U.S. DEPARTMENT OF ENERGY

Strategic Petroleum Reserve
Project Management Office
New Orleans, Louisiana

Site Environmental Report For Calendar Year 2019

Cover

Juvenile White Ibis (Eudocimus albus)
By: Renee' Hebert, Big Hill

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STRATEGIC PETROLEUM RESERVE

SITE ENVIRONMENTAL REPORT

FOR

CALENDAR YEAR 2019

Document No. 0395

Prepared for the U. S. Department of Energy
Strategic Petroleum Reserve Project Management Office
under Contract No. DE-FE0011020

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QUESTIONNAIRE/READER COMMENT FORM

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Environmental Department, EF-20
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Subject Matter Expert (SME): _____ Date: _____

SME's Response: _____

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Abbreviations and Acronyms	
AFFF	Aqueous Film Forming Foam
ANAB	ANSI-ASQ National Accreditation Board
ANSI	American National Standards Institute
ASER	Annual Site Environmental Report
ASQ	American Society for Quality
bbl	Barrel (1 bbl = 42 gallons)
BDL	Below Detection Limit
bls	Below Land Surface
^{o}C	Degrees Celsius
CAA	Clean Air Act
CAP	Corrective Action Plan
CESQG	Conditionally Exempt Small QuantityGenerator
CLR	Calculated Leak Rate
CO	Carbon Monoxide
COE	United States Army Corps of Engineers
CWA	Clean Water Act
CY	Calendar Year
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
DOE	United States Department of Energy
E&P	Exploration and Production
EAC	Environmental Advisory Committee
EMP	Environmental Monitoring Plan
EMS	Environmental Management System
EO	Executive Order
EPA	Environmental Protection Agency
EPCA	Energy Policy and Conservation Act
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Endangered Species Act
ES&H	Environmental Safety and Health
FFPO	Fluor Federal Petroleum Operations
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
F&WS	Fish and Wildlife Service
GALCOE	U.S. Army Corps of Engineers, Galveston District
GHG	Greenhouse gas
GIWW	Gulf Coast Intracoastal Waterway
GLO	General Land Office
ISM	Integrated Safety Management System
ISO	International Organization for Standardization
LA	Louisiana
LDEQ	Louisiana Department of Environmental Quality
LDNR	Louisiana Department of Natural Resources
LDWF	Louisiana Department of Wildlife and Fisheries

Abbreviations and Acronyms	
LPDES	Louisiana Pollutant Discharge Elimination System
MCL	Maximum Contaminant Levels
MDEQ	Mississippi Department of Environmental Quality
MDLR	Minimum Detectable Leak Rate
mmb	Million Barrels
M&O	Management and Operations
msl	Mean Sea Level
MSGP	Multi-Sector General Permit
MW	Monitoring well
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NIMS	National Incident Management System
NO	New Orleans
NODCOE	U.S. Army Corps of Engineers, New Orleans District
NOV	Notice of violation
NOx	Nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
OCC	Operations Control Center
OFI	Opportunities for Improvement
O&G	Oil and Grease
OPA	Oil Pollution Act of 1990
OSPRA	Oil Spill Prevention and Response Act
OVA	Organic Vapor Analyzer
PCB	Polychlorinated Biphenyl
pH	Negative Logarithm of the Hydrogen Ion Concentration
PM_{10}	Particulate Matter (less than 10 microns)
ppt	Parts per Thousand
PREP	Preparedness for Response Exercise Program
PW	Periphery Well
QA	Quality Assurance
QC	Quality Control
QPL	Qualified Products List
RRC	Railroad Commission of Texas
RWIS	Raw Water Intake Structure
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SOC	Security Operations Center
SPCC	Spill Prevention Control and Countermeasures
SPR	Strategic Petroleum Reserve
SPRPMO	Strategic Petroleum Reserve Project Management Office
SSP	Site Sustainability Plan
SWPPP	Storm Water Pollution Prevention Plan

