Deepwater Port License Application for the

Texas Gulf Terminals Project

Volume II – Environmental Evaluation (Public)

Section 3:

Water Quality

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

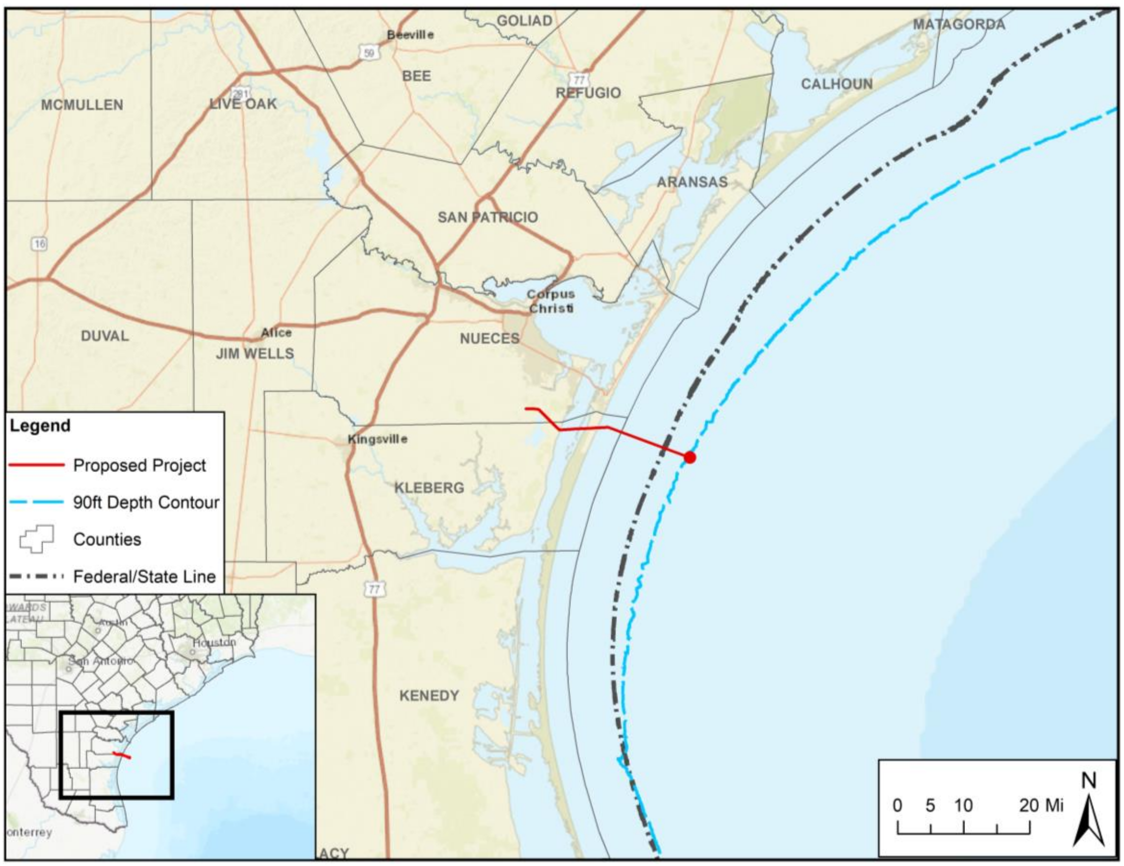
Applicant	Texas Gulf Terminals Inc.
BAV	beach action value
BEACH	Beaches Environmental Assessment and Coastal Health Act
BOEM	Bureau of Ocean Energy Management
bph	barrels per hour
CALM	Catenary Anchor Leg Mooring
CFR	Code of Federal Regulations
CMP	Coastal Management Program
CWA	Clean Water Act, as amended in 1977
CZMA	Coastal Zone Management Act
DO	dissolved oxygen
DWP	deepwater port
DWPL	Deepwater Port License
DWPA	Deepwater Port Act of 1974, as amended
e.g.	exempli gratia [Latin for '*for example*']
E&E	Ecology and Environment
EIS	Environmental Impact Statement
ft.	Feet
GLO	General Land Office
GOM	Gulf of Mexico
gpm	gallons per minute
HDD	Horizontal Directional Drilling
IGG	Inert gas generator
km	kilometer
m	meter
MARAD	Maritime Administration
MARPOL	The International Convention for the Prevention of Pollution from Ships,
MHT	mean high tide
MMS	Minerals Management Service
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRDC	Natural Resources Defense Council
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Land Act of 1953
OSTF	onshore storage terminal facility
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PINS	Padre Island National Seashore
PLEM	pipeline end manifold
Project	Texas Gulf Terminals Project
RHA	Rivers and Harbors Act of 1899
RO	Reverse Osmosis

RRC	Railroad Commission
SPCC	Spill Prevention, Control, and Countermeasure Plan
SPM	single point mooring
TCEQ	Texas Commission on Environmental Quality
TN	total nitrogen
TPDES	Texas Pollutant Discharge Elimination System
TWDB	Texas Water Development Board
U.S.	United States [of America]
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
VLCC	very large crude carrier
WOTUS	Waters of the United States

PROJECT OVERVIEW

Texas Gulf Terminals Inc. (TGTI; also referred to as Applicant) is proposing to construct and operate a deepwater port (DWP), associated pipeline infrastructure, booster station, and an onshore storage terminal facility (OSTF), collectively known as the Texas Gulf Terminals Project (Project), for the safe, efficient and cost-effective export of crude oil to support economic growth in the United States of America (U.S.). The Applicant is filing this Deepwater Port License (DWPL) application to obtain a license to construct, own, and operate the Project pursuant to the Deepwater Port Act of 1974, as amended (DWPA), and in accordance with the U.S. Coast Guard (USCG) and the Maritime Administration's (MARAD) implementing regulations.

The Applicant is proposing to construct and operate the Project to allow direct and full loading of very large crude carriers (VLCC) at the DWP, via a single point mooring (SPM) buoy system. The proposed Project consists of the construction of a DWP, onshore and inshore pipeline infrastructure, offshore pipelines, and an OSTF. The proposed DWP would be positioned outside territorial seas of the Outer Continental Shelf (OCS) Mustang Island Area TX3 (Gulf of Mexico [GOM]), within the Bureau of Ocean Energy Management (BOEM) block number 823. The proposed DWP is positioned at Latitude N27° 28' 42.60" and Longitude W97° 00' 48.43", approximately 12.7 nautical miles (nm) (14.62 statute miles [mi]) off the coast of North Padre Island in Kleberg County, Texas. Refer to the Vicinity Map depicting the location of the proposed Project.



