DEEPWATER PORT LICENSE APPLICATION FOR THE BLUEWATER SPM PROJECT

VOLUME II – ENVIRONMENTAL EVALUATION

Section 4 – Water Quality

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ACRONYMS AND ABBREVIATIONS

BEACH	Beaches Environmental Assessment and Coastal Health Act
BWTT	Bluewater Texas Terminal, LLC
CFR	Code of Federal Regulations
CMP	Texas Coastal Management Program
CWA	Clean Water Act of 1977
CZMA	Coastal Zone Management Act
DO	dissolved oxygen
DWP	Deepwater Port
DWPA	Deepwater Port Act
DWPL	Deepwater Port License
E.O.	Executive Order
EEZ	Exclusive Economic Zone
EIS	environmental impact statement
ERL	effects range low
ERM	effects range median
FR	Federal Register
GIWW	Gulf Intracoast Waterway
GOM	Gulf of Mexico
gpm	gallons per minute
HDD	horizontal directional drill
IG	inert gas
IMO	International Maritime Organization
km	kilometer
LEDPA	Least Environmentally Damaging Practicable Alternative
m	meter
m3/hr	cubic meters per hour
MARAD	Maritime Administration
MARPOL	International Convention for the Prevention of Pollution from Ships, adopted in 1973 and modified by the Protocol of 1978
mg/L	milligrams per liter
MHT	mean high tide
mi	miles
MMS	U.S. Mineral Management Service
NEPA	National Environmental Policy Act of 1969
nm	nautical mile
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRDC	Natural Resources Defense Council
oC	degrees Celsius
OCS	Outer Continental Shelf
oF	degrees Fahrenheit
PCR	primary contact recreation
P.L.	Public Law
PPA	Pollution Prevention Act of 1990
ppm	parts per million
Project	Bluewater SPM Project

RHA	U.S. Rivers and Harbors Act of 1899
RRC	Railroad Commission of Texas
SPCC	Spill Prevention, Control, and Countermeasures
SPM	single point mooring
sq km	square kilometer
sq mi	square mile
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TDS	total dissolved solids
TMDL	total maximum daily load
TSS	total suspended solids
TWDB	Texas Water Development Board
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
VLCC	very large crude carriers
WOUS	Waters of the U.S.

4 Water Quality

This section discusses the existing water quality conditions within the vicinity of the Proposed Bluewater Single Point Mooring (SPM) Project (Project) and the Alternative Project, and the anticipated environmental impacts associated with the construction, operation, and decommissioning of the Proposed Project and the Alternative Project. The detailed description of the Proposed and Alternative Project and the framework for the evaluation of environmental impacts is provided in Section 3: Project Description and Framework for Environmental Evaluation.

4.1 Applicable Laws and Regulations

Bluewater Texas Terminal, LLC (BWTT) has reviewed the following laws and statutes that relate to water quality and provided a list of applicable regulations required to comply with the Deepwater Port Act (DWPA) during construction and operation of the Proposed Project; Clean Water Act of 1977 (CWA), Public Law (P.L.) 95–217, 33 United States Code (U.S.C.). 1251, et. seq., Environmental Quality Improvement Act, P.L. 98–581, 42 U.S.C. 4371, et. seq., Federal Compliance with Pollution Control Standards, Executive Order (E.O.) 12088, 43 Federal Register (FR) 47707, Invasive Species, E.O. 13112, 64 FR 6183, National Environmental Policy Act of 1969 (NEPA), P.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) (P.L. 92-583, 1972), amended in 1976 (P.L. 94-370).

4.1.1 State

4.1.1.1 Coastal Management Program Consistency

The Texas Coastal Management Program (CMP), a product of Texas Coastal Coordination Act of 1991, grants Texas 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. 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, both the Proposed Project and the Alternative Project fall into the category of a Texas Coastal Zone.

To remain in accordance with 31 Texas Administrative Code (TAC) Section 506, either the Proposed Project or the Alternative Project must coincide with the Texas CMP. A Section 401 certification review of the Section 404 permit application from the U.S. Army Corps of Engineers (USACE) must also be conducted by the Texas Commission on Environmental Quality (TCEQ) to maintain consistency between state and federal reviews. This ensures that any activity with the potential to affect water quality meets the requirements and standards of all agencies involved.

4.1.1.2 Clean Water Act Section 401 - Water Quality Certification

One of the requirements for obtaining a USACE Section 404 permit (see Section 4.1.2.2, below) is certification from the TCEQ that the discharge to be permitted will comply with state water quality standards. Because these reviews are conducted 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 Texas 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.

Either the Proposed Project or the Alternative Project would require the 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 USACE permit application, under Section 401 of the CWA and Title 16, TAC 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 uses. 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 ensure that the discharge will not 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. As described above, the RRC will be responsible for issuing the water quality certification which enforces state water quality standards.

4.1.2 Federal and International

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

The Federal Water Pollution Control Act Amendments of 1972, known as the 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 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 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.

The Harbor Island Booster Station is 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, and no NPDES permit will be required for operations.

The offshore SPM buoy systems will operate in federal waters (beyond 9 nautical miles [nm] from shore), outside State of Texas waters. The SPM buoy systems will not result in any discharges during operations and the vessels connected to the SPM buoy systems will be operating in the capacity as a means of transportation. Therefore, it is BWTT's understanding that neither the SPM buoys nor the vessels loading crude oil will come under the jurisdiction of the USEPA NPDES Permit Program.

Minor permit authorization under the RRC Statewide Rule 8 is required for discharge of water resulting from a hydrostatic testing of a pipeline or vessel into or adjacent to water in the state. Since the RRC is not delegated authority under the NPDES, authorization for discharges of hydrostatic test waters to a Water of the United States (WOUS) must also be obtained from USEPA Region 6. Hydrostatic discharges will comply with the requirements of both the RRC and USEPA hydrostatic test water discharge permits.

4.1.2.2 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. These acts give the USACE jurisdiction over all the WOUS. Coastal Texas waters in the Proposed and Alternative Project area fall under the jurisdiction of the USACE, Galveston District. District resource and regulatory specialists evaluate permit applications for construction work in navigable waters, and/or for disposal of dredged material. Section 10 of the RHA 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 and operation within WOUS (e.g., 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 include in Volume I of this Deepwater Port License (DWPL) Application. A Section 401 certification review of the Section 404 permit application from the USACE will be conducted by the RRC to maintain consistency between state and federal reviews for crude oil projects. This ensures all actions that involve or affect water quality meet the requirements and standards of all agencies involved.

4.1.2.3 National Environmental Policy Act

The 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 will qualify as a major federal action and trigger the requirement for NEPA analysis. Under the DWPA, the U.S. Coast Guard (USCG) will initiate the NEPA process and have federal jurisdiction over the entire Project under NEPA. The USCG and the Maritime Administration (MARAD) have determined that an environmental impact statement (EIS) will be prepared to support the NEPA process.

4.1.2.4 BEACH Act

While most of the Texas coastline is dominated by tidal wetlands, coastal beaches line much of the Gulf of Mexico (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 beach water quality (out of 30 states), and found that 10 percent of samples collected at 62 beaches exceeded applicable thresholds for fecal coliform bacteria concentrations (NRDC 2014).

4.1.2.5 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 4-1. Because the Proposed Project will be located approximately 15.0 nm (17.0 statute miles [mi]) off the coast of Port Aransas, Texas, requirements for discharges fall within the established limits for “beyond 12 nm” from shore.

Table 4-1: United States Coast Guard Pollution Regulations

Parameter	Standard
Plastics	No discharge allowed anywhere.
Food wastes	0 to 3 nm - no discharge allowed. 3 to 12 nm - discharge permitted, but food waste must be ground to within 1 inch, or less, in size. Beyond 12 nm - 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 nm - discharge of materials greater than the “reportable quantity” (allowed by law) is prohibited.
Non-plastic trash	0 to 3 nm – not permitted. 3 to 12 nm – the material must be ground to 1 inch. 12 to 25 nm – discharge permitted except for dunnage. Beyond 25 nm – discharge is permitted.
Sewage	0 to 3 nm – discharge only after treatment of processing is completed through a USCG-approved marine sanitation device Beyond 3 nm – 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 (ppm) and does not cause a visible sheen.

4.1.2.6 MARPOL Convention

During construction and operation of the Project, all operating vessels will 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.

In the U.S., the legislation implementing the MARPOL Convention is known as the Act to Prevent Pollution from Ships. 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.

4.2 Proposed Project

4.2.1 Proposed Project Area

The Proposed Project area considered for water quality encompasses all freshwater, estuarine, and marine waters within the immediate vicinity of the Onshore Pipelines, Inshore Pipelines, Offshore Pipelines, and two SPM buoy systems (which make up the Deepwater Port [DWP]). The major underlying aquifer for the Texas Coastal Bend region and underlying the onshore elements of the Proposed Project is the Gulf Coast Aquifer (see Figure 4-1). The Onshore Pipelines will cross freshwater surface waterbodies. The Inshore Pipelines will occur in estuarine and marine waters between Redfish Bay and San Jose Island, opposite the City of Aransas Pass and including Aransas Pass Channel. The Offshore Pipelines and SPM buoy systems will be in the marine waters of the GOM.

4.2.2 Proposed Project Area Existing Conditions

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. Factors influencing onshore, coastal, and marine water quality include temperature, dissolved oxygen, salinity, nutrients, pH, contaminants, and turbidity. Alteration of water quality parameters could impact habitat and other biological resources. This section of this assessment presents the current understanding of water quality within the vicinity of the Proposed and Alternative Projects.

4.2.2.1 Onshore

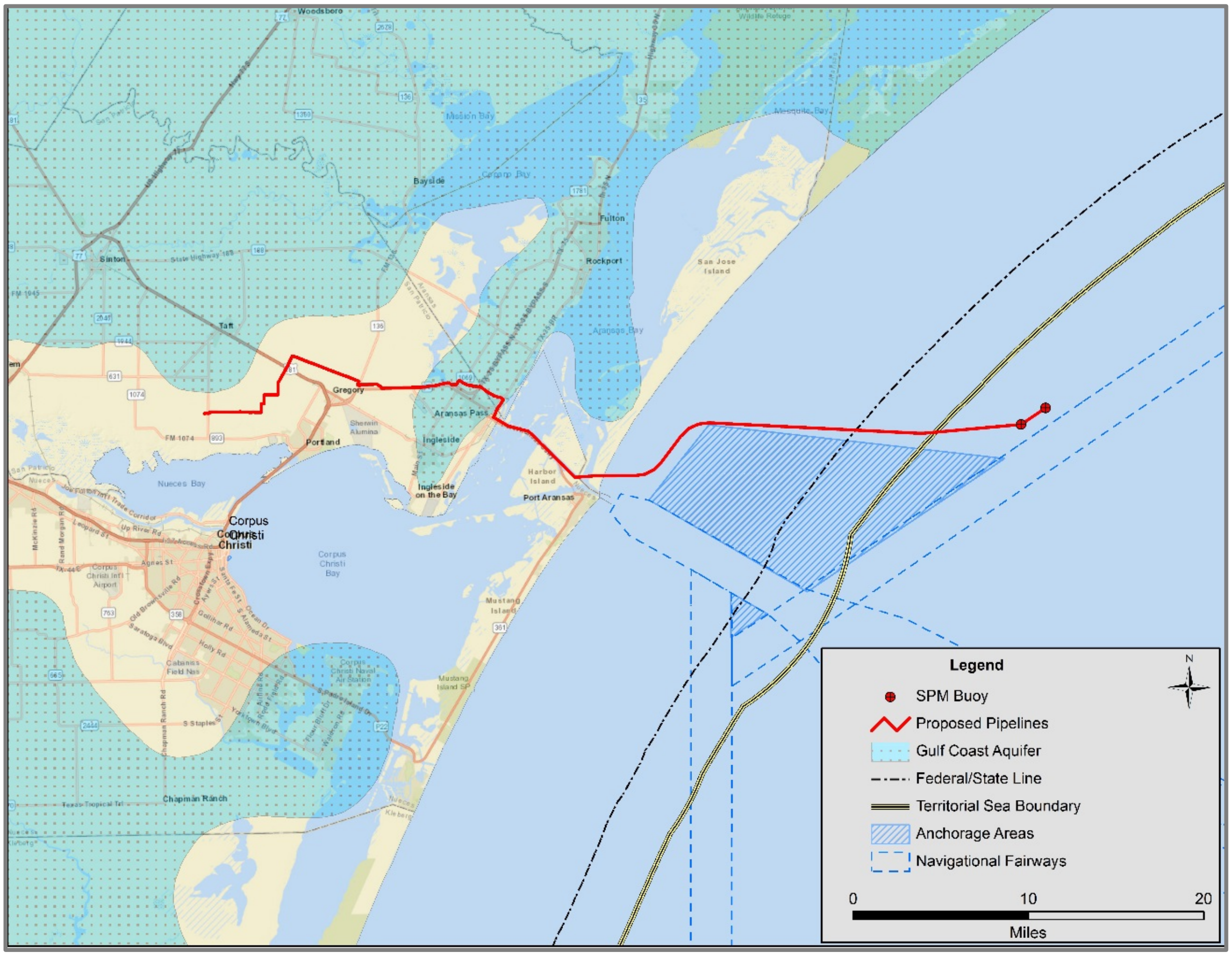
The Onshore Pipelines will commence at a planned multi-use terminal consisting of multiple inbound and outbound crude oil pipelines; two of those outbound pipelines are the Proposed Project pipeline infrastructure. The Onshore Pipelines will traverse east and continue on through Aransas Pass, Texas, transitioning into the Inshore Pipelines at the western shore of Redfish Bay on the mainland. The Onshore Pipelines are generally within disturbed lands used for agriculture, but will cross ephemeral, intermittent, and perennial waterbodies as described in Section 5: Wetlands and Waters of the U.S.