Abbreviations and Acronyms	
TCEQ	Texas Commission on Environmental Quality
TGLO	Texas General Land Office
TOC	Total Organic Carbon
TPWD	Texas Parks and Wildlife Department
TRI	Toxic Chemical Release Inventory
TSCA	Toxic Substance Control Act
TX	Texas
UIC	Underground Injection Control
UNO	University of New Orleans
VOC	Volatile Organic Compound
VSQG	Very Small Quantity Generator
WAD	Work Authorization Directive

Executive Summary

The DOE SPR Project Management Office (SPRPMO) Environmental Policy requires the SPR to operate in an environmentally responsible manner while conducting activities to ensure the mission of providing crude oil storage and maintaining readiness to distribute it in the event of a significant disruption of energy supply.

The M&O Contractor is contractually bound to create, execute, and sustain an environmental program that protects the environment and endeavors to meet sustainability goals. The M&O Contractor provides environmental stewardship to foster practices that promote energy and resource conservation, community outreach, pollution prevention, waste minimization, and wildlife habitat preservation.

The purpose of the DOE SPR Annual Site Environmental Report (ASER) is to characterize site environmental management performance, confirm compliance with environmental standards and requirements, and highlight significant programs and efforts performed by the M&O Contractor, Fluor Federal Petroleum Operations (FFPO). The ASER serves the public by summarizing monitoring data collected to assess SPR impacts to the environment.

The ASER provides a synopsis of non-radiological monitoring and regulatory compliance data. It also affirms that the SPR has been operating within acceptable regulatory limits and illustrates the success of SPR efforts toward continual environmental improvement.

During the calendar year 2019, the M&O Contractor coordinated activities with DOE, contractors, and regulatory agencies to ensure compliance with federal, state, and local requirements along with meeting established environmental and sustainability goals. The narrative of this document illustrates the performance of these achievements.

The Questionnaire/Reader Comment Form located in the front of this document may be utilized to submit questions or comments to the originator.

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1 Introduction

This Strategic Petroleum Reserve (SPR) Annual Site Environmental Report (ASER) for the calendar year 2019 was prepared to inform the DOE, environmental agencies, and the public about environmental management performance and data gathered at or near SPR sites. It also summarizes compliance with environmental standards and requirements and highlights significant programs and efforts.

1.1 Background Information

The Energy Policy and Conservation Act (EPCA) established the SPR in 1975. The goal of the EPCA is to ensure that the U.S. has sufficient petroleum reserves to mitigate the effects of a significant oil supply interruption. The mission of the SPR is to maintain a constant state of operational readiness to draw down the reserve and supply oil to the country in an emergency as directed by the President of the U.S. The Secretary of Energy also has the authority to acquire oil to fill the reserve or exchange current holdings to alter the mix of oil, to test the SPR's capabilities through test sales or to "loan" oil to refineries when there is a temporary oil supply disruption. Also, starting in 2017, the SPR has been releasing crude oil to the marketplace as required by the Bipartisan Budget Act (Sections 403 and 404) and the 21st Century Cures Act.

SPR MISSION

The mission is to maintain a constant state of operational readiness to draw down the reserve and supply oil to the country in an emergency.

The DOE Office of Deputy Assistant Secretary for the Petroleum Reserves has overall programmatic responsibility for establishing the SPR objectives. The SPRPMO is responsible for implementing these goals and objectives, including articulating an environmental policy (included as Appendix B) that is responsive to DOE requirements. The Management and Operating (M&O) contractor applies this policy to SPR operations.

The SPR stores emergency crude oil supplies in salt caverns. The caverns were created through the process of solution mining deep within the massive salt deposits that underlie most of the Texas and Louisiana coastline. The utilization of the caverns to store crude oil avoids hazards associated with aboveground storage, offers security, and is an economic means of storage.

The U.S. Government selected the Gulf Coast as the location for the SPR due to its large concentration of underground salt domes, and its large number of refineries and crude oil distribution capabilities. These attributes provide the flexibility needed to respond to a wide range of supply disruptions.