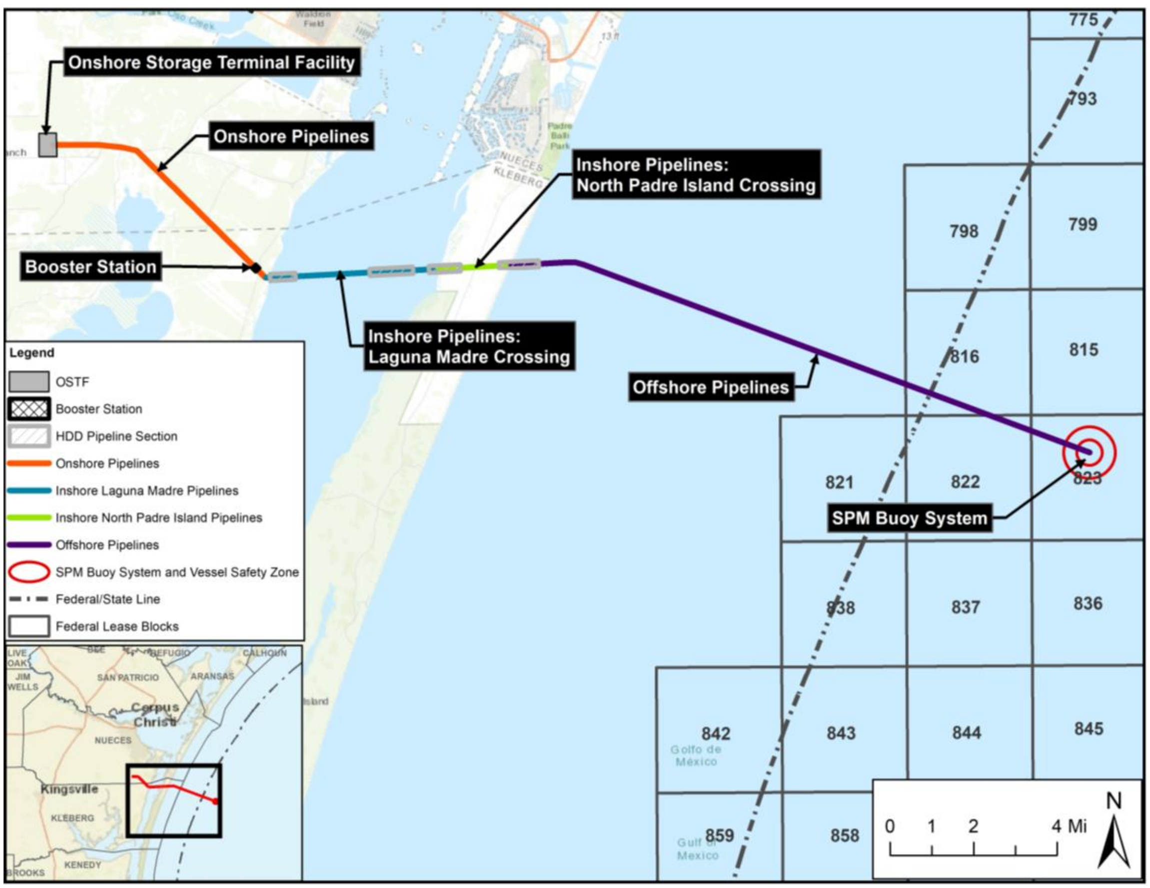
Vicinity Map

The proposed Project involves the design, engineering, and construction of a DWP, 26.81 miles of pipeline infrastructure, booster station, and an OSTF. For the purposes of this DWPL application, the proposed Project is described in three distinguishable segments by locality including "offshore", "inshore", and "onshore".

Onshore Project components includes an approximate 150-acre (ac) (60.7 hectares [ha]) OSTF, an 8.25 ac (3.3 ha) booster station, and approximately 6.36 mi of two (2) new 30-inch-diameter crude oil pipelines extending from the OSTF located in Nueces County, to the booster station located in Kleberg County, and continue to the landward side of the mean high tide (MHT) line of the Laguna Madre. The proposed OSTF will serve as the primary collection and storage terminal of crude oil to be directly pumped through the proposed pipeline infrastructure to the DWP. Outbound flow rates from the OSTF to the DWP are anticipated to be approximately 60,000 barrels per hour (bph).

Inshore components associated with the proposed Project are defined as those components located between the western Laguna Madre MHT line and the MHT line located at the interface of North Padre Island and the GOM; this includes approximately 5.74 mi of two (2) new 30-inch-diameter crude oil pipelines and an onshore block valve station located on North Padre Island. The onshore valve station will serve as the primary conjunction between the proposed onshore and offshore pipeline infrastructure.

Offshore components associated with the proposed Project include the DWP and offshore pipelines. Principle structures associated with the proposed DWP includes one SPM buoy system consisting of the SPM buoy, pipeline end manifold (PLEM), sub-marine hoses, mooring hawsers, and floating hoses to allow for the loading of crude oil to vessels moored at the proposed DWP. The proposed SPM buoy system will be of the Catenary Anchor Leg Mooring (CALM) type permanently moored with a symmetrically arranged six-leg anchor chain system extending to pile anchors fixed on the seafloor. Offshore pipeline infrastructure associated with the proposed Project consist of approximately 14.71 mi of two (2) new 30-inch-diameter pipelines extending from MHT line on North Padre Island to the SPM buoy system located at the proposed DWP. Refer to the Project Components Map below for a depiction of the location of the Project components discussed above.



Project Component Map

3.0 WATER QUALITY

Water Quality includes biological, chemical, and physical characteristics of waterbodies across a diverse set of habitats that occur within and adjacent to the Project area. Due to the location of the various Project components, water quality is discussed in terms of onshore, inshore and offshore habitat. Onshore habitats refer to water bodies located landward from the western shore of the Laguna Madre. Inshore habitat refers to water bodies located landward from the mean high tide (MHT) line of North Padre Island. Offshore habitat refers to water bodies located seaward into the Gulf of Mexico (GOM) from the MHT line of North Padre Island. This section describes the various water quality and the potential Project impacts on this resource. The framework for the evaluation of environmental consequences and cumulative impacts in the Introduction of Volume II of the Deepwater Port License (DWPL) application.

Section 3.0 Water Quality is structured as follows:

- Section 3.1 Applicable Laws and Regulations: Background on relevant regulatory laws for consideration;
- Section 3.2 Existing Conditions: Information on the existing inshore and offshore aquatic environment in the Project vicinity;
- Section 3.3 Environmental Consequences: An analysis of environmental consequences;
- Section 3.4 Cumulative Impacts: An analysis of cumulative impacts;
- Section 3.5 Mitigation Measures: Proposed mitigation measures;
- Section 3.6 Summary of Potential Impacts: A summary of potential impacts; and
- Section 3.7 References.

3.1 Applicable Laws and Regulations

3.1.1 International Laws and Regulations

During construction and operation of the proposed Project, all operating vessels would be required to comply with the International Convention for the Prevention of Pollution from Ships, adopted in 1973 and modified by the Protocol of 1978 (MARPOL). One hundred and thirty-six countries, including the U.S., have signed the MARPOL Convention, which covers 98 percent of the world's shipping tonnage. Every signatory of the MARPOL Convention is required to enact domestic laws to implement, and enforce compliance with the Treaty. The Convention includes regulations aimed at preventing and minimizing pollution from ships, both accidental pollution and that resulting from routine operations (Ecology and Environment [E&E] 2015).

In the U.S., the legislation implementing the MARPOL Convention is known as the Act to Prevent Pollution from Ships (E&E 2015). The Convention addresses ocean pollution via six annexes:

- Annex I: Oil;
- Annex II: Noxious Liquid Substances carried in Bulk;
- Annex III: Harmful Substances carried in Packaged Form;
- Annex IV: Sewage;
- Annex V: Garbage; and,
- Annex VI: Air Pollution.

3.1.2 Federal, State, and Local Laws and Regulations

The Applicant has reviewed the following laws and statues that relate to water quality and provided a list of applicable regulations required to comply with the Deepwater Port (DWP) Act during construction and operation of the proposed Project; Clean Water Act of 1977 (CWA), Pub. L. 95–217, 33 United States Code (USC). 1251, *et. seq.,* Environmental Quality Improvement Act, Pub. L. 98–581, 42 U.S.C. 4371, *et. seq.,* Federal Compliance with Pollution Control Standards, E.O. 12088, 43 FR 47707, Invasive Species, E.O. 13112, 64 FR 6183, National Environmental Policy Act of 1969 (NEPA), Pub. L. 91–190, 42 U.S.C. 4321, *et.* seq., Pollution Prevention Act of 1990 (PPA), 42 U.S.C. 13101–13109, et. seq., Protection and

Enhancement of Environmental Quality, E.O. 11514, 35 FR 4247, U.S. Rivers and Harbors Act of 1899 (RHA), Section 10, and Coastal Zone Management Act (CZMA) (Public Law 92-583, 1972), amended in 1976 (Public Law 94-370)

3.1.2.1 Clean Water Act Section 402- National Pollutant Discharge Elimination System

The Federal Water Pollution Control Act Amendments of 1972, known as the Clean Water Act (CWA) authorizes the U.S. Environmental Protection Agency (USEPA) to issue National Pollutant Discharge Elimination System (NPDES) permits. This authority has been delegated to 45 of the 50 states. In 1998, the USEPA delegated authority to the state of Texas Commission on Environmental Quality (TCEQ) to implement the NPDES to permit surface water and stormwater discharges, predominately from industrial and domestic wastewater facilities, as well as from certain construction sites.

The Railroad Commission of Texas (RRC) has jurisdictional authority over the transportation and storage of crude oil in the State of Texas; however, the RRC has not been delegated authority by USEPA to administer the NPDES program for non-exempt oil and gas operations.

Based on input from USEPA Region 6, the onshore portion of the facility would not be exempt from the Clean Water Act 402(l)(2) for uncontaminated stormwater discharges from oil and gas exploration, production, processing, or treatment operations or transmission facilities. Hence, the onshore storage terminal facility (OSTF) will be required to obtain authorization to discharge stormwater during construction activities and normal operation.