4.2.2.1.1 GROUNDWATER QUALITY

The Onshore Pipelines are underlain by the Gulf Coast Aquifer, a large water supply aquifer which includes the Gulf Coast of Texas, Louisiana, Mississippi, Alabama and the panhandle of Florida. There are no known drinking water or agriculture wells found within 1,000 feet (ft) of the planned pipelines (Texas Water Development Board [TWDB] 2019a).

In Texas, the Gulf Coast Aquifer extends along the entire GOM coastline from the Texas-Mexico border to Louisiana (TWDB 2006, 2011, 2019b). Specifically, the Gulf Coast Aquifer will underlie the Onshore Pipelines for about 6.0 mi (9.7 km) in Aransas Pass, Texas. Approximately 1.1 million acre-ft of groundwater are withdrawn from this aquifer each year in Texas, much of which is used for municipal, irrigation, and industrial water in communities along the Gulf Coast region (TWDB 2006). Water quality varies across the aquifer; however, it is generally declining along the southern extents due to high total dissolved solids (TDS) and saltwater intrusion near the coast (TWDB 2006, 2019b). Recharge to the Gulf Coast Aquifer in Nueces County is primarily from infiltration of precipitation (TWDB 2006).

Figure 4-1: Water Quality Study Area



Source: BOEM 2019, WDB 2019a

4.2.2.1.2 SOURCE: BOEM 2019SURFACE WATER QUALITY

The Onshore Pipelines will be located within the San Antonio-Nueces Coastal Basin which lies along the Texas Coastal Plain between the San Antonio and Nueces Rivers. This basin encompasses an approximately 2,652 square mile (sq mi) area which includes the Mission and Aransas Rivers, and drains into Copano Bay and Aransas Bay (TCEQ 2004). This basin is bordered to the northeast by the San Antonio River Basin; to the southwest by the Nueces River Basin; and to the east by bays, estuaries, and the GOM. The basin is predominantly coastal plain habitat and is dominated by farming and ranching land; several state- and federally-operated recreational areas are located along the coast (Nueces River Authority 2000). Within the Basin, the Onshore Pipelines are located within the Aransas Bay, Aransas, and North Corpus Christi Bay watersheds, which are connected to the GOM; coastal water quality is addressed in Section 4.2.2.2, below (USGS 2019).

The Onshore Pipelines will cross ephemeral, intermittent, and perennial waterbodies as described in Section 5: Wetlands and Waters of the U.S. None of the waterbodies crossed are known to contain contaminated sediments (USEPA 2004). The TCEQ identifies water quality classifications and uses for designated stream segments; surface waters that are not designated segments or subsegments by TCEQ may still have water quality classifications and fishery designations. Primary contact recreation 1 (PCR 1) is defined as activities that are presumed to involve a significant risk of ingestion of water, such as wading by children, swimming, and surfing. This is presumed to apply to all tidal waterbodies and perennial and freshwater intermittent streams. In addition, perennial waterbodies are presumed to have a high aquatic life use (TAC Title 30, Chapter 304).

To comply with Section 303(d) of the CWA, states are required to compile a list of impaired waters that do not meet water quality standards every 2 years. A total maximum daily load (TMDL), the calculation of the maximum amount of pollutant allowed to enter a waterbody so that it will meet water quality standards, must be developed by states for waterbodies listed as impaired under Section 303(d) of the CWA. The Onshore Pipelines will not cross designated impaired waterbodies.

4.2.2.2 Inshore

4.2.2.2.1 GROUNDWATER QUALITY

The Inshore Pipelines are not within the mapped area for the Gulf Coast Aquifer (TWDB 2019b). However, groundwater recharged from surface runoff and rain infiltration may occur on barrier islands along the Texas coast, including along the Inshore Pipelines (Watson 1998). Below the water table, the sand that composes barrier islands typically contains either fresh or saltwater (Watson 1998). As described above, there are no known drinking water or agriculture wells found within 1,000 ft of the Proposed Project area (TWDB 2019a).

4.2.2.2.2 SURFACE WATER AND SEDIMENT QUALITY

The DWP associated with the Proposed Project will not be located in coastal waters; however, certain Proposed Project components, including pipelines landward of the mean high tide (MHT) line on San Jose Island, will cross waterbodies in 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, TDS, 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 comprise greater than 95 percent of the commercial fishery harvests from the GOM (USEPA 1999). Waterbodies crossed by the Inshore Pipelines include the Gulf Intracoastal Waterway (GIWW), Redfish Bay, Aransas Pass Channel (which connects Redfish Bay to the GOM), and Lydia Ann Channel. Of those, three (the GIWW, Aransas Pass Channel, and Lydia Ann Channel) are navigable waterways. In addition, the Inshore Pipelines will cross wetlands and other waterbodies as described in Section 5: Wetlands and Waters of the U.S.

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 1994 in terms of discharging the greatest amount of toxic chemicals to estuaries (USEPA 1999). According to NOAA, the GOM region ranks highest of all coastal regions in the U.S. in the number of wastewater treatment plants, industrial point sources, percentage of land use devoted to agriculture, and application of fertilizer to agricultural lands; each of these activities and land uses has the potential to introduce contaminants into estuarine water (NOAA 1990 in USEPA 1999).

The USEPA conducted a National Coastal Condition Assessment in 2010 that summarized the "health" of all GOM estuarine systems. The report finds that, based on the water quality index, 24% of GOM coastal waters are in good condition; 58% are rated fair; and 24% are rated as having poor water quality. Phosphorus and chlorophyll a contribute most to the fair and poor water quality index scores in this region (USEPA 2010). In addition, nitrogen is found at high levels (rated poor) in 10% of GOM coastal waters; dissolved oxygen levels are rated poor in7% of Gulf coastal waters.

Ward and Armstrong (1997) assessed the water, sediment, and tissue (fish and shellfish) quality of the Corpus Christi Bay system (including Redfish Bay), using a compilation of data from multiple surveys and research projects preformed in the area. They found that Redfish Bay has elevated concentrations of polychlorinated biphenyls and metals (including in blue crabs) (Ward and Armstrong 1997).

Quenzer et al. (1998) created a model of the total load and water quality for the Corpus Christi Bay system (including the inshore Project area waterbodies) using elevation, stream network and discharge, precipitation, water quality, and land use data sets, and found that contaminants in the bay system have a long residence time since the bays do not flush frequently. Carr et al. (1998) examined the sediment associated with stormwater outfalls for potential contamination at 36 sites in the Corpus Christi Bay National Estuary Program (which extends from Copano and Aransas Bays in the north to the upper Laguna Madre and includes the Proposed Project area). 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, likely resulting from anthropogenic influences.

The Mission-Aransas National Estuarine Research Reserve, a federal and state partnership that conducts research and education programs, is located immediately northeast of the Proposed Project area in Aransas Bay. According to NOAA, increased industrialization along the Texas coast has resulted in growing public concern regarding impacts on water quality in the area of the Mission-Aransas National Estuarine Research Reserve (2006). However, inshore areas of the Proposed Project are not designated as impaired for water quality by the TCEQ. To comply with Section 303(d) of the CWA, and to protect water quality in Texas, the TCEQ maintains a list of impaired waters, compiled every 2 years. Redfish Bay, the TCEQ segment crossed by the Inshore Pipelines, is not listed as impaired. The GOM is on TCEQ's 303(d) impaired waters list due to concern over mercury in edible fish tissue in the Proposed Project area (TCEQ 2016).

BWTT conducted sediment and water quality testing along the Proposed Inshore and Offshore Pipelines alignment. Sediment samples were collected at four locations along the Inshore Pipelines; water column samples were collected at two inshore locations. Standard water quality parameters were measured during the surveys and documented salinity in the inshore Project area ranging from 23.7 to 30.9 parts per thousand and pH ranging from 8.17 to 8.32. Sampling included volatile and semi-volatile organic compounds, pesticides, metals, polychlorinated biphenyls, and total petroleum hydrocarbons. No exceedances of the TCEQ's water quality standards or USEPA's national recommended ambient water quality parameters were documented for water quality samples collected for the Proposed Project.

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 (ERL) and effects range median (ERM) 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 media that can be used to determine potential for contamination (Buchman 2008). The ERL benchmark level is based upon a database of sediment chemistry and toxicity data and the ERL represents the 10th percentile of the effects database, and represents a concentration below which adverse effects rarely occur. The ERM value is representative of concentrations above which effects often occur (Buchman 2008, NOAA 1999). No exceedances of the TCEQ's guideline levels regarding sediment concentrations of contaminants were documented for sediment samples collected along the Inshore Pipelines; however, arsenic concentrations were detected to exceed NOAA's ERL benchmark level at one sampling location in the GIWW near Aransas Pass. The arsenic concentration at the sampling location that exceeds the ERL benchmark does not exceed the ERM value.

Detailed results of water quality and sediment analyses, including a list of chemical constituents assessed, are provided in BWTT 's Sampling and Chemical Analysis Report in Appendix C.

4.2.2.3 Offshore

4.2.2.3.1 OFFSHORE MARINE WATER QUALITY

The Proposed DWP, consisting of the proposed SPM buoy systems, and the associated pipeline segments seaward of the GOM MHT line will be in marine waters of the GOM. While the various parameters measured to evaluate water quality vary in marine waters, pH does not. The marine environment's buffering capacity 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 Proposed Project, including the shallow waters overlying over the Outer Continental Shelf (OCS) and deeper waters farther offshore.

There is little research regarding trace metals and hydrocarbons in water column and sediments in deep ocean waters (MMS 2002). 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 66 hydrocarbon seeps using remote sensing and submarine observations in a 3,166 sq mi (8,200 sq kilometer [km]) area. 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 (Aharon et al. 2001). Geophysical analysis identifies one potential tar mound or seep near a former platform in the Proposed Project area (see Volume I Appendices for the Offshore Geophysical Survey Report).

Contamination, if present within the water column, can be a result from a number of sources. NOAA has 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).

BWTT conducted water quality testing in the offshore Project area, in addition to the inshore Project area as described above. Water column samples were collected at two locations along the Offshore Pipelines and at one DWP site. Standard water quality parameters were measured during the surveys; documented salinity in the offshore Project area ranged from 30.9 to 40.5 parts per thousand and pH ranged from 8.19 to 8.31. Sampling included volatile and semi-volatile organic compounds, pesticides, metals, polychlorinated biphenyls, and total petroleum hydrocarbons. No exceedances of the TCEQ's water quality standards or USEPA's national recommended ambient water quality parameters were documented for water quality samples collected for the Proposed Project. Detailed results of water quality analyses, including a list of chemical constituents assessed, are provided in BWTT's Sampling and Chemical Analysis Report in Appendix C. The results of sediment sample analyses are described below.

4.2.2.3.2 SEDIMENT QUALITY

Toxic substances and pesticides are discharged into the GOM via 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. 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 (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. However, informal benchmark levels have been established as described in Section 4.2.2.2.2, above.

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 Texas coast is low; however, levels are elevated in Matagorda Bay, which is located more than 20 mi (32 km) north of the Proposed Project area (Karnauskas et al. 2013). The GOM in the Proposed Project area is subject to restricted consumption guidelines due to mercury in offshore sport fishes. 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 and may be of concern in the northwestern and central 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).

BWTT conducted sediment testing in the offshore Proposed Project area concurrent with water quality testing described above. Sediment samples were collected at 14 locations, including 12 sites along the Offshore Pipelines and at each SPM buoy system site. No exceedances of the NOAA's or the TCEQ's guidelines regarding sediment concentrations of contaminants were documented for sediment samples collected along the Offshore Pipelines or at the SPM buoy systems. Detailed results of sediment quality analyses, including a list of chemical constituents assessed, are provided in BWTT 's Sampling and Chemical Analysis Report in Appendix C. Based on sediment grain size analyses, material collected amongst sampling locations ranged in composition between 18.5 and 98.5 percent sand, 1.5 and 69.3 percent silt, and 0.0 and 33.0 percent clay. The site-specific sediment distributions are also presented in Appendix C.

4.2.3 Proposed Project Construction Impacts

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 on 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. As proposed, the Proposed Project will include installation of an approximately 56.5 mi (90.9 km) of dual 30-inch-diameter pipeline and two offshore SPM buoy systems located in approximately 87 ft (27 meters [m]) of water, within the Exclusive Economic Zone. Impacts on water quality will be limited to those components of the Proposed Project that cross waterbodies within the onshore environment or are in inshore (Redfish Bay) or offshore (seaward of Mustang and San Jose Islands) locations; those impacts are discussed below. Refer to Appendix A: Construction, Operation, and Decommissioning Procedures, for a detailed description of techniques, procedures, and phases of the Proposed Project that were used to evaluate environmental consequences in the following sections.

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

4.2.3.1 Onshore

Impacts on ground and surface water quality from the Onshore Pipelines could result from in-water construction, inadvertent spills, and hydrostatic testing. Project impacts are described below.