1.2 Locations, Facilities, and Operations

The SPR consists of four Gulf Coast underground salt dome oil storage facilities (Bryan Mound, Big Hill, West Hackberry, and Bayou Choctaw), a project management facility in New Orleans and the Stennis Warehouse facility. Figure 1-1 illustrates the SPR locations. DOE leased the St. James Terminal (located southeast of Bayou Choctaw) to Shell Pipeline in January 1997 and subsequently to ExxonMobil in January 2020. Although the St. James Marine Terminal is not an active SPR storage facility, it continues as SPR property, and this report contains a descriptive narrative about it where applicable. Table 1-1 summarizes information about the four active storage facilities.

Figure 1-1 SPR Locations

Table 1-1 SPR Storage Facilities

	City, State	No. of Caverns	Crude Oil Storage Inventory*
Bayou Choctaw	Plaquemine, LA	6	70.8 million barrels
Big Hill	Winnie, TX	14	143.8 million barrels
Bryan Mound	Freeport, TX	20	230.3 million barrels
West Hackberry	Hackberry, LA	22	189.8 million barrels

*As of December 31, 2019

1.2.1 Bayou Choctaw

Iberville Parish, Louisiana serves as the location of the Bayou Choctaw site. This storage facility occupies 356 acres above the Bayou Choctaw salt dome, including off-site satellite brine disposal wells and associated brine piping.

The U.S. Government selected the Bayou Choctaw salt dome as a storage site early in the SPR program because of the potential to convert its existing brine caverns to oil storage, and its proximity to commercial marine and pipeline crude oil distribution facilities. Development of the site was initiated in 1977 and completed in 1991. One additional cavern was acquired, modified, and completed in 2012.

The area surrounding the site is a freshwater swamp, which includes substantial stands of bottomland hardwoods with interconnecting waterways. Small canals and bayous flow through the site area and join larger bodies of water off-site. The site is normally dry and protected from spring flooding by the site's flood control levees and pumps. The forest and swamp provide habitat for a diverse wildlife population, including many kinds of birds, mammals, and reptiles including the American alligator.

1.2.2 Big Hill

Jefferson County, Texas serves as the location of the Big Hill site that covers approximately 270 acres above the Big Hill salt dome. Off-site facilities include an intake structure that provides raw (brackish) water for cavern development and fluid movements, a brine line for brine disposal and a crude oil pipeline for receiving and distributing oil in commerce.

Big Hill is the most recently constructed SPR storage facility and the proximity of it to commercial marine and pipeline crude oil distribution facilities

is advantageous to the function of the SPR mission. Development of the site was initiated in 1982 and completed in 1991.

Most of the site is upland habitat, consisting of tall grass with a few 150-year-old live oak trees. The nearby ponds and marsh provide excellent habitat for a diverse population of wildlife including the American alligator, over-wintering waterfowl, and several species of birds and mammals.

1.2.3 Bryan Mound

The Bryan Mound site is in Brazoria County, Texas, and occupies 500 acres above the Bryan Mound salt dome. Off-site facilities include an intake structure that provides raw water for cavern development and fluid movements, brine pipeline for brine disposal and crude oil pipelines for receiving and distributing oil in commerce.

The U.S. Government selected Bryan Mound as a storage site early in the SPR program because of the potential to convert its existing brine caverns to oil storage. Development of the site was initiated in 1977 and completed in 1987.

The marsh and prairie areas surrounding Bryan Mound are typical of those found throughout this region of the Texas Gulf Coast. Brackish marshland dominates the low-lying portions of the site. The coastal prairie has abundant tall grass forming cover and feeding grounds for wildlife. Marshes and tidal pools provide diverse habitats for a variety of birds, aquatic life, and mammals.