While a NPDES permit would be required for operation of the proposed onshore components of the proposed Project; the offshore SPM buoy system would operate in federal waters, outside state of Texas waters. The SPM buoy system would not result in any discharges during operations and the vessels connected to the SPM buoy system would be operating in the capacity as a means of transportation. Therefore, it is the Applicants understanding that neither the SPM nor the vessels loading crude oil will come under the jurisdiction of the EPA's NPDES Permit Program.

3.1.2.2 Clean Water Act - Section 10 of the Rivers and Harbors Appropriation Act of 1899 and Section 404 of the CWA (Dredge and Fill Permits)

The USACE permit authority is derived from Section 10 of the RHA; Section 404 of the CWA; Section 103 of the Marine Protection, Research, and Sanctuaries Act; and Section 4(f) of the Outer Continental Shelf Land Act (OCSLA). These acts give the USACE jurisdiction over all the Waters of the U.S. (WOTUS). Coastal Texas waters in the proposed Project area fall under the jurisdiction of the Galveston USACE District. District resource and regulatory specialists evaluate permit applications for construction work in navigable waters, and/or for disposal of dredged material. Section 10 regulates navigable waters and is required for any constructed structure for the entire Project. Section 404 regulates any disturbance to substrate, wetlands and special aquatic sites, including Project construction, operation within WOTUS, including wetlands and other special aquatic sites.

A single USACE permit that covers both Section 10 of the RHA, as well as Section 404 of the CWA is required for the Project and is included as part of Volume I of this submittal. A Section 401 certification review of the Section 404 permit application from the USACE must be conducted by the RRC to maintain consistency between state and federal organization for crude oil projects. This ensures that all actions that involve or affect water quality meet the requirements and standards of all agencies involved.

3.1.2.3 National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires all federal agencies to consider the potential environmental consequences of their proposals, document the environmental analysis, and make this information available to the public for comment prior to making a permit decision on any major federal action. Issuing permits for construction of the Project would qualify as a major federal action and trigger the requirement for NEPA analysis. Under the DWPA, the USCG would initiate the NEPA process and have federal jurisdiction over the entire Project under NEPA. The USCG and Maritime Administration (MARAD) have determined that an environmental impact statement (EIS) will be prepared to support the NEPA process.

3.1.2.4 BEACH Act

While most of the Texas coastline is dominated by tidal wetlands, coastal beaches line much of the GOM and estuarine shoreline. The Beaches Environmental Assessment and Coastal Health Act (BEACH), signed into law on October 10, 2000, amends the CWA, incorporating provisions for reducing the risk of illness to users of the nation's recreational waters. The BEACH Act authorizes the USEPA to award program development and implementation grants to eligible states, territories, tribes, and local governments to support microbiological testing and monitoring of coastal recreation waters that are adjacent to beaches or similar points of access used by the public. BEACH Act grants also provide support for the development and implementation of programs to notify the public of potential exposure to disease-causing microorganisms in coastal recreation waters. The Natural Resources Defense Council (NRDC) (2014) ranked Texas 16th in Beachwater Quality (out of 30 states) (NRDC 2014). In 2013, 10% of Texas beach water samples exceeded the USEPA's new beach action value (BAV) standards of 60 enterococcus bacteria colony forming units per 100 milliliters for designated beach areas (NRDC 2014).

3.1.2.5 Operational Guidelines for Discharges

In addition to the regulations governing the permitted discharges, there are operational guidelines for discharges based on the jurisdictions regulated by the USCG, which are areas defined as Internal Waters, Inland Waters, Territorial Sea, Contiguous Zone, Exclusive Economic Zone, High Seas, and Foreign Territorial Seas. Under federal law, vessels are permitted to discharge under the parameters presented in Table 3-1 (E&E 2015). Because the proposed Project would be located approximately 12.8 nautical miles (or 14.7 statute miles) off the coast of Kleberg County, Texas, requirements for discharges would fall in the established limits for "beyond 12 nautical miles" from shore.

Table 3-1: United States Coast Guard Pollution Regulations

Parameter	Standard
Plastics	No discharge allowed anywhere.
Food wastes	0 to 3 nautical miles - no discharge allowed. 3 to 12 nautical miles - discharge permitted, but food waste must be ground to within 1 inch, or less, in size. Beyond 12 nautical miles - discharge permitted without restrictions
Gray Water	Defined as shower/sink drain water; there are no general federal restrictions regarding "gray water" discharge, unless a sensitive area has been identified as a no-discharge zone.
Hazardous substance	0 to 3 nautical miles - discharge of materials greater than the "reportable quantity" (allowed by law) is prohibited.
Non-plastic trash	0 to 3 nautical miles – not permitted. 3 to 12 nautical miles – the material must be ground to 1 inch. 12 to 25 nautical miles – discharge permitted except for dunnage. Beyond 25 nautical miles – discharge is permitted.
Sewage	0 to 3 nautical miles – discharge only after treatment of processing is completed through a USCG-approved marine sanitation device Beyond 3 nautical miles – sewage discharge is permitted.
Oil	Vessels are permitted to discharge oil wastes only when the vessel is underway and only after processing the oil waste through an oil/water separator resulting in an effluent that is less than 15 parts per million and does not cause a visible sheen.

3.1.3 Coastal Management Program Consistency

The Texas CMP, a product of Texas Coastal Coordination Act of 1991, gained the authority to review Federal actions that are in or affect the land and water resources in the Texas Coastal Zone. This is maintained through a Federal consistency review process. The counties of Orange, Jefferson, Chambers, Harris, Galveston, Brazoria, Matagorda, Jackson, Victoria, Calhoun, Refugio, Aransas, San Patricio, Nueces, Kleberg, Kenedy, Willacy and Cameron make up the Texas Coastal Zone. The proposed project site is located in Kleberg and Nueces Counties. National Oceanic and Atmospheric Administration (NOAA) defines a Texas Coastal Zone as "the area seaward of the Texas coastal facility designation line which roughly follows roads that are parallel to coastal waters and wetlands generally within one mile of tidal rivers. The boundary encompasses all or portions of 18 coastal counties. Texas' seaward boundary is 3 marine leagues (9 nautical miles)." Based on these parameters, the projected project site will fall into the category of a Texas Coastal Zone.

To remain in accordance with 31 TAC § 506, the project must coincide with the Texas CMP. A Section 401 certification review of the Section 404 permit application from the USACE must also be conducted by the TCEQ to maintain consistency between state and federal organization. This ensures that any activity with the potential to affect the water quality meets the requirements and standards of all agencies involved.

3.1.4 Clean Water Act Section 401 - Water Quality Certification

One of the requirements for obtaining a USACE Section 404 permit is certification from the Texas Commission on Environmental Quality (TCEQ) that the discharge to be permitted will comply with state water quality standards. Because these reviews are done under the authority of Section 401 of the federal CWA, they are referred to as Section 401 certification reviews. However, the Railroad Commission of Texas (RRC) has jurisdictional authority over the transportation and storage of crude oil in the State of Texas per TEXAS NATURAL RESOURCE CODE, '91.101 and TEX. WATER CODE, Section 26.131 for projects that require:

- dredging an access channel to conduct drilling or production operations in critical area;
- in connection with construction of a drilling pad or installation of a production platform in a critical area; or
- in connection with construction, operation, or maintenance of a crude oil or natural gas pipeline facility in a critical area.

The proposed Project requires construction, operation and maintenance of a crude oil pipeline; therefore, the RRC will issue the water quality certification for the proposed Project concurrent with the processing of a U.S. Army Corps of Engineers (USACE) permit application, under Section 401 of the Clean Water Act (CWA) and Title 16, Texas Administrative Code, Section 3.93.

The State of Texas sets its own water quality standards, which act as a measure of whether the quality of each waterbody in the state is kept at the level necessary to perpetuate the human and aquatic life that has historically existed there. In allowing pollutants to be added to state water (which includes a broad range of substances such as chemicals, concrete, rock, sand, or other materials), both the federal government and the State of Texas are required to be sure that the discharge will not create a condition that will impair the ability of life existing in or depending on the water to survive and reproduce. The state is charged with confirming that the federal permit accomplishes this. The TCEQ is the agency with primary responsibility for making sure the State of Texas adopts and enforces state water quality standards. It typically conducts 401 certification reviews to ensure that Texas is involved in decisions made by the federal government that affect the quality of the water resources of this state. For the proposed Project RRC will be responsible for issuing the water quality certification which enforces state water quality standards.

3.2 Existing Environment

3.2.1 Water Quality

The term water quality describes biological, chemical, and physical characteristics of waterbodies. It is an important measure of ecological health. Water quality is most often discussed in reference to a particular use of the water, such as recreation, drinking, or ecosystem health. This usage divides the analysis area into coastal and marine waters and includes human uses of water for recreational, agricultural, industrial and domestic uses.