4.2.3.1.1 GROUNDWATER

Impacts on groundwater from construction and operation of the Onshore Pipelines could result from trenching and construction activities, compaction, and inadvertent spills. Construction of the Onshore Pipelines will require the excavation of a trench about 6 ft deep to achieve sufficient cover. Surface drainage and groundwater recharge patterns could be temporarily altered by the clearing, grading, trenching, and soil stockpiling activities associated with pipeline installation. This could cause minor fluctuations in groundwater levels and recharge, as well as increased levels of TDS in groundwater. These impacts will be minor and temporary as water levels will likely re-establish equilibrium and TDS levels will subside shortly after construction. Additionally, compaction from the operation of heavy equipment could affect soil absorption, temporarily reducing groundwater recharge. However, given the large extent of the Gulf Coast Aquifer and relatively small construction workspace for the Onshore Pipelines that overlie the aquifer, impacts will be negligible. Further, as described in Section 4.2.2.1.1, above, no groundwater wells occur within 1,000 ft of the Onshore Pipelines; therefore, impacts on well water quality and yield will not occur during Proposed Project construction.

ACCIDENTAL RELEASES OF FUEL, OIL, AND OTHER CHEMICALS

An inadvertent spill of fuel or hazardous materials during refueling or maintenance of construction equipment could also affect groundwater quality if not cleaned up appropriately. To minimize the risk of potential fuel or hazardous materials spills, a Project-specific Spill Prevention, Control, and Countermeasures (SPCC) Plan will be implemented during construction. The SPCC Plan will include spill prevention measures as well as cleanup methods to reduce potential impacts should a spill occur.

Due to the developed nature of the southernmost section of the Onshore Pipelines, where they traverse the City of Aransas Pass, there is a potential to encounter contaminated groundwater during construction. If contaminated groundwater were encountered during construction, work in the area of contamination will be halted until the applicable agencies were notified and the extent of contamination is determined.

4.2.3.1.2 SURFACE WATER

The Onshore Pipelines will be installed across waterbodies via a combination of horizontal directional drill (HDD) construction and conventional open-cut pipeline installation. The Onshore Pipelines cross ephemeral, intermittent, and perennial waterbodies as described in Section 5: Wetlands and Waters of the U.S. Impacts on surface water quality from construction and operation of the Onshore Pipelines could result from in-water construction, inadvertent spills, and hydrostatic testing. Construction of the pipelines through waterbodies may occur through one of three methods, including open-cut, conventional bore, and HDD. The final method of construction through each waterbody will be determined during detailed engineering of the final pipeline route.

In general, impacts on water quality resulting from open-cut pipeline construction at waterbody crossings could include sedimentation and turbidity and introduction or disturbance of pollutants. An open-cut crossing will result in reduced water quality due to short-term increases in turbidity downstream of the pipeline crossing, if water is flowing at the time of construction; however, the concentration of total suspended solids (TSS) will decrease rapidly after completion of in-water work, which will likely last a day or two at each stream. None of the waterbodies crossed are known to contain contaminated sediments that could be resuspended and transported downstream (USEPA 2004). Following open-cut construction of the Onshore Pipelines, waterbody contours will be restored, and water quality will return to pre-construction conditions. Where waterbodies are located within construction workspaces, but not crossed by the Onshore Pipelines, BWTT will install erosion controls, matting, and/or temporary equipment bridges where needed to avoid water quality impacts. Water used for HDD construction will be sourced from waterbodies along the Project. Water intakes and discharges will be conducted in accordance with applicable permits and are further discussed in the hydrostatic testing permit application (refer to Volume I).

Intermittent (and ephemeral) waterbodies, such as those crossed by the Onshore Pipelines, may not contain flowing water at the time of construction. If BWTT crosses these waterbodies when water is not flowing, impacts on downstream water quality due to changes in turbidity will not occur.

Water quality impacts on waterbodies that will be crossed by trenchless construction methods (conventional bore and HDD) will generally be avoided since the waterbody and its banks will not be disturbed by clearing or trenching. Although HDD construction generally minimizes impacts on sensitive resources, there is the potential for an inadvertent return of drilling fluids, during which HDD drilling mud forces through fractures in the overlying material and discharges to the surface. As the drilling fluid will follow the path of least resistance, fluids may come to the surface over the Onshore Pipelines, or in a nearby area. Although an inadvertent return is possible, HDD drilling mud is a benign, non-toxic substance composed primarily of bentonite clay. If a release were to occur in a waterbody, the substance will result in a short-term increase in turbidity before settling on the streambed. In the case of any inadvertent return, BWTT will implement its Project-specific HDD Inadvertent Return Contingency Plan (see Volume I Appendices of the Application), which includes measures to prevent, detect, and mitigate for inadvertent releases of drilling fluid. Overall, impacts will be temporary and minor.

HYDROSTATIC TESTING

Following construction, the Onshore Pipelines will be hydrostatically tested using water obtained from municipal sources. Discharges will comply with appropriate agency and permit requirements and concurrent with the Inshore Pipelines. The total estimated volume of test water is 16,200,000 gallons for the Onshore and Inshore Pipelines combined, landward of the Harbor Island Booster Station, with a discharge rate of 3,000 gallons per minute. In addition, an estimated 440,000 gallons of surface water will be withdrawn for hydrostatic testing of HDD segments. The test water will be discharged back into environment at the planned multi-use terminal site. The discharge of hydrostatic test water could transport suspended sediment into nearby surface waters. However, BWTT will comply with applicable hydrostatic discharge permits and implement measures (such as use of a filter bag or hay bale structure) to reduce the speed of water discharges and minimize water quality impacts. Therefore, impacts from hydrostatic testing on water quality will be negligible. Hydrostatic testing procedures are further discussed in the hydrostatic testing permit application (refer to Volume I).

ACCIDENTAL RELEASES OF FUEL, OIL, AND OTHER CHEMICALS

Refueling of vehicles and storage of fuel, oil, or other hazardous materials near surface waters could result in accidental spills that could impact water quality by introducing contaminants to surface waters. BWTT will implement a Project-specific SPCC Plan during construction, which will include spill prevention measures and cleanup methods to reduce potential impacts should a spill occur. With adherence to the mitigation measures in these plans, impacts of potential spills on water quality associated with the Onshore Pipelines will be minimal.

4.2.3.2 Inshore

Impacts on surface water quality from the Inshore Pipelines could result from in-water construction, hydrostatic testing, and inadvertent spills. Because the Inshore Pipelines do not overlie the Gulf Coast Aquifer and drinking water supply wells do not within 1,000 ft of the Proposed Project, impacts on groundwater quality are not anticipated. Project impacts on surface water quality are described below.

The Inshore Pipelines will cross the GIWW, Redfish Bay, Aransas Pass Channel (which connects Redfish Bay to the GOM), and Lydia Ann Channel, as well as other ephemeral, intermittent, and perennial waterbodies as identified in Section 5: Wetlands and Waters of the U.S. The Inshore Pipelines will be installed across the GIWW, Redfish Bay, Aransas Pass Channel, and Lydia Ann Channel using the HDD construction technique described in Section 4.2.3.1.2, above; no in-water trenching will be required for these waterbody crossings. HDD construction requires up to 9 weeks at each location. Because HDD construction does not involve in-water disturbance, and because BWTT will implement its Project-specific HDD Inadvertent Return Contingency Plan, which includes measures to prevent, detect, and mitigate for inadvertent releases of drilling fluid, impacts from installation of the Inshore Pipelines across these will be negligible to minor. Further, where an exceedance of the ERL value for arsenic was detected in a sediment sample in the GIWW along the route for the Inshore Pipelines, the pipelines will be installed via HDD. HDD construction will avoid sediment disturbance from trenching that could introduce contaminants from the sediment into the water column; therefore, impacts on water quality due to potentially contaminated sediments in the inshore Project area are not anticipated.

In addition, land-based segments of the Inshore Pipelines and the Harbor Island Booster Station will be installed using conventional construction equipment and methods. BWTT will install erosion and sediment controls to prevent sedimentation of waterbodies near construction workspaces and will restore waterbodies crossed using the methods described for the Onshore Pipelines, above, thereby minimizing potential impacts on waterbodies near land-based construction. Overall, impacts will be temporary and minor.

4.2.3.2.1 HYDROSTATIC TESTING

Following construction, the Inshore Pipelines will be hydrostatically tested using water obtained from municipal sources. Discharges will comply with appropriate agency and permit requirements and concurrent with the Inshore Pipelines. The total estimated volume of test water is 16,200,000 gallons for the Onshore and Inshore Pipelines combined, landward of the Harbor Island Booster Station, with a discharge rate of 3,000 gallons per minute. The test water will be discharged back into environment at the planned multi-use terminal site. The discharge of hydrostatic test water could transport suspended sediment into nearby surface waters. However, BWTT will comply with applicable hydrostatic discharge permits and implement measures (such as use of a filter bag or hay bale structure) to reduce the speed of water discharges and minimize water quality impacts. Therefore, impacts from hydrostatic testing on water quality will be negligible. Hydrostatic testing procedures are further discussed in the hydrostatic testing permit application (refer to Volume I).

4.2.3.2.2 ACCIDENTAL RELEASES OF FUEL, OIL, AND OTHER CHEMICALS

Refueling of vehicles and storage of fuel, oil, or other hazardous materials near surface waters could result in accidental spills that could impact water quality by introducing contaminants to surface waters. BWTT will implement a Project-specific SPCC Plan during construction, which will include spill prevention measures and cleanup methods to reduce potential impacts should a spill occur. With adherence to the mitigation measures in these plans, impacts of potential spills associated with the Inshore Pipelines will be minimal.

4.2.3.3 Offshore

Short-term, minor, adverse impacts on the water quality will result from bottom sediment disturbance activities and associated increases in turbidity during construction. These impacts will be localized, reversible, and limited to the time of construction. After construction is complete, turbidity is expected to return to pre-construction levels. The duration of this post-excavation recovery may extend for days or weeks, depending on the amount of disturbance and the size of disturbed particles; however, as described below, TSS levels would generally return to pre-construction levels along the trench within an estimated 1-2 days. Turbidity increases will be localized and temporary in nature during the construction phase of the Proposed Project.

The Offshore Pipelines will be installed by HDD until about 3,900 ft (1,188.7 m) from shore; the remaining 26.4 mi (42.5 km) of the pipelines will be installed using a submersible pipeline jet sled (or similar pipe burial sled) operated from an anchored pipe-laying barge as described in detail in Appendix A: Construction, Operation, and Decommissioning Procedures. The pipelay barge will set four anchors prior to laying the pipe on the seafloor. The anchor spreads will be reset at varying intervals. Each anchor relocation will cause sediment disturbance and resuspension, resulting in temporary, localized increases in turbidity. The pipelines will be buried a minimum of 3 ft below the sediment surface using the jet sled. Operation of the sled will redeposit some material over the pipeline, but full backfilling will occur naturally due to currents and wave movement. The greatest potential to affect surface water quality will result from suspension or deposition of sediments resulting from trenching or jetting the pipeline.

Trenching and/or jetting will suspend sediments in the water column for a short period of time depending on sediment particle size. Coarse sediments are expected to fall out and resettle within hours, while finer sediments could remain suspended for longer periods of time (days). The installation of approximately 26.4 mi (42.5 km) of pipeline length for the dual Offshore Pipelines and other construction-related bottom disturbance activities (i.e., anchoring) will result in the suspension of significant quantities of sediment during Offshore Pipeline installation. However, once trenching is complete, local water turbidity is expected to return to pre-trenching levels without mitigation. BWTT conducted modeling to estimate the impact on TSS concentrations, a measure of turbidity, in the water column during and after trenching (see Appendix D). As depicted in the model results, TSS concentrations will be highest in the immediate area of the trench and will dissipate with distance from the trench, returning to ambient levels within a maximum distance of about 2.1 mi (3.5 km). Along the trench, TSS levels will generally return to pre-construction levels within an estimated 1-2 days. Given the temporary and localized nature of increased turbidity, impacts will be temporary and minor. The concentrations of sand, silt, and clay vary along the route for the Offshore Pipelines; sites located between about 0.7 and 2.7 nm from shore have the greatest percentage of sand (between 91 and 99 percent) and will have relatively minimal impacts; however, other sites dominated by silt and clay will result in sedimentation impacts over a larger area as depicted in Appendix D.

As described in Section 4.2.2.3, above, sediment samples in the Proposed Project area were not observed to exceed applicable benchmarks; therefore, the disturbance of sediment during trenching for the Proposed Project is not expected to result in the suspension or spread of contaminants. If trenching through the potential tar mound/seep identified during geophysical analyses, hydrocarbons could become suspended in the water column. However, hydrocarbon seeps are common in the GOM and therefore any potential impacts are expected to be temporary and consistent with the existing conditions in the Proposed Project area.

Installation of the SPM buoy systems will include pile-driving and the installation of anchor chains that will be attached to the piles. Anchoring systems will not be used for vessels installing the SPM buoy systems. Installation of the seafloor components of the SPM buoy systems may result in a short-term impact on water quality due to suspension of seafloor sediments; however, similar to pipeline construction, impacts will be temporary and minor since water turbidity will return to background levels following the 16-week-long construction period. Overall, potential impacts on water quality are anticipated to be short-term and minor during the installation and commissioning of the Offshore Pipelines and SPM buoy systems.

4.2.3.3.1 HYDROSTATIC TESTING

The proposed Offshore and Inshore Pipelines will be hydrostatically tested to ensure their integrity before being placed into service. Each test of the Offshore Pipelines will include flooding of the pipeline with seawater and subsequent discharge of the water. The total estimated volume of test water is 5,000,000 gallons with a discharge rate of 3,000 gallons per minute. Discharges will comply with appropriate agency and permit requirements. BWTT is investigating the use of biocides, corrosion inhibitors, and environmentally friendly oxygen scavengers for the hydrostatic testing of Offshore Pipeline infrastructure. Once more information is available, BWTT will provide supplemental information as required. All discharges will comply with permit conditions to minimize impacts to water quality at the discharge location. Therefore, negative effects on water quality are not expected in connection with hydrostatic testing of the Offshore Pipelines. Hydrostatic testing procedures are further discussed in the hydrostatic testing permit applications (refer to Volume I).