1.2.4 West Hackberry

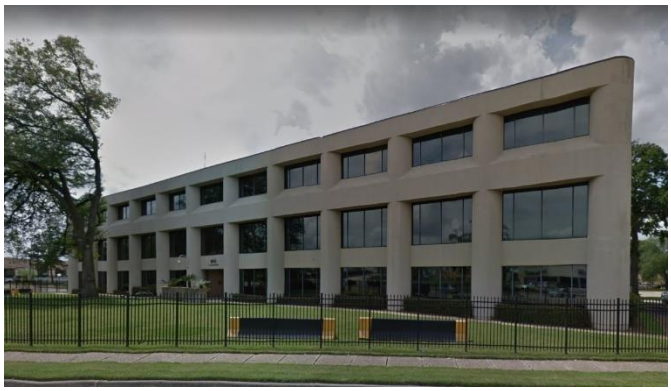
Located in Cameron Parish, Louisiana, the West Hackberry site occupies 565 acres over the West Hackberry salt dome. Off-site facilities include an intake structure that provides raw (brackish) water for cavern development and fluid movements, brine disposal wells with associated brine piping and crude oil pipelines for receiving and distributing oil in commerce.

The U.S. Government selected West Hackberry as a storage site due to the potential to readily convert its existing brine caverns to oil storage. Development of the site was initiated in 1977 and completed in 1988.

Numerous canals and natural waterways bisect the area. The surrounding area consists of marshland with natural ridges that support grass, trees, and affect water flow through the marshes. These marshlands provide habitat for a variety of wetland and wildlife species.

1.2.5 New Orleans

The New Orleans, Louisiana metropolitan area is the location for the SPRPMO. Located in Jefferson Parish, the SPRPMO exists in three adjacent leased office buildings with a nearby leased warehouse. This facility functions as the management headquarters of the SPR. Activities conducted at the New Orleans office complex are predominantly administrative.



1.2.6 Stennis

DOE leased the Stennis Warehouse located in Hancock County, Mississippi, from the U.S. Army from 2004 to 2011 and since 2011, from the National Aeronautics and Space Administration (NASA). The warehouse, adjacent concrete aprons, and parking lot occupy approximately 3.4 acres within the John C. Stennis Space Center. It is used to maintain and store heavy equipment and piping in support of the four storage sites. It also has office space permanently used by its tenants and, if needed, temporarily used by New Orleans SPRPMO personnel.

1.2.7 St. James Marine Terminal

The St. James Marine Terminal, located along the Mississippi River in St. James Parish, Louisiana consists of a 173-acre site that includes a central facility and two satellite docks on the west Mississippi River batture. DOE leased this facility to Shell Pipeline from 1997 to December 31, 2019. Effective January 1, 2020, ExxonMobil has entered a 20-year long-term leasing arrangement for use of the St. James site.

2 Compliance Summary

COMPLIANCE DURING 2019

The SPR did not have any:

- ***reportable releases,***
- ***compliance or cleanup agreements,***
- ***environmental violations cited by regulators,***
- ***notices of violation,***
- ***notices of deficiency,***
- ***notices of intent to sue, or***
- ***other types of enforcement actions issued at any of the sites.***

There were no permit exceedances regarding air and waste, and one regarding water.

2.1 Regulatory Compliance Summary

Operational activity at the SPR is subject to numerous federal and state regulations, Executive Orders (EO) and DOE Orders. A list of applicable environmental standards is provided in Appendix A1, and a list of SPRPMO Environmental Safety and Health (ES&H) Directives is included in Appendix A2. By following these regulations, orders, standards, and directives, the SPR successfully operates in an environmentally compliant manner. Table 2-1 summarizes major applicable environmental regulations and orders. It also provides a summary of how compliance requirements were met during 2019, and (where appropriate) references report sections that contain more detailed information.