The primary factors influencing coastal water quality and marine water quality are temperature, dissolved oxygen, salinity, nutrients, pH, contaminants, and turbidity. Trace metals and organic compounds can also affect water quality. Altering the ecosystem through changes in any of these water quality parameters could impact habitat and biological resources and could result in population reduction of specific aquatic species, proliferation of undesirable, exotic or invasive species, and possibly mass mortality (i.e., fish kills, red tide). Such effects can either be localized or widespread (E&E 2015).

The Project area includes both coastal and marine waters, as well as terrestrial components. The proposed offshore components and associated pipeline interconnects would be in the marine waters of the nearshore GOM between Corpus Christi Bay and the upper Laguna Madre. Marine waters, as defined in this document, include Texas state waters in the vicinity of the proposed Project site. Terrestrial components include North Padre Island as well as onshore areas west of Laguna Madre.

The proposed DWP and associated pipeline segments (seaward of the MHT line) would be in marine waters of the GOM. While the various parameters measured to evaluate water quality vary in marine waters, pH does not. The buffering capacity of the marine environment is controlled by carbonate and bicarbonate, which is slightly above circumneutral, maintaining a pH of 8.2 (U.S. Mineral Management Service [MMS] 2002). Factors such as currents, wind, and severe weather also affect water quality; however the effects of these variables are difficult to measure. The following sections describe the physical environment of the marine waters in the vicinity of the Project, including the shallow waters overlying over the Outer Continental Shelf (OCS) and deeper waters farther offshore.

3.2.1.1 Coastal Surface Water Quality

The proposed DWP would not be located in coastal waters; however, certain Project components, including pipelines landward of the MHT line, would cross the coastal zone of Texas. Coastal areas are influenced by the influx of freshwater and sediment from rivers and the tidal actions of the oceans, estuaries and bays. The primary variables that influence coastal water quality are water temperature, total dissolved solids (salinity), suspended solids (turbidity), and nutrients. An estuary's salinity and temperature structure are determined by hydrodynamic mechanisms, including tides, nearshore circulation, freshwater discharge from rivers, and local precipitation.

Coastal estuaries provide essential habitat for plants, animals, and humans. Wetlands, mangrove swamps, and seagrasses surround the Texas Gulf Coast estuaries, providing food and shelter for shorebirds, migratory waterfowl, fish, invertebrates (e.g., shrimp, crab, clams and oysters), reptiles, and mammals. Estuarine- dependent species constitute more than 75 percent of the commercial fishery harvests from the GOM (NOAA 1990).

Estuarine ecosystems are affected by humans, primarily via upstream withdrawals of water for agricultural, industrial, and domestic purposes; contamination by industrial and sewage discharges and agricultural runoff carrying pesticides and herbicides; and habitat perturbations (e.g., construction and dredge-and-fill operations). Drainage from more than 40 percent of the contiguous U.S. enters the GOM, primarily from the Mississippi River. Texas ranked first in the nation in 1995 in terms of discharging the greatest amount of toxic chemicals (USEPA 1999). The GOM region ranks highest of all coastal regions in the U.S. in the number of wastewater treatment plants (1,300), number of industrial point sources (2,000), percentage of land use devoted to agriculture (31 percent), and application of fertilizer to agricultural lands (62,000 tons of phosphorus and 758,000 tons of nitrogen) (NOAA 1990).

In 1999, the USEPA assessed the ecological condition of GOM estuaries. The assessment describes the general ecology and summarizes the "health" of all GOM estuarine systems. The Laguna Madre estuarine system was considered to be in poor condition in the early 1990s due primarily to high amounts of point source pollution and elevated metal concentrations (USEPA 1999).

The USEPA conducted a National Coastal Condition Assessment in 2010, Figure 2 and the following indicates their findings for the water quality of the Gulf coast waters. "Based on the water quality index, 16% of Gulf Coast waters are in good condition, 58% are rated fair, and 24% are rated poor. Phosphorus and chlorophyll a contribute most to the fair and poor water quality index scores in this region. The ratings of the component indicators are included below (USEPA 2010):

- Phosphorus is found at low levels (rated good) in 19%, at medium levels (rated fair) in 35%, and at high levels (rated poor) in 44% of Gulf Coast waters.

- Nitrogen is found at low levels (rated good) for 81%, moderate levels (rated fair) in 8%, and at high levels (rated poor) in 10% of Gulf Coast waters.

- Dissolved Oxygen (DO) is found at high levels (rated good) in 65%, moderate levels (rated fair) in 24%, and low levels (rated poor) in 7% of Gulf Coast waters.

- Water clarity is good in 61% of Gulf Coast waters, fair in 16%, and poor in 16%. Data are missing for 8% of Gulf Coast waters.

- Chlorophyll a is found at low levels (rated good) in 23% of coastal area, at moderate levels (rated fair) in 56%, and at high levels (rated poor) in 17% of Gulf Coast waters.

Ward and Armstrong (1997) assessed the water, sediment, and tissue (fish and shellfish) quality of the upper Laguna Madre, using a compilation of data from multiple surveys and research projects preformed in the area (Cooper, Cederbaum and Gannon 2005). They discussed trends for each type of data and addressed the deficiencies in data collection and management. Quenzer et al. (1998) created a model of the total load and water quality for Corpus Christi Bay and the upper Laguna Madre using elevation, stream network and discharge, precipitation, water quality, and land use data sets. Carr et al. (1998) examined the sediment associated with stormwater outfalls for potential contamination at 36 sites in the Corpus Christ Bay National Estuarine Program. They analyzed samples for microbial indicators, physical properties, concentration of contaminants, toxicity, and benthic community. Several of these variables, such as contaminant concentrations and fecal coliform, exceeded quality guideline levels at a number of sites. They determined that several sites were affected by human impacts (Cooper, Cederbaum and Gannon 2005).

Castro et al. (2003) examined the amount and source of total nitrogen (TN) in estuaries along the Eastern and Gulf coasts. The sources varied according to the watershed and the lowest TN was found in Laguna Madre. The authors recommended implementing reduction programs that target the dominant TN source for the watershed (Cooper, Cederbaum and Gannon 2005).

Water quality data for surface water in the state, including the Corpus Christi area, have been monitored by TCEQ since 2000. To comply with Section 303(d) of the CWA, states are required to compile a list of impaired waters every two years. Both the GOM and Laguna Madre were on TCEQ's 303(d) impaired waters list. The GOM was on the list due to concern over mercury in king mackerel (*Scomberomorus cavalla*), and depressed dissolved oxygen in various locations. Laguna Madre was on the list due to concerns over depressed dissolved oxygen and high levels of bacteria in various locations. In the upper third of the Laguna Madre and in a localized area near the mouth of the Arroyo Colorado, dissolved oxygen concentrations are occasionally lower than the criterion established to provide optimum conditions for aquatic life. Based on Texas Department of Health shellfish maps, 5.2% of the bay (18.1 square miles near the Arroyo Colorado and along the Intracoastal Waterway) does not support the oyster water use due to potential contamination by human pathogens (Cooper, Cederbaum and Gannon 2005).

3.2.1.2 Groundwater Quality

Areas west of the proposed project area are underlain by the Gulf Coast Aquifer, which is a large water supply aquifer, which includes the Gulf Coast of Texas, Louisiana, Mississippi, Alabama and the panhandle of Florida. The eastern edge of the Gulf Coast Aquifer comes to within approximately 25 miles of the project area to the west. There are no known drinking water or agriculture wells found within several miles of the project area. The proposed project area is not underlain by any parts of the Gulf Coast Aquifer (Texas Water Development Board [TWDB] 2006).

The source for fresh groundwater on barrier islands along the Texas coast is rain and surface runoff from rain percolating into the ground. The portion of the rain which does not evaporate, run off, or return to the atmosphere by plant transpiration, flows downward into the sand of barrier island aquifers and slowly flows into the GOM on the east side, as well as into bays and the Laguna Madre on the west side of the barrier islands (Watson 1998).

Texas barrier islands are composed of long, narrow bodies of sand. Maximum sand thickness on Texas barrier islands vary from approximately 75 to 150 feet (ft.) thick and it extends from a short distance seaward of the beach to the bay shoreline. Most of the aquifer will be considerably thinner than 100 ft. Texas barrier islands, and therefore, the water-bearing aquifers below them, are thickest in the vicinity of the main line of vegetated dunes adjacent to the GOM shoreline and thins to almost nothing near the Corpus Christi Bay shoreline. This sand body is full of either fresh water or salt water below the level of the water table (Watson 1998).