4.2.3.3.2 ACCIDENTAL RELEASES OF FUEL, OIL, AND OTHER CHEMICALS

Adverse direct impacts on water quality could occur 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 minor if the spill is small, or adverse and significant if the spill is major. Impacts on water quality would be temporary as oil weathers and is diluted to below toxic levels over time, as described further in Section 4.2.4.3.3. Most petroleum products that will be carried on the construction vessels will be light, remaining on the surface of the water and evaporating in the event of a spill. These spills will be expected to adversely affect water quality, as well as coastal, marine, and/or migratory birds that will 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 and other wildlife that occur near the water's surface. See Section 8: Wildlife and Protected Species for additional detail regarding wildlife impacts.

4.2.4 Proposed Project Operation Impacts

Impacts on water quality during operation of the Proposed Project will generally be limited to the presence of the SPM buoy systems, port calls by very large crude carriers (VLCC) (estimated at 16 per month for the two buoys combined), and the sporadic transit of support vessels to and from the deepwater port. Once installed, the pipelines will be buried a minimum of 3 ft below the bed of waterbodies and the seafloor. Although the habitats disturbed during construction will take various amounts of time to recover to pre-construction levels, no additional impacts will be incurred during operations. Although not anticipated to occur, a release of petroleum products from the SPM buoy systems or pipelines would also impact the aquatic environment.

4.2.4.1 Onshore

Normal operation of the Onshore Pipelines will not result in impacts on groundwater or surface water quality. Maintenance during the life of the Proposed Project will include vegetation maintenance along the Right-of-Way (ROW) to ensure visibility for leak inspections and also to ensure that vegetation does not compromise pipeline integrity; however, no earth disturbance will occur and vegetation maintenance is not planned within waterbodies.

During pipeline maintenance, pigging operations will be infrequent. During a pigging operation for pipeline cleaning purposes, waxes, condensates and gases could be expected to be discharged from the pipeline. The volume of these materials will be directly related to the type of product that has been passing through the pipeline and the length of time since the last pigging operations. Because the Proposed Project will operate as a closed system, any components in the pipeline and residues dislodged during the pigging/cleaning will be discharged into one of the storage tanks at the planned multi-use terminal. Materials will be disposed of in accordance with applicable state and federal requirements, and pigging residues will not be discharged to the environment.

4.2.4.2 Inshore

Normal operation of the Inshore Pipelines will not result in impacts on groundwater or surface water quality. Maintenance during the life of the Proposed Project will include vegetation maintenance along the ROW where it is located on land to ensure visibility for leak inspections and that vegetation does not compromise pipeline integrity; however, no earth disturbance will occur and maintenance activities are not planned within waterbodies. Operation of the Harbor Island Booster Station could impact surface water quality in the event of a spill or leak of hazardous materials. However, BWTT will implement its Project-specific SPCC Plan, which includes measures for the prevention of hazardous materials releases, and for the cleanup of a spill should it occur. Therefore, water quality impacts during operation are not anticipated.

4.2.4.3 Offshore

Water quality impacts during operation of the Proposed Project could result from anchor chain sweep during operation of the SPM buoy systems, discharges and intakes of GOM water by the VLCCs, and inadvertent releases of oil or hazardous materials, as discussed below. In addition, support vessels will regularly transit from shore to the SPM buoy systems and between the SPM buoy systems and incoming VLCCs and a minimum of two supply tugs will be onsite at the SPM buoy systems during mooring operations. Although regularly occurring, these vessel transits and tug operations are not anticipated to have any lasting effect on the aquatic environment as they are consistent with ongoing vessel activity in the GOM, and as such, are negligible and not addressed further.

4.2.4.3.1 DEEPWATER PORT PRESENCE

The SPM buoy systems will be attached to the seafloor via anchor chains attached to piles (24 total). As the buoy is floating and will move with the waves, currents, and VLCC activity, the anchor chains will also move, resulting in scour in areas where the anchor chains may drag on the seafloor. This chain sweep will occur throughout the life of the Port, resulting in continual disturbance of the sediment. However, each buoy will be limited to a maximum swing circle based on the tensions of the chains, and therefore the impact to the affected soft-bottom habitat is considered negligible.

4.2.4.3.2 DISCHARGES AND INTAKES

The SPM buoy systems 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 the vetting process, it is BWTT's intent to restrict unnecessary discharges from the vessels when they have entered the safety zone. Discharges from vessels transiting to the DWP can impact water quality in the surrounding waters, even though certain discharges are not permitted to occur while moored at the SPM buoy systems (including sewer, oil or oily water, garbage, and dirty ballast). Incidental discharges will be allowed as long as they comply with applicable standards and do not interfere with loading and unloading. For this reason, vessel discharges are discussed below and summarized in Table 4-2. Wastewater sources and effluent discharges from vessels may include:

- Sanitary sewer treated effluent;
- Non-contact generator cooling water;
- Ballast water;
- Firewater deluge test bypass water; and
- Inert gas (IG) scrubber water and deck seal.

In addition, intermittent stormwater discharges and discharges from the equipment open drain will occur; no intakes are required for these systems and discharges would be intermittent, at ambient temperatures, and oil-water separation will 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. Due to their intermittent nature, these discharges are excluded from Table 4-2.

Table 4-2: Liquid Discharge from Vessels

System or equipment type	Frequency and duration while in loading port	Discharge Rate (m^3/hr, gpm)	Temp. (˚C/˚F)	Pump type/capacity info if known	Over Board location (approx., optional)	Treatment type (if applicable)
Ballast water	Continuous	3,000 m^3/hr (13,208 gpm; electrical) and 3,000 m^3/hr (13,208 gpm, steam driven)	ambient	Shinko CV-450 (electrical) and CV-450 (steam driven, centrifugal pump)	Port side, aft of vessel	This vessel has no treatment plant for ballast water.[a]
Gray water/sanitary sewer	Continuous	1.2 m^3/hr, 5.3 gpm	Ambient	Unknown	Starboard side, Aft of Vessel	Biological
IG deck seal	Continuous Minimal	7.3 m^3/hr, 32 gpm	ambient	Shinko H540M, centrifugal pump	Port side, aft of vessel	NA
IG Scrubber	None during normal loading operations	273 m^3/hr, 1,202 gpm	10°C / 18°F above ambient	Shinko RVP-200M, centrifugal pump	Port side, aft of vessel	NA
Generator Cooling Water	Continuous	Closed loop central cooling system	NA	Unknown	NA	NA
Main Engine Cooling Water (maneuvering)	Continuous, while maneuvering (none at the SPM buoy systems)	940 m^3/hr, 4,139 gpm	45°C / 113°F	Shinko SVS350M, centrifugal pump	Starboard side	Electrolytic Marine growth prevention system
Main Engine Cooling Water (idling)	Continuous, while idling	400 m^3/hr, 1,761 gpm	40°C / 104°F	Shinko SVS 250M, centrifugal pump	Starboard side	Electrolytic Marine growth prevention system
Reverse Osmosis or Evaporator brine discharge	None; water to be made underway and stored	NA	NA	Unknown	NA	NA
Fire water system (pressurized)	Continuous, for open loop fire main	350 m^3/hr, 1,541 gpm	Ambient	Shinko RVP200-2MS, centrifugal pump	Port side aft of engine room	NA
Other auxiliary cooling water	Hydraulic power pack (forward and aft)	Source from fire line	10°C / 18°F above ambient	Shinko RVP200-2MS, centrifugal pump	Port side forward of vessel near the forecastle and port side aft of the ship.	NA

Table 4-2: Liquid Discharge from Vessels

System or equipment type	Frequency and duration while in loading port	Discharge Rate (m^3/hr, gpm)	Temp. (˚C/˚F)	Pump type/capacity info if known	Over Board location (approx., optional)	Treatment type (if applicable)

Notes:
Temperatures reflect the ambient water temperature of 62-87°F at the SPM buoy systems.
Discharge rates assume the unlikely event that all ship water discharge processes are simultaneously operating at peak capacity.
The estimated rates are the maximum for a VLCC of approximately 320,000 deadweight tons during a normal loading operation.
Key:
°C = degrees Celsius
°F = degrees Fahrenheit
Temp. = temperature
m^3/hr = cubic meters per hour
gpm = gallons per minute
[a] Internationally trading tankers (including VLCCs) are party to the International Maritime Organization (IMO) International Convention for the Control and Management of Ships' Ballast Water and Sediments and as such are required to complete ballast water exchange a minimum of 200 nm from their destination port and in greater than 200 m of water depth. Tankers are also required to carry a Ballast Water Management Plan and Ballast Water Record Book. Chemical treatment of ballast water is not required as part of the Convention.

The quantity of seawater withdrawals and discharges from the VLCCs will vary depending on the characteristics and size of each VLCC. Based on 192 annual port calls (96 per SPM buoy system), the maximum annual seawater withdrawal from VLCCs in port would be 1.04 billion gallons per year. Each VLCC port call is estimated to last approximately 40 hours (6 hours mooring and connection, 28 hours loading, 6 hours disconnect). The withdrawal calculation includes continuous seawater usage for the IG deck seal (32 gallons per minute [gpm]; 14.8 million gallons per year) and main engine cooling (4,139 gpm; 811.6 million gallons per year while idling), as well as 12 hours (per port call) of firewater pump usage during mooring and unmooring to cool the hydraulic power pack that controls the mooring equipment (213.1 million gallons per year). The estimated usage is extremely conservative because the approximate loading time and time to connect and disconnect are conservative estimates, and because the use of the hydraulic power pack and associated cooling water is conservative as it is based on mooring at a jetty where six mooring winches are used, while at the DWP only the bow chain stopper will be used to connect the hawser. Therefore this estimated annual volume is likely higher than the actual intake volume used by vessels at the deepwater port. This volume represents only a small fraction of the amount of water available within the Proposed Project area and thus is considered a negligible impact to overall water consumption impacts. Vessel intakes are identified in Table 4-3. Crude oil transfer carriers will be required to operate under MARPOL Convention standards; thus, all intake will adhere to international standards and not be expected to significantly impact water quality at the SPM buoy systems.

Table 4-3: Liquid Intakes for Vessels

System or equipment type	Frequency and duration while in loading port	Usage Rate (m^3/hr, gpm)	Pump type/capacity info if known	Sea chest location on hull (approx., *optional*)
Ballast Water	None, during loading	3,000 m^3/hr (13,208 gpm; electrical) and 3,000 m^3/hr	Shinko CV-450(electrical) and CV-450 (steam driven, centrifugal pump)	Pump room aft of vessel low sea suction port side and high sea suction starboard side

Table 4-3: Liquid Intakes for Vessels

System or equipment type	Frequency and duration while in loading port	Usage Rate (m^3/hr, gpm)	Pump type/capacity info if known	Sea chest location on hull (approx., *optional*)
		(13,208 gpm, steam driven)		
IG Deck Seal	Continuous, minimal	7.3 m^3/hr, 32 gpm	Shinko H540M, centrifugal pump	Engine room aft of vessel low sea suction port side and high sea suction starboard side
IG Scrubber	None during normal loading operations	273 m^3/hr, 1,202 gpm	Shinko RVP-200M, centrifugal pump	Engine room aft of vessel low sea suction port side and high sea suction starboard side
Exhaust gas scrubbers (to meet 2020 regs)	NA, not fitted	NA	NA	NA
Generator Cooling Water	Continuous	Closed loop central cooling system	Unknown	NA
Main Engine Cooling Water (maneuvering)	Continuous, while maneuvering (none during loading)	940 m^3/hr, 4,139 gpm	Shinko SVS350M, centrifugal pump	Engine room aft of vessel low sea suction port side and high sea suction starboard side
Main Engine Cooling Water (idling)	Continuous, while idling	400 m^3/hr, 1,761 gpm	Shinko SVS 250M, centrifugal pump	Engine room aft of vessel low sea suction port side and high sea suction starboard side
Reverse Osmosis or Evaporator freshwater maker	None, water to be made underway	NA	Unknown	NA
Fire water system (pressurized)	Continuous, for open loop fire main	350 m^3/hr, 1,541 gpm	Shinko RVP200-2MS, centrifugal pump	Engine room aft of vessel low sea suction port side and high sea suction starboard side
Other auxiliary cooling water	Hydraulic power pack (forward and aft)	Source from fire line	Shinko RVP200-2MS, centrifugal pump	Engine room aft of vessel low sea suction port side and high sea suction starboard side

Each ship will have several intake structures (seachests). They are all located at the bottom of the ship hull (below the water line).
Maximum intake rates assume the unlikely event that all ship water processes are simultaneously operating at peak capacity.
The estimated rates are the maximum for a VLCC of approximately 320,000 deadweight tons during a normal loading operation.

BALLAST WATER

Ballast tanks on vessels will be filled with seawater to maintain proper buoyancy. Ballast water will be discharged generally continuously during the crude oil loading process at an average rate of 13,208 gpm by either electrical or steam driven pups to maintain proper balance between the SPM buoy systems and VLCCs. Intake of ballast water will not occur at the SPM buoy systems.