The principal agencies responsible for enforcing environmental regulations at SPR facilities are:

- Environmental Protection Agency (EPA),
- New Orleans and Galveston Districts of the United States Army Corps of Engineers (NODCOE & GALCOE),
- United States Fish and Wildlife Service (F&WS),
- Louisiana Department of Environmental Quality (LDEQ),
- Louisiana Department of Natural Resources (LDNR),
- Louisiana Department of Wildlife and Fisheries (LDWF),
- Railroad Commission of Texas (RRC),
- Texas Commission on Environmental Quality (TCEQ),
- Texas General Land Office (TGLO),
- Texas Parks and Wildlife Department (TPWD),
- Mississippi Department of Environmental Quality (MDEQ), and
- John C. Stennis Space Center.

These agencies issue permits, review compliance reports, inspect site operations, and oversee compliance with regulations.

Table 2-1 Environmental Regulations Applicable to the SPR		
Regulation	**Compliance Status**	**Report Section**
National Environmental Policy Act (NEPA) — requires federal agencies to follow a prescribed process to anticipate impacts on the environment of proposed major federal actions and alternatives.	All design reviews, engineering change proposals, deviations, waivers and purchase requisitions were evaluated for NEPA review in 2019. Of these documents, 48 required NEPA categorical exclusion documentation. None of the projects associated with these documents had potential to adversely affect environmentally or culturally sensitive resources, such as structures of historical, archeological, or architectural significance or any threatened or endangered species or their habitat. Also, no wetlands were adversely impacted because of these actions. Supplement Analysis, DOE/EA-2073-SA-01, was prepared in 2019 for the SPR Life Extension-II Work Packages. It was determined that there are no substantial changes on November 15, 2019.	3
EO 11988 — "Floodplain Management," **EO 11990 —** "Protection of Wetlands," NODCOE, GALCOE, LDEQ and RRC	The SPR ensures compliance with EOs 11988 and 11990 by complying with NEPA requirements, identifying potential environmental impacts, and obtaining permits through the COE and state coastal management agencies prior to any construction, maintenance, rehabilitation, or installation of structures and facilities.	3
EO 13834 — "Efficient Federal Operations." The goal is to maintain Federal Leadership in sustainability and greenhouse gas emission reductions.	Each year the SPR Energy Efficiency and Pollution Prevention Committee oversees the identification, selection, scheduling, budgeting, and implementation of projects and activities that support the sustainability program. A Site Sustainability Plan is submitted yearly to DOE by December.	3
Atomic Energy Act of 1954	X-ray and other sealed radioactive sources are used at the SPR to perform analytical, monitoring, and scanning activities. Conformance is demonstrated by following state implementing agency radiation control regulations.	4

Table 2-1 Environmental Regulations Applicable to the SPR

Regulation	Compliance Status	Report Section
Safe Drinking Water Act (SDWA) Louisiana and Texas Underground Injection Control (UIC) programs regulate underground hydrocarbon storage, related brine disposal, and oil field wastes. TCEQ enforces the SDWA in Texas by regulating Public Water Systems for health-based violations to ensure potable water provided is safe to drink.	SPR sites comply with the SDWA through permitting under the Louisiana and Texas UIC programs. The 2019 Annual Report Form OR-1 for underground injection was completed and submitted on schedule to the LDNR. Local public water systems supply drinking water to all storage sites, New Orleans headquarters, and the New Orleans and Stennis warehouses. Potable water systems at Bryan Mound and Big Hill are classified by state regulations as "non-transient, non-community" public water distribution systems, and these sites are required to have potable water monitoring programs. West Hackberry and Bayou Choctaw facilities are not required to have potable water monitoring programs and are recognized as water purchasers only. In 2019, potable water samples were taken monthly at Bryan Mound and Big Hill for coliform monitoring, and weekly samples were collected and analyzed for residual chloramine (disinfectant). Average disinfectant levels were reported to TCEQ on a Disinfectant Level Quarterly Operating Report. Calculated results at both sites did not exceed the regulatory maximum contaminant levels (MCL) for disinfectants. All coliform results were also below the MCL. Potable water is sampled and tested for lead and copper tri-annually at Big Hill and Bryan Mound. In 2019, testing for disinfection by-products (DBP; Trihalomethanes and Haloacetic Acids) was conducted through TCEQ at Bryan Mound and Big Hill. Test results for DBPs were below the MCL at both sites. Other potable water parameters monitored for compliance include asbestos, nitrite, and nitrate with varied monitoring schedules. Samples were collected by a TCEQ contractor and tested for nitrate and nitrite at Big Hill and Bryan Mound in 2019. All results were below their MCLs. Groundwater monitoring of the uppermost aquifer at the SPR storage sites is mandated via DOE orders for surveillance assessment and is coordinated through the Environmental Monitoring Plan (EMP). Details of groundwater monitoring are presented in Section 6. Historical groundwater evaluations have indicated the presence of shallow groundwater impacts from salt water at the BM and WH sites. As part of the site's overall groundwater surveillance, the post-closure monitoring near the Bryan Mound brine storage pond is provided through this report to the RRC as requested. The West Hackberry site completed the closure of its brine ponds in 1999 under a corrective action plan (CAP) negotiated with LDNR. Remedial recovery pumping was completed in 2001. Post-closure monitoring for 30 years is currently met by quarterly monitoring and annual reporting in the ASER, which is shared with LDNR.	5.1, 6