Watson (1998) studied the groundwater of Mustang Island and Port Aransas, just north of the Project area. Groundwater in the Mustang Island aquifer, is a valuable resource for the citizens of Port Aransas and Mustang Island. The aquifer has a maximum thickness of between 75-150 ft. It is thickest near the dune line and thinnest on the Corpus Christi Bay side (Watson 1998; Cooper, Cederbaum and Gannon 2005).

Myers (1964) conducted a survey on the availability of potable water on the north and south ends of Padre Island. Using surveys and electric oil test logs, he found that there was not enough naturally existing potable water available on the island to support the proposed Padre Island National Seashore (PINS) and instead the water would have to be piped in from existing sources. Fresh shallow groundwater (3-15 ft. in the north, 3-10 ft. in the south) existed in the dunes as a lens floating on saline water but was probably not more than a few ft. deep. Electric logs in the bay did not locate any potable deep groundwater in the north and no logs were available for the south end of the island (Cooper, Cederbaum and Gannon 2005).

Boylan (1986) conducted a year-long study examining the effects of season, meteorology and tides on the groundwater at PINS. Sharp et al. (1992) examined the hydrology of PINS and attempted to characterize the chemistry of the groundwater and determine the configuration of the freshwater lens (Cooper, Cederbaum and Gannon 2005).

The University of Texas conducted two hydrogeologic surveys during 1997 and 2001 (Sharp 1997, 2001). They collected data on the groundwater levels and chemistry of PINS, the shape of the freshwater lens and the extent of hydrocarbon contamination (Cooper, Cederbaum and Gannon 2005).

Berkebile (1995) investigated groundwater at PINS. In his Phase I report he described the aquifer as having three distinct zones: the hypersaline, the freshwater and the seawater. As with Myers, Berkebile found that the freshwater recharge comes from precipitation on the island but also found that the aquifer was not directly connected to the mainland aquifer (Cooper, Cederbaum and Gannon 2005).

Groundwater chemistry was described in the Phase II draft report (Berkebile and Hay 2001). Berkebile and Hay found that the ammonia levels were very high in wells near the saline zone. It was thought that this was due to high N production from the algal mat on the wind tidal flats instead of an anthropogenic source. They also monitored three ponds in the northern portion of the park for changes in water levels. These were the most recent studies on groundwater at the park (Berkebile and Hay 2001). Berkebile and Hay found that wells near the dune line had extremely low salinities often lower than 1 part per thousand and not exceeding 3 parts per thousand salinities. Wells in the center of the island rarely exceeded 5 parts per thousand. Normal seawater salinity is 35 parts per thousand. Berkebile and Hay found very high salinities on the back of Padre Island near Laguna Madre ranging to a high of 96 parts per thousand (Berkebile and Hay, n. d.; Cooper, Cederbaum and Gannon 2005).

Watson's experience on Mustang Island is similar (Watson 1998). Wells near the dunes and in the higher vegetated parts of the island produce excellent fresh water. Wells further toward the bay, the channels and the flats are of higher salinity and lower quality. The wells in the thinner parts of the aquifer (toward the bay and flats) are also not able to produce large quantities of water without drawing the water table down to salt. The best location for water wells is within 1500 to 2000 ft. of the beach (Watson 1998).

3.2.1.3 Offshore Marine Water Quality

There is little research regarding trace metals and hydrocarbons in water column and sediments in deep ocean waters (Trefry 1981; Gallaway et al. 1988). Hydrocarbon seeps are extensive throughout the OCS and contribute hydrocarbons to the substrate and water column, especially in the central GOM (Sassen et al*.* 1993a, 1993b;). MacDonald et al. (1993) observed 63 hydrocarbon seeps using remote sensing and submarine observations. Estimates of the total volume of seeping oil range widely, from 121,800 gallons per year (29,000 oil barrels per year; MacDonald 1998) to 21,840,000 gallons per year (520,000 oil barrels per year) (Mitchell et al. 1999). In addition to hydrocarbon seeps, other fluids leak from the underlying sediments into deep water areas along the bottom water along the continental slope. These fluids have been identified from three sources: (1) seawater trapped during the settling of sediments, (2) dissolution of underlying salt domes, and (3) deep-seated formation waters (Fu and Aharon 1998; Aharon et al. 2001). The first two fluids are the source of authigenic (i.e., formed in situ) carbonate deposits, while the third is rich in barium and is the source of barite deposits, such as chimneys (E&E 2015).

Contamination if present within the water column can be a result from a number of sources. NOAA has also developed Screening Quick Reference tables that present concentrations for inorganic and organic contaminants in a variety of water mediums that can be used to determine whether a discrete water sample has concerning concertation of contamination (Buchman 2008).

3.2.2 Sediment Quality

Toxic substances and pesticides are discharged into the GOM estuaries from industrial, commercial, and municipal discharges, urban and agricultural non-point source runoff, accidental spills, and atmospheric deposition, often resulting in adverse effects on estuarine and coastal habitats. Contaminants that enter estuaries are often bound to suspended particulate matter that eventually deposits on the substrate (USEPA 1999).

Toxic chemicals in the substrate may be available for uptake by benthos. Bioavailability is dependent on the sediment characteristics; some contaminants of concern are acutely toxic, resulting in death of the benthic organism; others may be chronically toxic, affecting organism growth or fecundity. Toxic chemicals can affect both ecological and human receptors because they may bioaccumulate as they stored in animal fat and transferred up the food chain (E&E 2015; USEPA 1999).

Evaluation of the potential effects of contaminated sediments on marine and estuarine biota is difficult because few applicable state or federal regulatory criteria exist to determine "acceptable" sediment concentrations or action levels for most identified chemical contaminants of concern. Informal benchmarks, such as effects range-low and effects range-median values based on many field and laboratory studies have been suggested (Long et al. 1995). NOAA also has also developed Screening Quick Reference tables that present concentrations for inorganic and organic contaminants in a variety of mediums that can be used to determine potential for contamination (Buchman 2008).

NOAA's National Status and Trends Mussel Watch Program monitors organic and metal levels in coastal sediments and bivalve mollusks. Mollusks and other benthic organisms have been shown to be able to efficiently uptake metals and organic pesticides. Mercury is a highly toxic heavy metal that has been shown to be both a natural and anthropogenically introduced contaminant. Generally, both sediment and mollusk tissue mercury contamination along the Louisiana coast is low (Karnauskas et al. 2013). Similarly, cadmium contamination is important because of its potential toxicity to both humans and aquatic organisms. The majority of cadmium found in the environment is anthropogenic; sediment concentrations have been found to correlate with urban development. Generally, cadmium concentrations in mollusk tissues have decreased from the 1990s; however, cadmium remains as a metal of concern in the western GOM (Karnauskas et al. 2013).

The offshore oil and gas industry operates numerous platforms throughout this portion of the GOM. Many oil and gas platforms have discharges of drilling wastes, product water, and other industrial wastewater that have potential adverse impacts on water quality. The USEPA regulates the discharge of these waste streams through the NPDES permitting program. The effects of these discharges are generally localized near individual points of discharge (Neff 2005).

Turner et al. (2003) analyzed continental shelf sediments in the northwestern GOM and found trace polycyclic aromatic hydrocarbons (PAHs), Atrazine, chlorinated pesticides, polychlorinated biphenyls (PCBs), and trace metals in samples. The detection of organochlorine pesticides and PAHs in sediment cores collected off the southwest pass of the Mississippi River showed an increase for those deposits after the 1940s (Turner et al. 2003). The river was identified as the primary source of both organochlorine and the PAHs associated with the burning of fossil fuels. Higher concentrations of petrogenic PAHs associated with natural petroleum seeps and/or oil and gas exploration were found farther from the mouth of the river (Turner et al. 2003; E&E 2015).

3.3 Environmental Consequences

Significant impacts to water quality are those that measurably threaten human health or result in degradation of the environment, or cause an existing federal, state, or local water quality criterion, or a federally recognized international criterion, to be exceeded. Impacts to water quality may be caused during the construction, operation, or decommissioning of the proposed Project. Anticipated environmental consequences of each phase with regard to water quality impacts are discussed in the following sections.

3.3.1 Construction

Significant impacts to water quality are those that measurably threaten human health or result in degradation of the environment, or cause an existing federal, state, or local water quality criterion, or a federally recognized international criterion, to be exceeded (E&E 2015).