Impacts to water quality associated with ballast water discharge in the offshore environment will 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. 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). 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 will 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 will involve intake and discharge of local GOM waters; therefore, the potential threat of introducing invasive, noxious species will be removed. As described in Section 8: Wildlife and Protected Species, and as required by USCG Regulations under 33 Code of Federal Regulations (CFR) 151.1510, vessels equipped with ballast tanks must implement one of five options to control nonindigenous species in WOUS. Examples of these strategies include retaining ballast water on board, minimizing discharge or uptake at certain times and locations, and exchanging ballast water with mid-ocean seawater. Ships that have operated outside of the U.S. Exclusive Economic Zone must either retain their ballast water on board or undergo a mid-ocean (> 200 nm [230 mi or 370 km] from shore/water depth > 6,561 ft [2,000 m]) ballast water exchange in accordance with applicable regulations. The IMO has adopted this regulation and requires each vessel to install and operate a ballast water management system. VLCCs are also required to carry a Ballast Water Management Plan and Ballast Water Record Book. Chemical treatment of ballast water is not required. Minor pH variations between ambient seawater and ballast water are not likely to be of concern when ballast water is discharged, since ballast water intake will occur in marine waters.

COMBINED DOMESTIC WATER (GRAY) AND SANITARY WATER DISCHARGES

Sanitary wastes and gray water generated onboard vessels will be collected and treated by USCG Type II marine sanitation devices. These units will treat black and gray wastewater generated from use by personnel onboard vessels. These outfalls will discharge continuously at an average rate of 5.3 gpm. Tugboats, service/supply vessels, and VLCCs will 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 sea water. Discharges of treated sanitary wastes and domestic wastes will be rapidly diluted and dispersed to ambient levels within a few thousand meters of the discharge (MMS 2001). Therefore, these discharges are not expected to significantly impact water quality in the offshore GOM.

DISCHARGES AFFECTING 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 62°F to 87°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. Similarly, discharges from the IG deck seal and fire water system are expected to be at ambient temperatures. Non-contact cooling water discharge during engine idling at the SPM buoy systems will be continuous at a rate of 1,761 gpm; discharges are expected to result in a localized change in seawater temperatures. The IG scrubber and other auxiliary cooling water will also result in discharges of water at temperatures greater than ambient. The temperature ranges for water discharges are presented in Table 4-2. While these temperature ranges may be above the ambient seawater temperatures, discharges are not expected to result in significant temperature changes given the small discharge volume relative to the volume of water in the GOM.

REVERSE OSMOSIS OR EVAPORATOR DISCHARGE

Seawater will be used to generate non-potable fresh water, potable water, demineralized water, and utility water. However, because water will be made underway, no discharge of brine will be associated with the VLCCs at the SPM buoy systems.

INTERMITTENT STORMWATER DISCHARGES FROM DECK DRAINAGE

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

EQUIPMENT OPEN DRAIN AND OILY WATER TREATMENT

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

As previously stated, based on the first-flush principle, the first half inch of rainfall will be diverted to the slop tank for treatment. Remaining stormwater from the process and other areas will be directly discharged overboard. Oil-free water will be discharged to the GOM through an outfall pipe located below water level. Free oil collected at the water surface will be removed using floating oil booms and/or skimmers and routed to an oil/sludge collection tank. Oily sludge collected in the slop tanks will be routed to a hydrocyclone for separation of oil and solids. Treated water will be discharged to the GOM if it contains less than 15 milligrams per liter (mg/L) of oil. Oil discharge monitoring equipment will be provided to ensure compliance with this regulatory requirement. If the oil content is higher than 15 mg/L, the water will be re-routed to the slop tank for treatment. If oily water from the IG scrubber wash water or other sources exceeds 15 mg/L, the oily discharge will be routed to slop tanks for further treatment.

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

The open drain system described above will 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. Treated discharged will meet all USEPA and USCG requirements and thus will not significantly affect water quality. Crude oil transfer carriers will operate under MARPOL Convention standards. Overall, potential impacts to water quality as a result of vessel operations associated with the Proposed Project will be permanent but negligible.

4.2.4.3.3 ACCIDENTAL RELEASES OF FUEL, OIL, AND OTHER CHEMICALS

The probability of a major crude oil spill is extremely low (see Section 14: Navigation, Safety, and Security). The major elements of the Proposed Project that could leak crude oil in the marine environment include the SPM buoy systems and the pipelines. Under the worst-case discharge scenario, a volume of 120,770 barrels of crude oil would be released.

Oil spilled from the Proposed Project could contaminate surface water, potentially exceeding toxicity levels for biota in the immediate vicinity of the spill. After oil is released into the environment, it undergoes a wide variety of physical, chemical, and biological processes that begin to transform the oil almost immediately. While some compounds may quickly dissolve, evaporate, or biodegrade, others, including polycyclic aromatic hydrocarbons, do not degrade and become concentrated in weathered oil residue (such as tarballs; Deepwater Horizon NRDA Trustees 2016).

Trajectory models were completed for the Proposed Project, to evaluate the coastal impact (how much oil makes landfall), in the event of a worst-case discharge from all the Offshore Components. The trajectory and time that a worst-case scenario spill from either of the SPM buoy systems would remain on the surface varies between about 12 and 18 days seasonally; with the exception of subsurface oil during the fall seasonal trajectory model, oil is projected to remain offshore and not enter inshore areas behind GOM-facing barrier islands. Modeling scenarios were run for all seasons, and only during the fall scenario would any subsurface oil reach inshore areas; otherwise, oil released at the SPM buoy systems would remain offshore. Oil spilled from locations along the Offshore and Inshore Pipelines would be more likely to reach inshore waters. Impacts on water quality could be significant in the immediate vicinity of a spill, but would be temporary as oil weathers and is diluted to below toxic levels over time.

The results of the trajectory models assume no response efforts were employed and therefore no oil was contained, recovered, or diverted. However, in the actual situation of an unanticipated discharge, BWTT would implement its Tactical Response Plan (see Volume I) and highly-trained tactical response teams would be mobilized immediately to initiate mitigation efforts. The models were used to create the Tactical Response Plan, which ensures the appropriate equipment and resources are available if a large-scale spill were to occur, although extremely unlikely. Mitigation measures in design of the system are also described in the trajectory modeling report and worst-case discharge report (see Volume I).

In the event of a petroleum release, either from a vessel or pipeline, an Emergency Response Plan, Spill Response Plan, and Tactical Response Plan will be implemented to respond to the incident in a timely and effective manner. The Spill Response Plan will be a strategic document that identifies initial actions in the event of a spill, notification procedures, identifies resources, and describes implementation of response strategies. The Tactical Response Plan, as described above, includes maps detailing the location and type of equipment to be deployed in response to a release, and identifies sensitive resources for protection. Equipment used would include boom to contain oil and skimmers to remove oil from the environment. VLCC and port operators are required by law to have a contract with an Oil Spill Response Operator that owns and operates resources to respond to a spill and mitigate the potential impacts. All measures necessary will be taken to mitigate the likelihood of a spill through design of the Project and through competency and training of operations personnel. It is expected that with the Emergency Response Plan, immediate response actions would reduce impacts, if they occur, on water quality and impacts will be temporary.

Other, smaller spills could also occur during typical operations. However, oil in the water must be recorded and/or reported, based on the quantity. VLCCs, under International Maritime Organization (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 books to hold operators accountable. Any oil greater than 15 ppm in water must remain onboard and cannot be discharged. Any amount of oil over 15 ppm in water or any oil that goes into the water must be reported to the appropriate authorities.

At the SPM connection point during connecting/disconnecting operations, the SPM hoses will connect directly to the manifold on the VLCC, thereby minimizing the potential for crude oil residue releases. The flanges are equipped so that when loading is complete, and the ship is ready to disconnect, they close the butterfly valve in preparation of removing the hose; this stops the flow of product through hose. Because the tank on the ship is at atmospheric pressure, the product continues to drain into the manifold and any remaining residue is then contained in drip trays beneath the ship's manifold and disposed of in the vessels slop tank system to be treated. The amount of crude that can be released after the butterfly valve has been closed from the flange will vary from ship to ship and depends on the amount of crude that remains stored between the butterfly valve and the flange. The maximum amount is expected to be less than 10 gallons for the 16-inch floating hose tails used for this Project. After the remaining product is drained from the flange into the ship's drip tray and slop tank storage, the transfer operator will ensure the butterfly valve on the hose is secure and place the hose cover over the camlock coupling face. This cover is designed to seal and prevent any hydrocarbons from coming into contact with the ocean. There will be no crude oil residue exposure when the hoses are disconnected from the vessel manifold because the cover and end connection mechanism of the hose is designed to be secured prior to returning the hoses back to resting state in the ocean. Impacts from smaller spills associated with chemicals stored on support vessels or the SPM buoy systems will be minor, and will be mitigated as discussed above, for construction.

4.2.5 Proposed Project Decommissioning Impacts

4.2.5.1 Onshore/Inshore

At the end of its useful life (50 years), the Proposed Project will be decommissioned. Decommissioning of the proposed Onshore and Inshore Pipelines will consist of purging the pipe of crude oil liquids and filling them with water; the onshore and inshore pipelines will be abandoned in place in order tp minimize environmental disturbance. No decommissioning activities are anticipated to occur in onshore or inshore waterbodies; all HDD pipeline segments will be plugged and abandoned in place. BWTT will remove the Harbor Island Booster Station, which could result in minor water quality impacts similar to construction; however, erosion and sediment controls and implementation of spill prevention and control measures will minimize the potential for water quality impacts from the decommissioning of the Booster Station facility.

4.2.5.2 Offshore

The Offshore Pipelines (from a point about 3,900 ft [1,188.7 m] offshore) will be removed, as will the SPM buoy systems. Decommissioning of the Offshore Pipelines will consist of divers to cut sections of the pipe and a heavy lift vessel to retrieve the cut segments from the seafloor for offsite disposal. This activity will result in localized increases in turbidity; however, impacts will be temporary and limited to the immediate vicinity of pipeline removal activities. In addition, adverse direct impacts on water quality could occur 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 and would be similar to impacts from a spill during construction as described in Section 4.2.3.3.2.

The SPM buoy systems will be removed using divers and offshore cranes. The Offshore Components will be generally be disconnected and hauled to shore for proper disposal. The anchor piles will be removed by cutting the piles 15 ft (4.6 m) below the mudline. Removal by cutting, which is standard practice in the GOM, involves the jetting and removal of the seafloor materials around each pile to facilitate the cut; deeper portions of the pile are left in place, buried below the seafloor. This will result in increased turbidity and sedimentation adjacent to the activity; however, given the small amount of area impacted and the duration of impacts (approximately 25 days for removal of the anchor piles), these impacts will be minor and temporary. Overall, potential impacts to water quality as a result of Project decommissioning are anticipated to be temporary (about 5 months or less) and minor to negligible.

4.2.6 Summary of Proposed Project Impacts

Temporary, minor impacts on groundwater quality and flow could occur during construction for the Onshore Pipelines; however, water levels will likely re-establish equilibrium and TDS levels will subside shortly after construction. The Gulf Coast Aquifer will underlie the Onshore Pipelines for about 6.0 mi (9.7 km) in Aransas Pass, Texas; however, no water supply wells are located within 1,000 ft of the Proposed Project. Normal operation of the Onshore Pipelines will not result in impacts on groundwater quality. Inadvertent releases of hazardous materials could occur during all phases of Proposed Project construction, operations, and decommissioning and could affect groundwater quality if not cleaned up appropriately. To minimize the risk of potential fuel or hazardous materials spills, a Project-specific SPCC Plan will be implemented. Groundwater impacts are not anticipated for the Inshore and Offshore Pipelines or SPM buoy systems.

Construction of the Onshore and Inshore Pipelines could result in potential increases in downstream turbidity and sedimentation during stream crossings. The concentration of TSS will decrease rapidly after the completion of in-water work, which will likely last a day or two at each stream. The Inshore Pipelines will be installed via HDD across the GIWW, Redfish Bay, Aransas Pass Channel, and Lydia Ann Channel, thereby avoiding direct impacts from trenching through major inshore waterbodies. Where HDD construction will be used to avoid direct waterbody impacts, inadvertent returns of drilling fluids could also result in temporary turbidity impacts during construction. HDD construction will require up to 9 weeks at each location, and potential impacts would subside immediately following construction or after implementation of measures to mitigate for inadvertent releases are implemented.

Installation of the Offshore Pipelines will result in turbidity impacts along the 26.4 mi (42.5 km) that will be installed via trenching; however, impacts will be temporary and minor. Along the 3,900 ft [1,188.7 m] of Offshore Pipelines that will be installed via HDD, temporary, minor increases in turbidity could occur in the event of an inadvertent return of drilling fluids. Installation of the seafloor components of the SPM buoy systems (within a 700 sq ft [0.02 ac] area) may result in temporary, minor turbidity increases due to suspension of seafloor sediments in the immediate vicinity; however, impacts will subside shortly following the 16-week-long installation period.

Normal operation of the Onshore, Inshore, and Offshore Pipelines will not result in impacts on surface water quality. During operation of the SPM buoy systems, anchor chain sweep will result in negligible turbidity impacts within the seafloor footprint of the SPM buoy system. In addition, vessel calls at the SPM buoy systems will result in the maximum estimated withdrawal of 1.04 billion gallons of seawater per year, as well as discharges of water from sanitary sewer treated effluent; non-contact generator cooling water; ballast water; firewater deluge test bypass water; and IG scrubber water and deck seal. Given the dilution capacity of the GOM, which will rapidly dilute waters with altered qualities (temperature, DO, or pH), as well adherence to regulatory standards for discharges, impacts from discharges would be permanent, but negligible. The volume of water intakes by VLCCs for the Proposed Project represent only a small fraction of the water available in the Project area and discharges.