Table 2-1 Environmental Regulations Applicable to the SPR

Regulation	Compliance Status	Report Section
Clean Air Act (CAA) — LDEQ and TCEQ regulate the release of air pollutants through permits and air quality limits.	SPR sites comply with provisions of the CAA and State Implementation Plans (SIP) through permitting and following applicable regulations. All SPR facilities operate in accordance with the provisions of the applicable state air permits. In 2019, there were no air permits issued or renewed. All existing air permits are current. Annual fugitive monitoring of piping components for volatile organic compound (VOC) leaks was performed at the Louisiana SPR sites in 2019. Fugitive VOC monitoring was not required at the Texas SPR sites in 2019.	5.2
Clean Water Act (CWA) — EPA Region VI, RRC, LDEQ and MDEQ establish standards and issue permits to improve water quality. LDEQ has primary enforcement responsibility for the National Pollutant Discharge Elimination System (NPDES) in Louisiana. EPA and RRC issue NPDES permits in Texas.	SPR sites comply with the CWA through permitting under the NPDES program, following SPCC regulations and complying with the wetlands' usage program. <u>NPDES</u> In 2019, the Texas state (Rule 8) and federal (NPDES) water discharge permits for the two Texas SPR sites were submitted for renewal. In 2019, no modifications, changes or renewals were needed to water discharge permits (LPDES and Multi-Sector General Permit, MSGP) for the two Louisiana sites. <u>Spill Prevention Control and Countermeasure (SPCC)</u> Each SPR storage site and the Stennis warehouse comply with SPCC regulations by following a plan that addresses prevention and containment of petroleum and hazardous substance spills. SPCC plans are current with Title 40 CFR 112 and corresponding state regulations. <u>Wetlands</u> The SPR sites obtain permits from the COE and Coastal Zone Management representatives of the responsible state agencies whenever projects have fill, discharge, or dredging occurring in a wetland. There were no wetlands permits issued to the SPR in 2019. There were, however, applications submitted for projects at Bryan Mound and Bayou Choctaw and a maintenance dredging notification for Bryan Mound.	5.3, 5.4
Pollution Prevention Act of 1990 — LDEQ, RRC and EPA Region VI focus on reducing the amount of pollution through cost-effective changes in production, operation, and raw materials usage.	Each SPR site operates in accordance with a Storm Water Pollution Prevention Plan (SWPPP) prepared in accordance with EPA multi-sector general storm water discharge authority for storm water associated with industrial activity and similar Louisiana and Mississippi state requirements, using Pollution Prevention Program principles as the basis for limiting or precluding storm water contamination.	5.5