The proposed Project consists of the construction and operation of an OSTF, pipeline infrastructure, and DWP to provide a logistical solution for the safe and reliable export of crude oil. The pipeline infrastructure associated with the proposed Project consists of approximately 26.81 miles of two 30-inch-diameter pipelines. The proposed pipelines would originate at the OSTF, cross the Laguna Madre, North Padre Island, and extend approximately 14.71 miles along the seafloor of the GOM to terminate at the proposed DWP. Pipeline infrastructure associated with the Project is proposed to be installed using both conventional lay and horizontal directional drilling (HDD) techniques. The proposed pipeline infrastructure to be installed using conventional lay methods would be completed within an approximate 75-ft.-wide construction corridor, including permanent and temporary easements, roughly centered on the proposed pipeline alignment. Portions of the proposed pipeline infrastructure to be installed using HDD crossing techniques would be completed using 150-ft. by 150-ft. HDD workspaces at designated locations. Operation would include vessel intakes for various water usages as well as discharges, including vessel ballast management. No impacts to sediment quality are expected from construction, operation, or decommissioning of the Project. Potential impacts to water quality are as discussed below.

3.3.1.1 Pipeline Construction

Short-term, minor, adverse impacts on the water quality would result from bottom sediment disturbance activities during construction. An increase in turbidity would be associated with disturbance of soft bottom sediments. These impacts would be localized, reversible, and limited to the time of construction. After construction is complete, turbidity is expected to return to pre-trenching levels. Duration for this post-excavation recovery may extend for days or weeks, depending on the amount of disturbance and the size of disturbed particles. Turbidity increases would be localized and temporary in nature during the construction phase of the proposed Project.

The greatest potential to affect surface water quality would result from suspension or deposition of sediments resulting from trenching or jetting the pipeline. Offshore and inshore construction of the proposed pipelines would occur prior to installation of the DWP. Short-term, direct, minor, adverse impacts would occur during installation of the proposed Laguna Madre and marine pipelines. All marine pipeline segments would be installed in water depths less than approximately 90 ft. (27.4 meters [m]). Pipelines would be installed by jet-trenching (using a jet- sled trencher). Typically, a jetted trench has a V-shaped cross-section ranging in width from approximately 30 ft. (9 m) at the trench top to 10 ft. (3 m) at the trench bottom. The Bureau of Ocean and Energy Management (BOEM) requires that the pipeline be buried at least 3 ft. (1 meter) below the mudline (30 Code of Federal Regulations [CFR] 250.1003(a)(1)). The Applicant will bury proposed pipelines 5 ft. below the mudline, thereby preventing potential impacts caused by strong currents and storms, anchors, and trawling gear, and to minimize interference with other operations on the OCS (MMS 2002).

Trenching and/or jetting would suspend sediments in the water column for a short period of time depending on sediment particle size. Coarse sediments would fall out and resettle within hours, while finer sediments could remain suspended for longer periods of time (days). The installation of approximately 14.71 miles of pipeline and other construction-related bottom disturbance activities (i.e., anchoring) would result in the suspension of significant quantities of sediment during offshore pipeline installation. Once trenching is complete, local water turbidity should return to pre-trenching levels without mitigation.

The pipes would be installed using two barges and several support vessels. The crew on the first (conventional lay) barge would weld pre-coated joints of pipe to the string, inspect the welds, apply joint coating, and install anodes. The pipe string would then be placed into the water off the rear of the barge as the barge moves forward. The crew on the second (trenching) barge would cut the trenches and then cover the pipe in accordance with the requirements under 49 CFR 192.327(g) and 192.612(b)(3). The barges would be 300 to 500 ft. (91.4 to 152.4 m) long and have several anchor spreads. The anchor spreads would be reset at varying intervals. Each anchor relocation would cause sediment disturbance and re-suspension, resulting in temporary, localized increases in turbidity. Such impacts to water quality would be minor since water turbidity at an anchoring site would return to background levels within hours of the relocation. Anchoring of barges during construction may have short-term, minor, adverse effects on water quality. Anchoring would cause the localized and temporary resuspension of sediments, which in turn would increase turbidity. No lasting impacts on water quality are expected from the anchoring (E&E 2015).

Overall, potential impacts to water quality are anticipated to be minor, temporary, and adverse during the installation and commissioning of the pipelines.

3.3.1.2 Hydrostatic Testing

The proposed offshore and inshore pipelines would be hydrostatically tested to ensure their integrity before being placed into service. The hydrotest fill water would not be treated with a biocide. Negative effects on water quality are not expected in connection with hydrostatic testing of the proposed inshore and offshore pipelines.

Prior to filling pipe segments for hydrostatic testing, test water would be filtered through a mesh screen to prevent debris from entering the new pipe. The Applicant would pump test water from the pipeline into a diffuser to re-oxygenate the water before discharging it back into the marine and/or estuarine environment. Biocides would not be used during hydrostatic testing. Minor permit authorization under the RRC Statewide Rule 8 is required for discharge of water resulting from a hydrostatic test of a vessel into or adjacent to water in the state. Since RRC is not delegated authority under the NPDES, authorization for discharges hydrostatic test waters must also be obtained from USEPA Region 6. Discharges would be made in accordance with the requirements of both the RRC and USEPA hydrostatic test water discharge permits.

Water quality would not be negatively affected as a result of the hydrostatic testing of the proposed inshore and offshore pipelines.

Overall, no impact to water quality is anticipated as a result of hydrostatic testing during the construction phase of the Project.

3.3.1.3 Accidental Releases of Fuel, Oil, and Other Chemicals

Adverse direct impacts on water quality would be expected from accidental releases of fuel, oil, and other chemicals. The degree of impact is directly proportional to the amount of spill and how long it continues. Impacts could be short-term if the spill is minor, or adverse and significant and not mitigatable if the spill is major. Oil spills pose a risk to seabirds through direct contamination and destruction of nesting, roosting, and foraging habitats (USEPA 1999). Most petroleum products that would be carried on the construction vessels would be light, remaining on the surface of the water and evaporating in the event of a spill. These spills would be expected to adversely affect water quality, as well as coastal, marine, and/or migratory birds that would encounter the products. Heavier petroleum products that create a sheen and remain on the water's surface could affect dissolved oxygen levels and/or marine birds landing on, resting on, or diving for food.

As discussed in Section 14, a trajectory model was completed for the Project, to evaluate the coastal impact (how much oil makes landfall), in the event of a worst-case discharge from all the offshore components. This model was used to create a tactical response plan that ensures the equipment and resources are available, if a large-scale spill would occur, although extremely unlikely. Mitigation measures in design of the system are also described in the trajectory report and worst-case discharge report.

All oil in the water must be recorded and/or reported, based on the quantity. Tankers, under IMO regulations are required to keep an oily water discharge record book and any oily water quantities accounted for that are discharged overboard. There are audit requirements for the book to hold operators accountable. Any oil greater than 15 ppm must remain onboard and cannot be discharged. Any amount of oil over 15ppm in water or any oil that goes into the water must be reported to the appropriate authorities.

Both the deepwater port and the tankers will have Emergency Response Plans that follow specific steps in reporting and initiating the response to an oil spill. Tanker and port operators are required by law to have a contract with an Oil Spill Response Operator that owns and operates recourses to respond to a spill and mitigate the potential impacts. All measures necessary will be taken to mitigate the likelihood of a spill into design and through competency and training of operations personnel. It is expected that with the Emergency Response Plan, immediate response actions could reduce impacts, if they occur, on ESA-listed bird populations to temporary.

Industrial contaminants associated with crude oil liquids at DWPs would be present but at very low volumes. The proposed Project does not include ship refueling (fuel oil and diesel oil) capability or ship provisioning vessels, however limited fuels (such as diesel) for support vessels would be stored on the proposed DWP for use during startup and emergency situations. Oil releases from the proposed DWP are expected to be minimal because of the small quantities to be stored on site. A spill from the proposed Project would be expected to produce adverse, but temporary and insignificant, impacts to water quality.

3.3.2 Operation

During the operation period, pipeline maintenance would include pigging to periodically clean out oil residue, as well as to inspect pipeline integrity (i.e., smart pigging). The release of pigging residue materials into the surrounding aquatic environment could lead to potential negative water quality and benthic community impacts. However, if they do occur, significant negative effects on marine or coastal environments would not be expected due to short duration of these impacts.