Impacts from decommissioning the Proposed Project will be similar to those described for construction, including temporary, minor increases in turbidity from removing Project components.

Inadvertent releases of hazardous materials could occur during all phases of Proposed Project construction, operations, and decommissioning. The degree of impact is directly proportional to the amount and duration of a spill. In the event of a worst-case scenario operational spill, impacts could be significant in the immediate vicinity of the spill, but would be temporary as BWTT would implement its Tactical Response Plan and oil would weather.

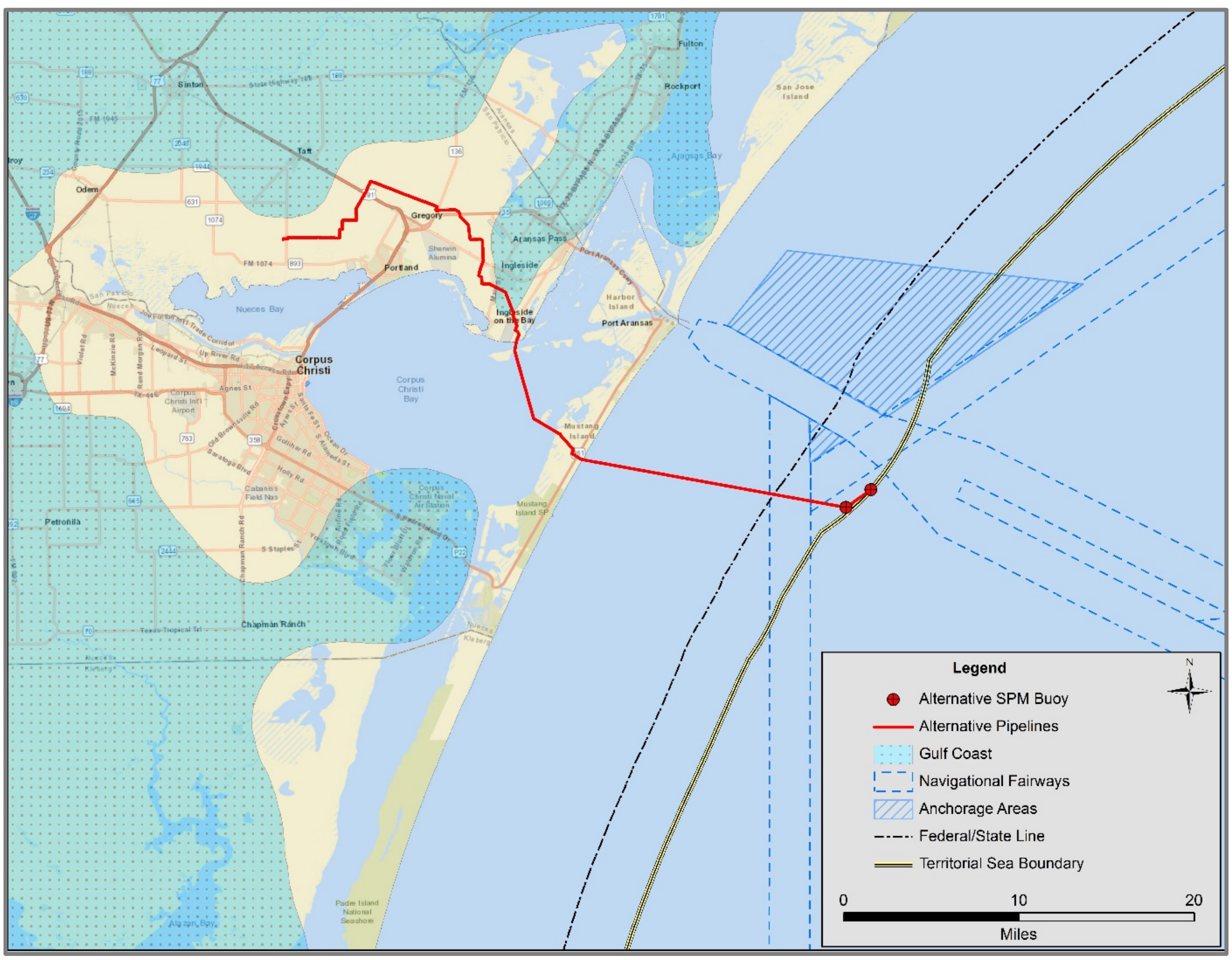
4.3 Alternative Project

The Alternative Project would include installation of approximately 48.6 mi (78.2 km) of dual, 30-inch-diameter pipeline and the offshore SPM buoy systems located in 87 ft (27 m) of water, within the Exclusive Economic Zone (EEZ). Impacts on aquatic habitats would be limited to those components of the Alternative Project that cross waterbodies within the onshore environment or are in inshore (Corpus Christi Bay) or offshore (seaward of Mustang Island) locations; those impacts are discussed below. Refer to Appendix A: Construction, Operation and Decommissioning Procedures, for a detailed description of techniques, procedures, and phases of the Alternative Project that were used to evaluated environmental consequences in the following sections.

4.3.1 Alternative Project Area

The Alternative Project area considered for water quality encompasses all freshwater, estuarine, and marine waters within the immediate vicinity of the Alternative Onshore Pipelines, Inshore Pipelines, Offshore Pipelines, and both SPM buoys (which make up the Alternative SPM buoy systems). Similar to the Proposed Project, portions of the Alternative Onshore Pipelines are underlain by the Gulf Coast Aquifer, and the Alternative Onshore Pipelines would cross freshwater surface waterbodies. The Alternative Inshore Pipelines would occur in estuarine and marine waters between the MHT line of the shore and Corpus Christi Bay and the MHT line of Mustang Island at the GOM. The Alternative Offshore Pipelines and SPM buoy systems would be in the marine waters of the GOM (Figure 4-2)

Figure 4-2: Alternative Project Study Area



Source: BOEM 2019, TWDB 2019a

4.3.1.1 Onshore

The Alternative Onshore Pipelines would commence at the same location as the Proposed Project. The Alternative Onshore Pipelines would traverse east and southeast through Ingleside, Texas, transitioning to the Alternative Inshore Pipelines at the southwestern shore of Corpus Christi Bay on the mainland. Based on a review of available desktop data, the Alternative Onshore Pipelines are generally within disturbed lands used for agriculture, but would cross ephemeral, intermittent, and perennial waterbodies as described in Section 5: Wetlands and Waters of the U.S and similar to the Proposed Project.

4.3.1.1.1 GROUNDWATER QUALITY

Similar to the Proposed Project, the Alternative Onshore Pipelines would cross the Gulf Coast Aquifer. Specifically, the Gulf Coast Aquifer would underlie the Onshore Pipelines for about 1.7 mi (2.7 km) in Ingleside, Texas. There is one domestic drinking water well currently in use 348 ft (107 m) from the Alternative Onshore Pipelines near MP 19.8; in addition, brackish water wells have been identified within 1,000 ft of the pipeline, but brackish water is not suitable for use as drinking water (TWDB 2019a). Given the proximity to the Proposed Project, groundwater quality along the Alternative Project is expected to be similar.

4.3.1.1.2 SURFACE WATER QUALITY

The Alternative Onshore Pipelines would be located within the San Antonio-Nueces Coastal Basin which lies along the Texas Coastal Plain between the San Antonio and Nueces Rivers, and is described in Section 4.2.2.1.2. Within the Basin, the Onshore Pipelines are located within the North Corpus Christi Bay, Aransas, and Corpus Christi Bay watersheds, which are connected to the GOM; coastal water quality is addressed in Section 4.3.1.2.2, below (USGS 2019).

The Alternative Onshore Pipelines would cross ephemeral, intermittent, and perennial waterbodies similar to the Proposed Project. None of the waterbodies crossed are known to contain contaminated sediments (USEPA 2004).

To comply with Section 303(d) of the CWA, states are required to compile a list of impaired waters that do not meet water quality standards every 2 years. A TMDL, the calculation of the maximum amount of pollutant allowed to enter a waterbody so that it would meet water quality standards, must be developed by states for waterbodies listed as impaired under Section 303(d) of the CWA. The Alternative Onshore Pipelines would not cross designated impaired waterbodies. As described for the Proposed Project, all tidal waterbodies and perennial and freshwater intermittent streams are presumed to support PCR 1, and all perennial waterbodies are presumed to support a high aquatic life used.

4.3.1.2 Inshore

4.3.1.2.1 GROUNDWATER QUALITY

The Alternative Inshore Pipelines are not within the mapped area for the Gulf Coast Aquifer (TWDB 2019b). However, similar to the area surrounding the Proposed Project, groundwater recharged from surface runoff and rain infiltration may occur on barrier islands along the Texas coast, including on Mustang Island (Watson 1998). There are no known drinking water or agriculture wells found within 1,000 ft of the Inshore Pipelines (TWDB 2019a).

4.3.1.2.2 SURFACE WATER QUALITY

Waterbodies crossed by the Alternative Inshore Pipelines include the GIWW and Corpus Christi Bay. General surface water quality and habitat functions in these areas would be similar to those described in Section 4.2.2.2.2 for the Proposed Project area. The primary variables that influence coastal water quality are water temperature, TDS (salinity), suspended solids (turbidity), and nutrients.

In their assessment of the water, sediment, and tissue (fish and shellfish) quality of the Corpus Christi Bay system described above, Ward and Armstrong found that the highest average fecal coliform bacteria occur in Corpus Christi Bay from Corpus Christi Beach to Oso Bay, west of the Alternative Project area; in addition, copper, nickel and zinc are elevated throughout Corpus Christi Bay (1997). Surface sediment in Corpus Christi Bay is dominated by a mixture of fine silt and clay; sand content increases toward the shorelines (Davis 2017).

4.3.1.3 Offshore

While the Alternative Project would be located about 18.9 mi (30.4 km) from the Proposed Project, the water and sediment quality of the GOM is as described for the Proposed Project area and would be similar for the Alternative Project (see Section 4.2.2.3).

4.3.2 Alternative Project Construction Impacts

4.3.2.1 Onshore

Similar to the Proposed Project, impacts on ground and surface water quality from the Alternative Onshore Pipelines could result from in-water construction, inadvertent spills, and hydrostatic testing. Project impacts are described below.

4.3.2.1.1 GROUNDWATER

Impacts on groundwater from construction and operation of the Alternative Onshore Pipelines could result from trenching and construction activities, compaction, and inadvertent spills, and would be similar to those described for the Proposed Project in Section 4.2.3.1.1, above. Given the large extent of the Gulf Coast Aquifer and relatively small construction workspace for the Alternative Onshore Pipelines that overlies the aquifer, impacts would be negligible.

As described in Section 4.3.1.1.1, above, there is one domestic drinking water well currently in use within 1,000 ft of the Alternative Onshore Pipelines; the well is 348 ft (107 m) from the pipelines near MP 19.8.. In addition, brackish water wells have been identified within 1,000 ft of the pipeline (TWDB 2019). At this distance, impacts on the well are not anticipated. However, in the event that a well were damaged or well yield reduced during construction of the Alternative Project, BWTT would work with the affected well owner for well repairs, compensation, and/or provision of an alternative water source.

ACCIDENTAL RELEASES OF FUEL, OIL, AND OTHER CHEMICALS

An inadvertent spill of fuel or hazardous materials during refueling or maintenance of construction equipment could also affect groundwater quality if not cleaned up appropriately. To minimize the risk of potential fuel or hazardous materials spills, a Project-specific SPCC Plan would be implemented during construction. The SPCC Plan would include spill prevention measures as well as cleanup methods to reduce potential impacts should a spill occur.

Due to the developed nature of the southernmost section of the Onshore Pipelines, where they traverse the City of Ingleside, there is a potential to encounter contaminated groundwater during construction. If contaminated groundwater were encountered during construction, work in the area of contamination would be halted until the applicable agencies were notified and the extent of contamination is determined.

4.3.2.1.2 SURFACE WATER

The Alternative Onshore Pipelines would cross ephemeral, intermittent, and perennial waterbodies similar to the Proposed Project and as described in Section 5: Wetlands and Waters of the U.S. Impacts on surface water quality from construction and operation of the Alternative Onshore Pipelines could result from in-water construction, inadvertent spills, and hydrostatic testing. Construction of the pipelines through waterbodies may occur through one of three methods, including open-cut, conventional bore, and HDD. The final method of construction through each waterbody would be determined during detailed engineering of the final pipeline route, if applicable.

In general, impacts on water quality resulting from open-cut pipeline construction at waterbody crossings could include sedimentation and turbidity and introduction or disturbance of pollutants as described in Section 4.2.3.1.2 for the Proposed Project. None of the waterbodies crossed are known to contain contaminated sediments that could be resuspended and transported downstream (USEPA 2004). Where waterbodies are located within construction workspaces, but not crossed by the Alternative Onshore Pipelines, BWTT would install erosion controls, matting, and/or temporary equipment bridges where needed to avoid water quality impacts.

Water quality impacts on waterbodies that would be crossed by trenchless construction methods (conventional bore and HDD) would generally be avoided since the waterbody and its banks would not be disturbed by clearing or trenching, and would be similar to those described in Section 4.2.3.1.2 for the Proposed Project. In the case of any inadvertent return, BWTT would implement its Project-specific HDD Inadvertent Return Contingency Plan (see Volume I) which includes measures to prevent, detect, and mitigate for inadvertent releases of drilling fluid. Overall, impacts would be temporary and minor.

