sabine Lake will be avoided and reduced through the use of the HDD and the push/pull method. The push/pull method requires little or no travel lane and avoids the use of heavy equipment on the shore, reducing the potential for shoreline erosion. The contractor would follow the Construction BMPs found in **Appendix C-1** of Volume IIb. The existing Mainline of the Stingray system will be repurposed for oil service from Station 501 out to the DWP location in WC 509. Therefore, no shoreline would be impacted along this existing pipeline system.

7.3.14 Mineral Resources

There are no mineral resource features (including oil and gas wells) located within 0.25 miles of the Project facilities. There are no anticipated impacts to mineral resources from construction and operation of the Project. Materials sourced for the Project will be done from known commercial sources.

7.3.15 Paleontological Resources

In the Project area, deposits from four geologic eras dating as far back as 65 million years ago could contain a wide variety of paleontological resources. Impacts to paleontological resources are unlikely. See Volume III, **Appendix E** as well as Topic Report 6 of Volume IIb.

7.4 CUMULATIVE IMPACTS

A complete discussion of cumulative impacts is included in Volume IIa, Appendix C, "Framework for Cumulative Impacts Analysis."

7.5 MITIGATION MEASURES

Construction, operation, and maintenance of the Project facilities will be in accordance with all applicable rules and regulations, permits, and approvals. To avoid and minimize impacts to soils and geologic resources during construction and operation of the Project, the Applicant has:

- Minimized the footprint of the proposed work activities and the duration of disturbances to the extent practicable to reduce impacts;
- Repurposed existing facilities (Station 501, Station 701, Stingray Mainline) to minimize impacts;
- Collocated the onshore pipeline to the extent possible with existing ROW to minimize impacts during construction and operation of the pipeline system; and
- HDD crossing method used to cross sensitive environmental land (i.e., Lower Neches WMA Nelda Stark Unit) and waterbodies (i.e., Neches River).

The Applicant will implement the following plans (included in **Appendix C** of Volume IIb) to ensure adequate protection of vegetation resources during onshore construction.

- Project's Onshore Construction BMP Plan to avoid, minimize, and mitigate environmental impacts as they relate to the construction and operation of the Project (**Appendix C-1**).
- Revegetation Plan to avoid and minimize introduction of noxious and invasive plant species and promote rapid revegetation (**Appendix C-2**).
- SPAR Plan to avoid and minimize inadvertent spills and releases of oil and hazardous materials (**Appendix C-3**).
- HDD Contingency Plan to reduce the likelihood of inadvertent releases of drilling fluid/mud and will follow cleanup procedures should an inadvertent release occur (**Appendix C-5)**.

7.6 SUMMARY OF POTENTIAL IMPACTS

Activities that would result in impacts on soils and geologic resources during construction would include clearing, grading, and excavating, as well as the movement of construction vehicles, which could result in rutting and compaction from heavy equipment.

The impacts on the soils and geologic resources during construction of the Project would be temporary and limited to the extent of the construction footprint. The Applicant proposes to restore the temporarily disturbed areas to pre-construction topographic contours. As a result of the relatively narrow width of construction workspaces and proposed restoration to pre-construction contours, the impacts from Project construction are anticipated to be short-term and minor.

In total, the Project would temporarily impact approximately 57.7 acres of soils suitable for agriculture and approximately 242.4 acres of hydric soils. The Project would permanently impact approximately 23.2 acres of soils suitable for agriculture and approximately 125.8 acres of hydric soils.

7.7 REFERENCES

Baum, R.L., D.L. Galloway, and E.L. Harp. 2008. Landslide and Land Subsidence Hazards to Pipelines: U.S. Geological Survey Open-File Report 2008-1164, 192 p.

Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA). 2020. Available online at: https://lacoast.gov/new/About/Basin_data/cs/Default.aspx. Accessed July 2020.

McBride R.A, Taylor M.J, and Byrnes M.R. 2007. Coastal morphodynamics and Chenier-Plain evolution in southwestern Louisiana, USA: A geomorphic model. Geology and Earth Science Program, Department of Environmental Science and Policy, George Mason University; Department of Geography, University of Denver; Applied Coastal Research and Engineering, Inc; Available online at: www.sciencedirect.com. Accessed June 2020.

National Oceanic and Atmospheric Administration (NOAA). 2020a. Sea Level Trends. Available online at: https://tidesandcurrents.noaa.gov/sltrends/sltrends.html. Accessed June 2020.

——. 2020b. Storm Events Database. Available online at: https://www.ncdc.noaa.gov/stormevents/. Accessed June 2020.

National Resource Conservation Service (NRCS). 2020. Custom Soil Resource Report for Cameron Parish, Louisiana, and Jefferson and Orange Counties, Texas. July 13, 2020.

Kulp, M., Penland, S., Williams, S.J., Jenkins, C., Flocks, J., and Kindinger, J. 2005. Geological framework, evolution, and sediment resources for restoration of the Louisiana coastal zone. In: Finkl, C.W. and Khalil, S.M. (eds.), Saving America's Wetland: Strategies for Restoration of Louisiana's Coastal Wetlands and Barrier Islands, Journal Coastal Research, Special Issue No. 44, pp. 56–71.

Penland, S., Connor, P.F., Jr., Beall, A., Fearnley, S., and Williams, S.J. 2005. Changes in Louisiana's shoreline, 1855–2002, in Saving America's wetland—Strategies for restoration of Louisiana's coastal wetlands and barrier islands: Journal of Coastal Research, Special Issue no. 44, p. 7–39, Available online at: https://www.jstor.org/stable/25737047. Accessed June 2020.

Kindinger, J.L., Buster, N.A., Flocks, J.G., Bernier, J.C., and Kulp, M.A., 2013, Louisiana Barrier Island Comprehensive Monitoring (BICM) Program Summary Report—Data and analyses 2006 through 2010: U.S. Geological Survey Open-File Report 2013–1083, 86 p., Available online at: https://pubs.usgs.gov/of/2013/1083/. Accessed June 2020.

United States Department of Agriculture (USDA). 1996. 61 Federal Register 29050 - Changes in Hydric Soils of the United States. Available online at: https://www.govinfo.gov/content/pkg/FR-1996-06-07/pdf/96-14142.pdf. Accessed June 2020.

Wheeler, R.L. and A.J. Crone. 2000. Data for Quaternary faults, liquefaction features, and possible tectonic features in the Central and Eastern United States, east of the Rocky Mountain front.