3.3.2.1 Discharges and Intakes

Discharges

The single point mooring (SPM) will be attached to the bed of the ocean, but solely for the purpose of conducting crude oil loading operations, not for oil exploration or development. As the vessels are attached solely for the purpose of crude oil loading operations, they are continuing to operate as means of transportation. During vetting process, it is the Applicant's intent to restrict the vessels discharges types when they have entered the DWP safety zone or designated approach fairway. Discharges from vessels transiting to the DWP can impact water quality in the surrounding waters, even though discharges are not permitted to occur while at the DWP. For this reason, vessel discharges are discussed below. Wastewater sources and effluent discharges from vessels would potentially include:

- Sanitary sewer treated effluent;
- Reverse osmosis (RO) reject water;
- Non-contact generator cooling water;
- Ballast water;
- Firewater deluge test bypass water; and
- Inert gas generator (IGG) scrubber water.

Table 3-2: Liquid Discharges from Vessels

Overboard Discharge	From	Rate (gallons per minute)	Period	°F	Treatment
Ballast water	Ballast Tanks	6,900	Continuous (7.4 of every 8.4 days)	62–87	Filtration, electrochemical treatment; ocean discharge through outfall
IGG scrubber water	IGG scrubber wash water	50	72 hours per year	62–87	Filtration, electrochemical treatment; ocean discharge through outfall
Sanitary sewer	Personnel sewage treatment	20	Continuous	75–90	Type II Marine Sanitation Device; aeration and disinfection; ocean discharge through outfall
Generator Cooling water	Non-contact cooling water for essential generator tests	600	30 min per 2 weeks	63–88	Filtration, electrochemical treatment; ocean discharge through outfall
RO reject water	Filter backwash and brine from water treatment plant	450	Continuous	62–87	Filtration, electrochemical treatment; ocean discharge through outfall
Fire water deluge test bypass water	Pump test fire water deluge system	7,000	30 min per week	62–87	Filtration, electrochemical treatment; ocean discharge through outfall

Notes:
All overboard discharges are located at least 3 m below the water line.
Antifouling-treated seawater discharges would have maximum residual chlorine concentrations of 0.5 mg/L.
Temperatures reflect the ambient water temperature of 62–87°F at the deepwater port.
Key:
°F = degrees Fahrenheit
DWP = deep water port
mg/L = milligrams per liter
T = temperature

Temperature increases above ambient conditions resulting from several of the discharges would result in short-term changes to the marine environment in the area very close to the discharge point. The expected discharge volumes would be small compared to the amount of water in the GOM. As a result, any temperature increase would be minimal and would not affect water quality. Treated discharged would meet all USEPA and USCG requirements and thus would not significantly affect water quality. Crude oil transfer carriers would operate under MARPOL Convention standards. Overall, potential impacts to water quality as a result of engine cooling water/bilge discharge during Project operation are anticipated to be long-term but negligible.

Intakes

Continuous on-board vessel seawater intake is limited to the RO desalination system. Intermittent intakes would include water for ballast and water curtains during crude oil offloading; once-through seawater cooling for essential generator function tests; and washing of the IGG scrubber system. Crude oil transfer carriers would operate under MARPOL Convention standards; thus all intake will adhere to international standards and not be expected to significantly impact water quality at the DWP (E&E 2015).

Combined Domestic Water (Grey) and Sanitary Water

Sanitary wastes and grey water generated onboard vessels would be collected and treated by USCG Type II marine sanitation devices. These units would treat black and gray wastewater generated from use by personnel. Sanitary wastes and grey water generated onboard vessels would be collected and treated. The flow rate would range from 10 to 40 gallons per minute (gpm) throughout the day. These outfalls would discharge continuously at an average rate of 20 gpm. Tugboats, service/supply vessels, and crude oil tankers would have their own sanitary waste systems independent of the proposed Project. Sanitary and domestic water discharges can introduce additional nutrients (e.g., phosphorus and nitrates) into the sea water. Discharges of treated sanitary wastes and domestic wastes would be rapidly diluted and dispersed to ambient levels within a few meters of the discharge (United States Minerals Management Service [USMMS] 2001 E&E 2015). Therefore, these discharges are not expected to significantly impact water quality in the offshore GOM.

Intermittent Stormwater from Deck Drainage

The SPM does not have any exposed process areas and will not be discharging any contaminants. Vessel process areas, where there is a potential for oil contamination, would be curbed. Based on the first- flush principle, the first half inch of rainfall would be diverted to the vessel slop tank for treatment. Remaining stormwater from the vessel process and other areas would be directly discharged overboard.

Equipment Open Drain and Oily Water Treatment

Vessel equipment that has the potential to release hydrocarbons would be designed to include drain pans to capture hydrocarbons and rainwater. The open drain system would collect rainwater, wash water, and other fluids, which would be gravity drained to slop tanks/oil water separators. Slop tanks and/or oil/water separators would treat oily water by gravity separation (E&E 2015).

As previously stated, based on the first-flush principle, the first half inch of rainfall would be diverted to the slop tank for treatment. Remaining stormwater from the process and other areas would be directly discharged overboard. Oil-free water would be discharged to the GOM through an outfall pipe located below water level. Free oil collected at the water surface would be removed using floating oil booms and/or skimmers and routed to an oil/sludge collection tank. Oily sludge collected in the slop tanks would be routed to a hydrocyclone for separation of oil and solids. Treated water would be discharged to the GOM if it contains less than 15 mg/L oil. Oil discharge monitoring equipment would be provided to ensure compliance with this regulatory requirement. If the oil content is higher than 15 mg/L, the water would be re-routed to the slop tank for treatment. Treated water from the slop tanks would be discharged at rate of 125 gpm during a 7-hour event on a weekly basis on average, based on estimated rainfall at Corpus Christi. If oily water from the bilge or IGG scrubber wash water exceeds 15 mg/L, the oily discharge would be routed to slop tanks for further treatment (E&E 2015).

Routine wastewater flows from the process units are not proposed. Intermittent process wastewater streams would be routed to the oil/sludge collection tank in the hull. Because there are no routine process wastewater flows, no onboard treatment system would be needed. Process wastewater would be taken off site for disposal. Wastewater from the Flare/Vent System would be collected in the oil/sludge collection tank. Compressor collection tanks would be used to collect liquids from compressor drains, which may contain emulsified oil and detergents. Wastewater collected in these areas would be routed to an oil/sludge collection tank for off-site disposal.

The open drain system described above would effectively prevent impacts to water quality from hydrocarbon or chemical spills by collecting rainwater, wash water, or other fluids subject to hydrocarbon contamination and pumping them to the slop tank / oil water treatment system.

Brine Water

Seawater would be used to generate non-potable fresh water, potable water, demineralized water, and utility water. Seawater would be filtered and the filter would be intermittently cleaned with utility air. Seawater would then be treated with a diluted solution of sodium hypochlorite to prevent marine and biological fouling. The seawater would then be pumped to the pre-treatment equipment for the RO unit consisting of a self-cleaning strainer, seawater filter, and a cartridge filter. A two-stage RO system would be provided for the generation of fresh water for the DWP. Outfalls would include RO reject water (brine) and filter backwashing. Additional brine from second stage RO would be used for utility and other non-potable water. The expected flow rates of brine from first stage RO would be 450 gpm, and the salinity of the ambient seawater in the immediate area would increase from 35 parts per thousand (ppt) to 54 ppt.

Ballast Water

Ballast tanks on vessels would be filled with seawater to maintain proper buoyancy. Ballast water would be discharged generally continuously during the crude oil loading process at an average rate of 6,900 gpm to maintain proper balance between the DWP and deepwater vessels.

Impacts to water quality associated with ballast water intake and discharge in the offshore environment would not be significant. Generally, ballast discharges have the potential to reduce dissolved oxygen (DO) levels in receiving waters. DO levels are a critical component for the respiration of aquatic marine life. DO levels can be influenced by water temperature, water depth, phytoplankton, wind, and current. All of these factors influence the amount of DO in the water. Typical seawater column profiles indicate higher DO levels in waters nearer to the surface. Some factors influencing DO stratification include sunlight attenuation (which affects photosynthetic organisms that produce oxygen), as well as wind, waves, and currents (which result in mixing) (E&E 2015). Although water within ballast tanks may have suppressed DO levels within the ballast water itself, the location of the proposed Project in the open ocean would mitigate these conditions, resulting in no measurable impact on water quality

Of more concern regarding discharge of ballast water is the potential for introducing invasive and/or noxious species to surrounding seawater. One way of meeting ballast water management guidelines regarding the spreading of invasive and noxious species is to lower the DO in the ballast water. Ballast water exchange operations would involve intake and discharge of local GOM waters; therefore, the potential threat of introducing invasive, noxious species would be removed. Minor pH variations between ambient seawater and ballast water are not likely to be of concern when ballast water is discharged (E&E 2015).