Table 2-1 Environmental Regulations Applicable to the SPR

Regulation	Compliance Status	Report Section
Resource Conservation and Recovery Act (RCRA) — LDEQ, EPA and RRC govern the generation, storage, handling, and disposal of hazardous wastes.	SPR facilities continued to operate as Very Small Quantity Generators (VSQG) in 2019. Hazardous wastes are not treated, stored, or disposed at any SPR sites. Therefore, the sites are not RCRA-permitted. Each SPR site has an EPA generator number that is used to track the manifesting of hazardous waste for off-site treatment or disposal.	5.5
Toxic Substances Control Act (TSCA) — regulates the manufacture, use, and distribution of all chemicals.	Procedures are in place to prohibit the purchase of equipment containing either friable asbestos or polychlorinated biphenyls (PCBs). Small amounts of non-friable asbestos usually in the form of seals or gaskets are disposed of as they are taken out of service in accordance with applicable solid waste regulations. Non-asbestos replacement components are used. No liquid-filled electrical equipment or hydraulic equipment currently used on the SPR has been identified as containing PCBs.	5.6
Superfund Amendments and Reauthorization Act (SARA) — EPA, LDEQ, LDNR, and TCEQ — SARA Title III specifies many responsibilities and reporting obligations for facilities with hazardous chemicals. **Emergency Planning and Community Right to Know Act (EPCRA) —** establishes requirements for federal, state and local governments, Indian tribes, and industry regarding emergency planning and "Community Right-to-Know" reporting on hazardous and toxic chemicals.	SARA Title III Tier Two reports, also known as EPCRA Section 312 reports, were prepared and distributed as required by March 1, 2020, to state and local emergency planning committees and local fire departments. The submittal of a TRI Form R (EPCRA Section 313) was required for the Big Hill, Bryan Mound, and West Hackberry sites in 2019 because the SPR introduced crude oil into commerce from Crude Oil Sales. TRI reporting was not applicable to Bayou Choctaw. The TRI reports were prepared and submitted to EPA as required by July 1, 2020.	5.6

Table 2-1 Environmental Regulations Applicable to the SPR

Regulation	Compliance Status	Report Section
Endangered Species Act — LDWF and TPWD prohibit activities that would jeopardize the existence of an endangered or threatened species or cause an adverse modification to critical habitat.	The F&WS is consulted about the appropriate actions taken regarding threatened and endangered species. The SPR does not perform activities that would jeopardize the existence of endangered or threatened species. Additionally, there are no critical habitats at any of the SPR sites. Consideration of potential impacts to endangered species at the SPR was included as part of the original conditional coverage through the re-issued MSGP. The MSGP coverage has since been migrated to either the individual or general permits issued to each site.	5.7
EO 13186 — "Responsibilities of Federal Agencies to Protect Migratory Birds" and Migratory Bird Act	In a continuing effort to minimize disruption and provide suitable habitat to migratory birds at SPR sites, bird-nesting areas are closed or otherwise protected during critical periods to prevent disturbance because of site operations. SPR storage facilities are located on migratory pathways along the Texas and Louisiana Gulf Coast. Many species of waterfowl and song birds use SPR sites for resting and refueling during spring and fall migration. Environmental awareness of migratory bird issues commences at the site level. Selected fields are not mowed from early fall through spring at Bayou Choctaw, Bryan Mound, Big Hill, and West Hackberry to provide food and shelter for migrating birds, and nesting and brooding of resident birds. When discovered, nesting areas are flagged (e.g., ground-nesting terns and killdeer); and equipment is designated for limited/restricted use on occasion when they harbor bird nests (e.g., by Northern Mockingbird, Mourning Dove, and Loggerhead Shrike).	5.7
National Historic Preservation Act (NHPA) — identifies, evaluates and protects historic properties eligible for listing in the National Register of Historic Places. NHPA is administered by State Historic Preservation Offices.	No site projects required certified reviews by the State Historical Preservation Offices in 2019.	