HYDROSTATIC TESTING

Following construction, the Alternative Onshore Pipelines would be hydrostatically tested using water withdrawn from municipal sources similar to the Proposed Project. Discharges would comply with appropriate agency and permit requirements. Impacts from withdrawal and discharge of hydrostatic test water would be similar to those described for the Proposed Project in Section 4.2.3.1.2 and would be temporary and negligible.

ACCIDENTAL RELEASES OF FUEL, OIL, AND OTHER CHEMICALS

Refueling of vehicles and storage of fuel, oil, or other hazardous materials near surface waters could result in accidental spills that could impact water quality by introducing contaminants to surface waters. BWTT would implement a Project-specific SPCC Plan during construction, which would include spill prevention measures and cleanup methods to reduce potential impacts should a spill occur. With adherence to the mitigation measures in these plans, impacts of potential spills on water quality associated with the Alternative Onshore Pipelines would be minimal.

4.3.2.2 Inshore

Impacts on surface water quality from the Alternative Inshore Pipelines could result from in-water construction, hydrostatic testing, and inadvertent spills. Because the Inshore Pipelines do not overlie the Gulf Coast Aquifer and drinking water supply wells are not within 1,000 ft of the Alternative Inshore Pipelines, impacts on groundwater quality are not anticipated. Project impacts on surface water quality are described below.

Where the Alternative Inshore Pipelines would be installed via HDD at the crossing of the GIWW and the approach to Mustang Island, impacts would be similar to those described for the Proposed Project (see Section 4.2.3.2). However, the Alternative Inshore Pipelines would be installed using aquatic trenching methods for about 5.8 mi (9.3 km) across Corpus Christi Bay. Construction methods for the Alternative Project are described in Appendix A. Trenching across Corpus Christi Bay would increase TSS concentrations in the immediate vicinity. The increased turbidity would be localized and temporary; after completion of construction, turbidity would return to pre-Project levels as the trench is filled in and suspended sediments settle. Sediment storage barges would be used to lessen the volume of sediment exposed for resuspension, however, because of the shallow depths in Corpus Christi Bay (averaging 11 ft as described in Section 6: Aquatic Environment), the initial suspension of sediments during trenching would cause a significant but temporary water quality impact in the vicinity of the pipeline. BWTT conducted modeling to estimate the impact on total suspended solid concentrations in the water column during and after trenching in the GOM for the Proposed Project (see Appendix D). Since the hydrologic conditions in Corpus Christi Bay are different than in the GOM, impacts regarding the duration and distance of elevated TSS levels would not be identical to those modeled for the Proposed Project; however, impacts would be temporary and would subside following active construction. Because sediments in Corpus Christi Bay are dominated by fine sediments (silt and clay), rather than sand, sediments are expected to remain in suspension longer than in sandy areas. The trench would be excavated to a depth of 8 ft in Corpus Christi Bay, to allow for 5 ft of cover; the TSS model conducted for the Proposed Project assumes 3 ft of pipeline cover. In addition to turbidity impacts, trenching through Corpus Christi

Bay could result in the suspension of contaminants, if present in sediments crossed by the Alternative Project. Further, wind-wave resuspension is the dominant cause of TSS levels in Corpus Christi Bay (Reisinger 2015), and may prolong the period that sediments remain suspended following disturbance during Project construction.

Land-based segments of the Alternative Inshore Pipelines and the Harbor Island Booster Station would be installed using conventional construction equipment and methods. Similar to the Proposed Project, BWTT would install erosion and sediment controls to prevent sedimentation of waterbodies near construction workspaces, similar to the Proposed Project, thereby minimizing potential impacts on waterbodies near land-based construction.

HYDROSTATIC TESTING

Following construction, the Alternative Inshore Pipelines would be hydrostatically tested water from municipal sources similar to the Proposed Inshore Pipelines. The discharge of hydrostatic test water could transport suspended sediment into nearby surface waters. Impacts from withdrawal and discharge of hydrostatic test water would be similar to those described for the Proposed Project in Section 4.2.3.2 and would be negligible.

ACCIDENTAL RELEASES OF FUEL, OIL, AND OTHER CHEMICALS

Refueling of vehicles and storage of fuel, oil, or other hazardous materials near surface waters could result in accidental spills that could impact water quality by introducing contaminants to surface waters. Since the Alternative Inshore Pipelines would be installed via trenching in Corpus Christi Bay, the potential for a spill that directly affects surface water quality is greater than for the Proposed Inshore Pipelines, which would be installed using land-based construction equipment. Similar to the Proposed Action, BWTT would implement a Project-specific SPCC Plan during construction of the Alternative Project, which would include spill prevention measures and cleanup methods to reduce potential impacts should a spill occur. With adherence to the mitigation measures in these plans, impacts of potential spills associated with the Alternative Inshore Pipelines would be minimal.

4.3.2.3 Offshore

Short-term, minor, adverse impacts on the water quality would result from bottom sediment disturbance activities and associated increases in turbidity during construction of the Alternative Project. These impacts would be localized, reversible, and limited to the time of construction. After construction is complete, turbidity is expected to return to pre-construction 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 Alternative Project.

The Alternative Offshore Pipelines would be installed by HDD for the first approximate 4,950 ft (1,508.3 m) from shore; the remaining 16.2 mi (26.1 km) of the pipelines would be installed using a submersible pipeline jetting sled operated from an anchored pipe-laying barge. Construction methods and impacts would be similar to those described in Section 4.2.3.3 for the Proposed Project. However, where the Alternative Offshore Pipelines would cross a shipping fairway (see Figure 4-2), a greater depth of cover (10 ft [3 m]) and placement of rip-rap over the pipeline trench is required; therefore, the volume of sediment disturbed for trenching along that 3.1 mi (5.0 km) of pipe would be greater, and localized construction would require more time, than elsewhere along the Alternative Offshore Pipelines.

Similarly, installation of the Alternative SPM buoy systems would include pile-driving and the installation of anchor chains that would be attached to the piles. Installation of the seafloor components of the SPM buoy systems could result in a temporary impact on water quality due to suspension of seafloor sediments; however, similar to pipeline construction, impacts would be temporary and minor since water turbidity would return to background levels following construction. Overall, potential impacts on water quality are anticipated to be temporary and minor during the installation and commissioning of the Alternative Offshore Pipelines and SPM buoy systems.

4.3.2.3.1 HYDROSTATIC TESTING

The Alternative Offshore Pipelines would be hydrostatically tested to ensure their integrity before being placed into service. Hydrostatic testing procedures would be similar to those described for the Proposed Project and are further discussed in the draft hydrostatic testing permit applications located in Volume I.

4.3.2.3.2 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 from a spill during construction of the Alternative Project would be similar to those described for the Proposed Project, and could be temporary the spill is minor, or adverse and significant if the spill is major (see Section 4.2.3.3). Alternative Project Operation Impacts

4.3.2.4 Onshore

Similar to the Proposed Project, normal operation of the Alternative Onshore Pipelines would not result in impacts on groundwater or surface water quality. Maintenance during the life of the Alternative Project would include vegetation maintenance along the ROW to ensure visibility for leak inspections and to ensure that vegetation does not compromise pipeline integrity; however, no earth disturbance would occur, and vegetation maintenance is not planned within waterbodies.

4.3.2.5 Inshore

Similar to the Proposed Project, normal operation of the Alternative Inshore Pipelines would not result in impacts on groundwater or surface water quality. Maintenance during the life of the Alternative Project would include vegetation maintenance along the ROW where it is located on land to ensure visibility for leak inspections and to ensure that vegetation does not compromise pipeline integrity; however, no earth disturbance would occur and maintenance activities would not be planned within waterbodies. Operation of the Alternative Booster Station could impact surface water quality in the event of a spill or leak of hazardous materials. However, BWTT would implement an SPCC Plan, as described for the Proposed Project, which would include measures for the prevention of hazardous materials releases, and for the cleanup of a spill should it occur. Therefore, water quality impacts during operation are not anticipated.

4.3.2.6 Offshore

Water quality impacts during operation of the Alternative Project could result from anchor chain sweep during operation of the SPM buoy systems, discharges and intakes of GOM water by the VLCCs, and inadvertent releases of oil or hazardous materials, as discussed for the Proposed Project. In addition, support vessels would regularly transit from shore to the SPM buoy systems and between the Alternative SPM buoy systems and incoming VLCCs and a minimum of two supply tugs would be onsite during mooring operations. While the Alternative Project would be located about 18.9 mi (30.4 km) from the Proposed Project, potential water quality impacts on the GOM would be similar to those described in Section 4.2.4.3.

4.3.3 Alternative Project Decommissioning Impacts

4.3.3.1 Onshore/Inshore

The decommissioning procedures and impacts associated with the Alternative Onshore and Inshore Pipelines would be consistent with those impacts described for the Proposed Project, as they would be abandoned in place.

4.3.3.2 Offshore

The decommissioning procedures and impacts associated with the Alternative Offshore Pipelines would be consistent with those impacts described for the Proposed Project, with offshore removal of the pipelines beginning about 4,950.0 ft (1,1,508.3 m) from the shore. However, removal of the Alternative Offshore Pipelines across shipping fairways (see Figure 4-2) would have a greater localized impact than decommissioning the Proposed Project.

The Alternative Offshore Pipelines would be installed with a greater depth of cover (10 ft [3 m]) and using rip-rap for the 3.1-mi (5.0-km) crossing length; therefore, the volume of sediment disturbed for trenching and pipeline removal would be greater, and decommissioning would require more time, than at other locations along the Proposed Alternative.

4.3.4 Summary of Alternative Project Impacts

Temporary, minor impacts on groundwater quality and flow could occur during construction for the Alternative Onshore Pipelines; however, water levels would likely re-establish equilibrium and TDS levels would subside shortly after construction. The Gulf Coast Aquifer would underlie the Alternative Onshore Pipelines for about for about 1.7 mi (2.7 km) in Ingleside, Texas. One drinking water supply well is located within 1,000 ft of the Alternative Project (348 ft [107 m] from the Alternative Onshore Pipelines near MP 19.8). At this distance, impacts on the well are not anticipated; however, in the event that a well were damaged or well yield reduced during construction of the Alternative Project, BWTT would work with the affected well owner for well repairs, compensation, and/or provision of an alternative water source. Normal operation of the Alternative Onshore Pipelines would not result in impacts on groundwater quality. Inadvertent releases of hazardous materials could occur during all phases of Alternative Project construction, operations, and decommissioning and affect groundwater quality if not cleaned up appropriately. To minimize the risk of potential fuel or hazardous materials spills, a Project-specific SPCC Plan would be implemented. Groundwater impacts are not anticipated for the Alternative Inshore and Offshore Pipelines or SPM buoy systems.

Construction of the Alternative Onshore and Inshore Pipelines could result in potential increases in downstream turbidity and sedimentation during stream crossings. The concentration of TSS would decrease rapidly after the completion of in-water work, which would likely last a day or two at each stream. The Alternative Inshore Pipelines would be installed via aquatic trenching methods across Corpus Christi Bay for about 5.8 mi (9.3 km), resulting in an increase in TSS concentrations in the immediate vicinity of construction. The increased turbidity would be temporary; after completion of construction, turbidity would return to pre-Project levels as the trench is filled in and suspended sediments settle. However, because of the shallow depth of Corpus Christi Bay (averaging 11 ft), impacts would be significant. The maximum distance at which TSS concentrations are expected to return to ambient levels in Corpus Christi Bay is expected to be greater than the 2.1 mi (3.5 km) estimated for the Proposed Project Offshore Pipelines. Trenching in Corpus Christi Bay could also result in the suspension of contaminated sediments, if crossed by the Alternative Inshore Pipelines. Where HDD construction would be used to avoid direct waterbody impacts, inadvertent returns of drilling fluids could also result in temporary turbidity impacts during construction. HDD construction would likely require up to 9 weeks at each location and potential impacts would subside immediately following construction or after implementation of measures to mitigate for inadvertent releases are implemented.

Installation of the Alternative Offshore Pipelines would result in turbidity impacts along the 16.2 mi (26.1 km) that would be installed via trenching. Impacts would be temporary and minor in any one location. Where the Alternative Offshore Pipelines would cross a shipping fairway, a greater depth of cover and placement of rip-rap over the pipeline trench is required; therefore, the volume of sediment disturbed for trenching would be greater at that location and construction would require more time than along the remainder of the Alternative Offshore Pipelines. Along the 4,950 ft (1,508.3 m) that Alternative Offshore Pipelines that would be installed via HDD, temporary, minor increases in turbidity could occur in the event of an inadvertent return of drilling fluids. Installation of the seafloor components of the Alternative SPM buoy systems (within a 700 sq ft [0.02 ac] area) may result in temporary, minor turbidity increases due to suspension of seafloor sediments in the immediate vicinity; however, impacts would subside shortly following the estimated 16-week-long installation period.

Normal operation of the Alternative Onshore, Inshore, and Offshore Pipelines would not result in impacts on surface water quality. During operation of the Alternative SPM buoy systems, anchor chain sweep would result in negligible turbidity impacts within the seafloor footprint of the Alternative SPM buoy systems. In addition, vessel calls at the

Alternative SPM buoy systems would result in the maximum estimated withdrawal of 1.04 billion gallons of seawater per year, as well as discharges of water from sanitary sewer treated effluent; non-contact generator cooling water; ballast water; firewater deluge test bypass water; and IG scrubber water and deck seal. Given the dilution capacity of the GOM, which would rapidly dilute waters with altered qualities (temperature, DO, or pH), as well adherence to regulatory standards for discharges, impacts from discharges would be permanent, but negligible. The volume of water intakes by VLCCs for the Alternative Project represent only a small fraction of the water available in the Project area.