Water Temperature

Water temperatures and pH are not likely to be altered as a result of introducing ballast water or other discharges. The ambient seawater temperature at Project ranges from 65°F to 79°F. Ballast water temperatures will reflect ambient temperatures of the surrounding seawater since ballast water is stored in the vessel's hull below the water line. Non-contact cooling water from the DWP would be limited to a 30-minute test once every two weeks; therefore, the change in the ambient temperature of seawater is expected to be minimal. Water temperature changes on the fire pump bypass tests and fresh water systems would be minimal. Temperature ranges from bilge, sanitary sewer, and slop tank/oil water separator discharges are shown in Table 3-2. These temperature ranges may be above or below the ambient seawater temperatures but are not expected to be of concern.

3.3.3 Decommissioning

Short-term, direct, minor, adverse impacts to water quality are expected in connection with decommissioning the DWP. Decommissioning would include disassembly and removal of above-ground appurtenances. Pipelines would be cleaned and left in place with no intrusive activities resulting from decommissioning. Decommissioning may involve the removal of all aboveground structures and leaving in place facilities and pipelines below ground in onshore and inshore environments. Decommissioning of the offshore pipelines will consist of utilizing a heavy lift vessel to retrieve pipeline segments from the sea floor and then transport the segments to a scrap facility. There will be no offshore pipeline component decommissioned and abandoned in place for this project. Such activities would cause minimal sediment displacement and a temporary increase in water turbidity. Overall, potential impacts to water quality as a result of Project decommissioning are anticipated to be temporary and minor to negligible.

3.4 Cumulative Impacts

Cumulative impacts to wetland and waters of the US were assessed based on the Framework for Cumulative Impact Analysis. The proposed Corpus Christi LNG Terminal, offshore oil and gas exploration, waterway improvement projects, marine traffic, and commercial and residential development projects could contribute to cumulative impacts on water quality within the vicinity of the proposed Project. Impacts on water quality could arise from increased turbidity and sediment, changes in water temperatures and/or marine currents, and contamination, including release of hazardous materials into the water as well as marine trash and debris.

Construction activities associated with the proposed Project will generally be concentrated about 12.6 nautical miles offshore at the proposed SPM Buoy site in water at a depth of 92 ft. (28 m). Alternatively, construction of the proposed pipelines will be sequential along the 12.6 nautical miles and will include a brief 12-week period of onshore construction. At the locations where the pipelines will be installed via the HDD method, construction will occur over about 4 weeks at each location. Impacts on water quality associated with in-water construction will be associated with disturbance of the seabed, discharge of waters (ballast and for hydrostatic-testing), and inadvertent spills. Onshore construction activities that will impact water quality will be primarily associated with sedimentation from construction, and in the event of an inadvertent leak or spill.

Offshore oil and gas exploration and production, including the decommissioning of existing infrastructure, and associated marine traffic will also impact water quality in a similar manner as the proposed Project. Assuming regulatory requirements are followed, BOEM predicts that discharges associated with these activities would rapidly dilute, thus the discharge areas would not overlap and therefore would not have an additive impact on water quality (BOEM 2017). However, given to the localized nature of such impacts relative to the proximity of these other activities to the proposed Project, ranging from 0.7 to 245.4 miles (1.1 to 394.9 kilometers [km]), cumulative effects from these projects are not likely.

Other on or nearshore projects, such as waterway improvement projects and commercial and residential development projects, will involve modification of surface water resources and placement of fill, and some may require dredging. Current or future maintenance dredging associated with these projects will temporarily impact water quality by increasing turbidity and sedimentation. If these projects were to occur concurrent with construction of the proposed Project, cumulative impacts on water quality in the Project area would be short-term, and minor, given the localized nature of these activities.

Also, construction equipment and support vessels associated with these projects could affect water quality from inadvertent spills, releases of hazardous materials, and discharge of ballast water. Generally, these impacts are expected to be localized and short-term. Once installed the pipeline trench will naturally backfill from tidal and current movement. Since the pipelines will be buried, they will not contribute to cumulative effects on water quality during operation.

Overall, the cumulative impacts of the proposed Project when considered with other projects will be short-term (during construction) to permanent (within the footprint of the SPM buoy system), and minor. Temporary, minor impacts on water quality in nearshore locations of North Padre Island could occur if construction of the proposed Project and the projects discussed above are concurrent. The proposed Project and other projects will be required to comply with the CWA to minimize impacts on surface water quality. Therefore, while the proposed Project will contribute to cumulative impacts on water quality along with other projects in the geographic range, this impact will be negligible.

3.5 Mitigation Measures

All Project-related activities during construction, operation and decommission would comply with federal regulations to control the discharge of operational wastes such as bilge and ballast waters, trash and debris, and sanitary and domestic waste that would be generated from vessels associated with the Project. In addition, as per USCG and USEPA regulations, an Emergency Response Plan will be developed for the Project. Because impacts to water quality in the Gulf of Mexico are considered negligible, no mitigation measures, other than those noted above, are proposed.

During pipeline installation of the inshore project components, within the Laguna Madre, mitigation measures will be taken to reduce the turbidity levels caused by trenching as required by issued permits. Barges will be used to hold sediment from trenches to reduce the dispersion of removed sediment in the shallow estuarine waterbody. Additionally, silt curtains may be deployed in the immediate work area to reduce the migration of sediment in the water column caused by disturbance during trenching or pipe laying.

3.6 Summary of Potential Impacts

Potential impacts to water quality are summarized in Table 3-3.

Table 3-3: Summary of Potential Impacts to Water Quality

Project Phase	Impact	Duration	Significance	Mitigation
All Project phases	Potential impacts to sediment quality	Permanent	No Impact	N/A
Construction: Installation of SPM	Potential impacts to water quality resulting from increased turbidity, increased suspended sediments, and habitat modification.	Temporary	Minor	Compliance with federal regulations
Construction: Installation of Pipelines	Potential impacts to water quality resulting from increased turbidity, increased suspended sediments, decreased oxygen levels, and habitat modification.	Temporary	Minor	Compliance with federal regulations, use of sediment discharge barges and possibly silt curtains in the Laguna Madre
Construction: Anchoring of Construction Vessels	Potential impacts to water quality resulting from increased turbidity, increased suspended sediments, and habitat modification.	Temporary	Minor	Compliance with federal regulations
Construction: Hydrostatic Testing of Pipelines	Potential impacts to water quality resulting from increased turbidity, decreased oxygen levels, and introduction of chemical contaminants.	Temporary	Minor	Discharges made in accordance with RRC/ USEPA hydrostatic test water discharge permit.
Construction: Inadvertent Spills	Potential impacts to water quality resulting from an introduction of chemical contaminants due to an accidental releases of fuel, oil, and other chemicals.	Temporary	Negligible	Compliance with Emergency Response Plant
Operation: Engine Cooling Water/Bilge Discharge	Potential impacts to water quality resulting from an increased water temperature and an introduction of chemical contaminants.	Long-term	Negligible	No discharges allowed at the DWP; and, Compliance with MARPOL Convention standards.

Project Phase	Impact	Duration	Significance	Mitigation
Ballast Intake and Discharge	Potential impacts to water quality resulting from decreased oxygen levels, release of detrital materials, and introduction of chemical contaminants.	Long-term	Negligible	Compliance with federal regulations
Domestic and Sanitary Water Discharge	Potential impacts to water quality resulting from increased water temperature, and introduction of chemical contaminants.	Long-term	Negligible	Compliance with federal regulations
Stormwater Discharge	Potential impacts to water quality resulting from increased water temperature, increased turbidity, and an introduction of chemical contaminants.	Long-term	Negligible	Compliance with federal regulations
RO Water Treatment	Potential impacts to water quality resulting from and introduction of chemical contaminants.	Long-term	Negligible	Compliance with federal regulations
Firewater bypass	Potential impacts to water quality resulting from an introduction of chemical contaminants.	Long-term	Negligible	Compliance with federal regulations
Decommissioning	Potential impacts to water quality	Temporary	Minor to Negligible	Compliance with federal regulations
Cumulative	Potential impacts to water quality	Temporary	Negligible	Compliance with federal regulations

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