Impacts from decommissioning the Alternative Project would be similar to those described for construction, including temporary, minor increases in turbidity from removing Project components. Removal of the Alternative Offshore Pipelines across a shipping fairway would disturb a greater volume of sediment and require additional time for decommissioning at a single location than elsewhere along the Alternative Offshore Pipelines, similar to construction. Inadvertent releases of hazardous materials could occur during all phases of Alternative Project construction, operations, and decommissioning. The degree of impact is directly proportional to the amount and duration of a spill. In the event of a worst-case scenario operational spill, impacts could be significant in the immediate vicinity of the spill, but would be temporary as BWTT would implement its Tactical Response Plan and oil would weather.

4.4 Summary of Impacts

A summary of impacts for the both the Proposed Project and Alternative Project is presented in Table 4-4 below. Temporary, minor impacts on groundwater quality and flow could occur during construction for the Proposed and Alternative Onshore Pipelines; however, water levels will likely re-establish equilibrium and TDS levels will subside shortly after construction. The Onshore Pipelines and Alternative Onshore Pipelines will both cross the Gulf Coast Aquifer; however, the Onshore Pipelines will cross it for a greater distance (about 6.0 mi [9.7 km]) than the Alternative Onshore Pipelines (about 1.7 mi [2.7 km]). However, given the limited potential for groundwater impacts, impacts from both the Proposed and Alternative Projects on the Gulf Coast Aquifer will be temporary and minor. No groundwater wells were identified within 1,000 ft of the Proposed Project; however, one drinking water supply well is located about 348 ft (107 m) from the Alternative Onshore Pipelines; therefore, the potential for impacts on water supply wells is greater under the Alternative Project. In the event that a well were damaged or well yield reduced during construction of the Alternative Project, BWTT would work with the affected well owner for well repairs, compensation, and/or provision of an alternative water source. Normal operation of the Proposed and Alternative Onshore Pipelines will not result in impacts on groundwater water quality. Inadvertent releases of hazardous materials could occur during all phases of Project construction, operations, and decommissioning and affect groundwater quality if not cleaned up appropriately. To minimize the risk of potential fuel or hazardous materials spills, a Project-specific SPCC Plan will be implemented. Groundwater impacts are not anticipated for the Proposed and Alternative Inshore and Offshore Pipelines or SPM buoy systems.

Construction of the Proposed and Alternative Onshore and Inshore Pipelines could result in potential increases in downstream turbidity and sedimentation during stream crossings. The concentration of TSS will decrease rapidly after the completion of in-water work, which will likely last a day or two at each stream. The Proposed Inshore Pipelines will cross major waterbodies using HDD construction, thereby avoiding direct impacts from trenching. Although inadvertent returns of drilling fluid could result in temporary increases in turbidity, these impacts would subside immediately following construction, or after implementation of measures to mitigate for inadvertent releases are implemented. The Alternative Inshore Pipelines would be installed via aquatic trenching methods across Corpus Christi Bay, resulting in a temporary increase in TSS concentrations in the immediate vicinity of construction along about 5.8 mi (9.3 km). After completion of construction, turbidity will return to pre-Project levels as the trench is filled in and suspended sediments settle. However, because of the shallow depth of Corpus Christi Bay (averaging 11 ft), impacts will be significant. The maximum distance at which TSS concentrations are expected to return to ambient levels in Corpus Christi Bay is expected to be greater than the 2.1 mi (3.5 km) estimated for the Proposed Project Offshore Pipelines. Trenching in Corpus Christi Bay could also result in the suspension of contaminated sediments, if crossed by the Alternative Inshore Pipelines. Because of the trenching through Corpus Christi Bay, which could result in significant impacts from turbidity and sedimentation, as well as potential impacts from contaminated sediments, impacts of the Alternative Inshore Pipelines would be greater than those of the Proposed Inshore Pipelines.

Installation of the Proposed Offshore Pipelines will result in temporary turbidity impacts along the 26.4 mi (42.5 km) that will be installed via trenching. Installation of the Alternative Offshore Pipelines would result in similar turbidity impacts along a shorter distance of 16.2 mi (26.1 km). Since impacts at any one location along the pipelines will be temporary, localized, and minor, the greater distance and associated impacts of the Proposed Offshore Pipelines will not result in a significant impact on water quality in the GOM. However, where the Alternative Offshore Pipelines would cross 3.1 mi (5.0 km) of shipping fairways, a greater depth of cover (10 ft [3 m] rather than 3 ft [0.9 m]) and placement of rip-rap over the pipeline trench is required; therefore, the volume of sediment disturbed for trenching along that 3.1 mi (5.0 km) of pipe would be greater, and localized construction would require more time than elsewhere along the Proposed Alternative. Along the segments that the Proposed and Alternative Offshore Pipelines that will be installed via HDD, temporary, minor increases in turbidity could occur in the event of an inadvertent return of drilling fluids. Installation of the seafloor components of the Proposed and Alternative SPM buoy systems may result in temporary, minor turbidity increases due to suspension of seafloor sediments in the immediate vicinity; however, impacts will be similar and will subside shortly following the estimated 16-week-long installation period.

Normal operation of the Proposed and Alternative Onshore and Inshore Pipelines will not result in impacts on surface water quality. During operation of the SPM buoy systems impacts will be similar for the Proposed and Alternative Projects, and anchor chain sweep will result in negligible turbidity impacts within the seafloor footprint of each SPM buoy system. In addition, vessel calls at the SPM buoy systems will result in the maximum estimated withdrawal of 1.04 billion gallons of seawater per year, as well as discharges of water from sanitary sewer treated effluent; non-contact generator cooling water; ballast water; firewater deluge test bypass water; and IG scrubber water and deck seal. Given the dilution capacity of the GOM, which will rapidly dilute waters with altered qualities (temperature, DO, or pH), as well adherence to regulatory standards for discharges, impacts from discharges would be permanent, but negligible. The volume of water intakes by VLCCs represent only a small fraction of the water available in the Project area and discharges are not expected to result in significant impacts.

Impacts from decommissioning the Proposed and Alternative Projects will be similar to those described for construction, including temporary, minor increases in turbidity from removing Offshore Components. Removal of the Alternative Offshore Pipelines across a shipping fairway would disturb a greater volume of sediment and require additional time for decommissioning at a single location than elsewhere along the Alternative or Proposed Offshore Pipelines, similar to construction. Inadvertent releases of hazardous materials could occur during all phases of Proposed and Alternative Project construction, operations, and decommissioning. The degree of impact is directly proportional to the amount and duration of a spill. In the event of a worst-case scenario operational spill, impacts could be significant in the immediate vicinity of the spill, but would be temporary as BWTT would implement its Tactical Response Plan and oil would weather.

In summary, The Alternative Project has a greater potential for impacts on groundwater supply wells, since one drinking water well was identified within 348 ft (107 m) of the Alternative Onshore Pipelines. Greater impacts on surface water quality would occur under the Alternative Project due to increased turbidity and potential suspension of contaminated sediments, if present, during trenching of about 5.8 mi (9.3 km) through Corpus Christi Bay. The Proposed Offshore Pipelines may result in slightly greater impacts on water quality than the Alternative Offshore Pipelines based on the 10.2 mi (16.4 km) more of aquatic trenching; however, impacts at any one location along the Proposed Offshore Pipelines will be temporary, localized, and minor. However, elevated TSS levels caused by the

Alternative Offshore Pipelines, for the 3.1 mi (5.0 km) where they cross the shipping fairways, would likely persist longer than any other areas along the Proposed or Alternative Offshore Pipelines. For these reasons, the Proposed Project is the Least Environmentally Damaging Practicable Alternative (LEDPA) and is considered to be environmentally preferable to the Alternative Project.

Table 4-4: Summary of Impacts

		Construction	Operation	Decommissioning
Proposed Project	**Onshore**	Temporary, minor impact on groundwater quality and flow; Potential increase in downstream turbidity and sedimentation during construction in streams, potential for inadvertent returns of HDD fluids and inadvertent releases of hazardous materials would result in overall temporary, minor impacts on surface water quality.	No impacts on groundwater or surface water quality during normal pipeline operations.	No decommissioning activities are proposed in onshore waterbodies.
	Inshore	No impacts on groundwater quality are anticipated. Potential increase in downstream turbidity and sedimentation during construction in streams, potential for inadvertent returns of HDD fluids and inadvertent releases of hazardous materials would result in overall temporary, minor impacts on surface water quality.	No impacts on groundwater or surface water quality during normal pipeline operations. Potential for inadvertent releases during operation of the Harbor Island Booster Station; however, with implementation of BWTT's SPCC Plan, impacts are not anticipated.	Potential for inadvertent releases due to operation of construction equipment. Minor turbidity increase from equipment and sediment disturbance during removal of the Harbor Island Booster Station.
	Offshore	Short-term, minor increase in turbidity during 26.4 mi of trenched pipeline and SPM buoy systems installation; potential for inadvertent releases (Impacts could be minor if the spill is small, or adverse and significant if the spill is major).	Some risk of operational oil spill; Negligible turbidity impacts from anchor chain sweep; permanent, negligible impacts resulting from vessel operations, including associated intakes and discharges of surface water.	Temporary and minor to negligible increased turbidity due to operation of construction equipment and vessels while removing components. Potential for inadvertent releases due to operation of construction equipment/vessels.

Table 4-4: Summary of Impacts

		Construction	Operation	Decommissioning
Alternative Project	**Onshore**	Temporary, minor impact on groundwater quality and flow; potential impacts on one drinking water well within 348 ft (107 m) of the Alternative Onshore Pipelines would be minimized; Potential increase in downstream turbidity and sedimentation during construction in streams, potential for inadvertent returns of HDD fluids and inadvertent releases of hazardous materials would result in overall temporary, minor impacts on surface water quality.	No impacts on groundwater or surface water quality during normal pipeline operations.	No decommissioning activities are proposed in onshore waterbodies.
	Inshore	No impacts on groundwater quality are anticipated. Potential sediment and erosion runoff from construction; increased potential for inadvertent returns of HDD fluids and inadvertent releases of hazardous materials would result in temporary, minor impacts on surface water quality. *Significant, temporary impacts due to trenching in Corpus Christi Bay as well as greater potential for inadvertent releases from equipment in the bay.	Potential for inadvertent releases during operation of the Booster Station.	Potential for inadvertent releases due to operation of construction equipment. Minor turbidity increase from equipment and sediment disturbance during removal of the Booster Station.
	Offshore	Minor increase in turbidity during 16.2 mi (26.1 km) of trenched pipeline and SPM buoy systems installation; Potential for inadvertent releases. *Locally greater turbidity impacts where deeper trenching is required across the navigational fairway.	Some risk of operational oil spill; Negligible turbidity impacts from anchor chain sweep; permanent, negligible impacts resulting from vessel operations, including associated intakes and discharges of surface water.	Temporary and minor to negligible increased turbidity due to operation of construction equipment and vessels while removing components. Potential for inadvertent releases due to operation of construction equipment/vessels.

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

4.5 Mitigation of Proposed Project Impacts

The LEDPA choice in regard to water quality impacts is the Proposed Project. Therefore, mitigation measures for the anticipated water quality impacts from only the Proposed Project are discussed in this section. Appendix V summarizes mitigation measures and Best Management Practices that BWTT will implement for the Project. In addition, impacts and mitigation for crossing WOUS, including surface waterbodies and wetlands, are further described in Section 5: Wetlands and Waters of the U.S.

4.5.1 Groundwater

BWTT will adhere to the measures in its Project-specific SPCC Plan to minimize impacts to groundwater resulting from inadvertent spills and releases of fuel or hazardous materials. Further, if contaminated groundwater were encountered during construction or excavation activities, work in the area will be halted and appropriate regulatory agencies will be notified to determine appropriate cleanup protocols.

4.5.2 Surface Water

BWTT will adhere to the USACE permit conditions, as applicable for the crossing of all jurisdictional waterbodies, including water quality protections under Section 401 of the CWA such as the appropriate use of soil erosion and sediment controls. Further, BWTT is planning to cross many waterbodies via conventional bore and HDD construction methods; these methods will avoid waterbody disturbance and therefore minimize water quality impacts. During construction, BWTT will adhere to the measures in its HDD Inadvertent Return Contingency Plan and Project-specific SPCC Plan to minimize potential surface water quality impacts. The discharge of hydrostatic test water will be conducted in compliance with RRC and USEPA NPDES requirements. During operation, BWTT will adhere to the measures in its Project-specific SPCC Plan for operation of the Harbor Island Booster Station to minimize the potential for inadvertent releases of hazardous materials to surface waters.

Spill prevention measures include leak detection measures that would allow for automatic pipeline shutdown within 30 seconds; in addition, the pipe will be built to American Petroleum Institute standards (including overfill protection standards) to minimize the potential for a release. A Spill Response Plan will be in place to respond to the potential spills in a timely and effective manner; in addition, the measures in BWTT's Tactical Response Plan will be implemented in the event of a spill. The Tactical Response Plan includes maps detailing the location and type of equipment to be deployed in response to a release, and identifies sensitive resources for protection. Equipment used would include boom to contain oil and skimmers to remove oil from the environment.

All Project-related activities during construction, operation, and decommissioning will comply with federal regulations to control the discharge of operational wastes such as ballast water, trash and debris, and sanitary and domestic waste that will 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 from anticipated construction, operation, and decommissioning activities are considered negligible to minor, no mitigation measures, other than those noted above, are proposed.

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