Table 2-1 Environmental Regulations Applicable to the SPR

Regulation	Compliance Status	Report Section
Oil Pollution Act (OPA) of 1990 — OPA and TGLO improved the nation's ability to prevent and respond to oil spills and provided requirements for contingency planning both by government and industry.	SPR emergency programs, planning, and management are guided by the OPA standards for onshore storage facilities, pipelines, and marine terminal facilities. Facility Response Plans have been combined with site emergency response procedures in accordance with the EPA "One Plan" scheme and meet or exceed the requirements of OPA and related state acts such as the Oil Spill Prevention and Response Act (OSPRA) in Texas. The plans are approved by the appropriate federal and state regulatory agencies. The Texas sites maintain their individual OSPRA certifications in accordance with state requirements. The SPR conducts quarterly emergency drills or hands-on training at its sites in accordance with the National Preparedness for Response Exercise Program (PREP), along with full equipment deployment of announced/unannounced exercises at each site annually. Emergency management personnel from New Orleans coordinate these drills and include the participation of public and regulatory agencies. The SPR utilizes the National Incident Management System (NIMS), the response management system required by the National Oil and Hazardous Substances Pollution Contingency Plan. SPR site and New Orleans response management personnel have been trained in the unified Incident Command System, and a team of selected New Orleans personnel is available to support extended site emergency operations when needed.	
Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) — LDEQ and TCEQ regulate the manufacture, use, storage and disposal of pesticides and herbicides.	The SPR hires state-certified pesticide applicators to apply pesticides. Also, only chemical products on the SPR Qualified Products List (QPL) are allowed on site. Much of the SPR property is developed with buildings, piping, cable trays, and other structures where pesticide and herbicide use is necessary to control unwanted vegetation and other pests. During 2019, the SPR used pesticide products to control pests in buildings and around work areas, control vegetation throughout site grounds, and security zone areas, and to mitigate the reduction of the number of personnel dedicated to mowing. Although pesticide use is necessary, there is a concerted effort made, through screening of chemicals before purchase, to use products safest for the environment and employees.	

2.2 Preventing and Reporting Releases

The SPR oil storage sites are located adjacent to or near marsh, wetlands, and water bodies. Protection of the surrounding environment through oil spill prevention and control is a primary commitment. Verbal notification and associated written reports to the appropriate regulatory agencies (e.g., National Response Center) are made if a release meets reportable criteria. Each SPR site has structures in place to contain or divert any harmful release that could impact

surrounding waterways or land areas. Onsite spill control equipment, detailed emergency plans, and extensive training are used to ensure that the environment is safeguarded.

Site Emergency Response Procedures address release reporting requirements of the SPR M&O, DOE, and appropriate regulatory agencies. Specific reporting procedures are dependent upon the quantity and type of material released, immediate and potential impacts of the spill, and spill location (e.g., wetland or water body). Spills of hazardous substances are verbally reported to site management and then to New Orleans M&O and DOE management. Releases are documented using the Operations Control Center (OCC) Non-Routine and Occurrence Report form. The form is completed at the site and then forwarded to the New Orleans OCC. Corrective action/cleanup reports are also submitted unless otherwise directed by the DOE or appropriate regulatory agency.

2.2.1 Reportable Releases

Federal and state regulations require notification to authorities in the event of a release of a reportable quantity of designated materials. Historically, most of the reportable releases at the SPR have resulted from brine and crude oil operational activities. During calendar year 2019, there were zero reportable releases at the SPR.

Figure 2-1 and Table 2-2 provide a five-year summary of reportable releases at the SPR. Due to the number of reportable spills that occurred in CY 2017, the M&O Senior Management initiated communication with site management to focus on preventative measures to reduce the likelihood of reportable releases. Additionally, a work instruction titled *SPR Unplanned Release, Estimation, Notification and Reporting for Non-Emergency Situations* was published in 2019 to promote consistent identification of reportable spills. Training on usage of the work instruction was provided for site personnel who handle oil, brine and other chemicals. Because of this focus and support, combined with Environmental oversight and project design review input, and usage of the new work instruction, reportable releases were reduced to zero from November 2017 through December 2019.

Figure 2-1 SPR Reportable Spills for Calendar Years 2015 – 2019

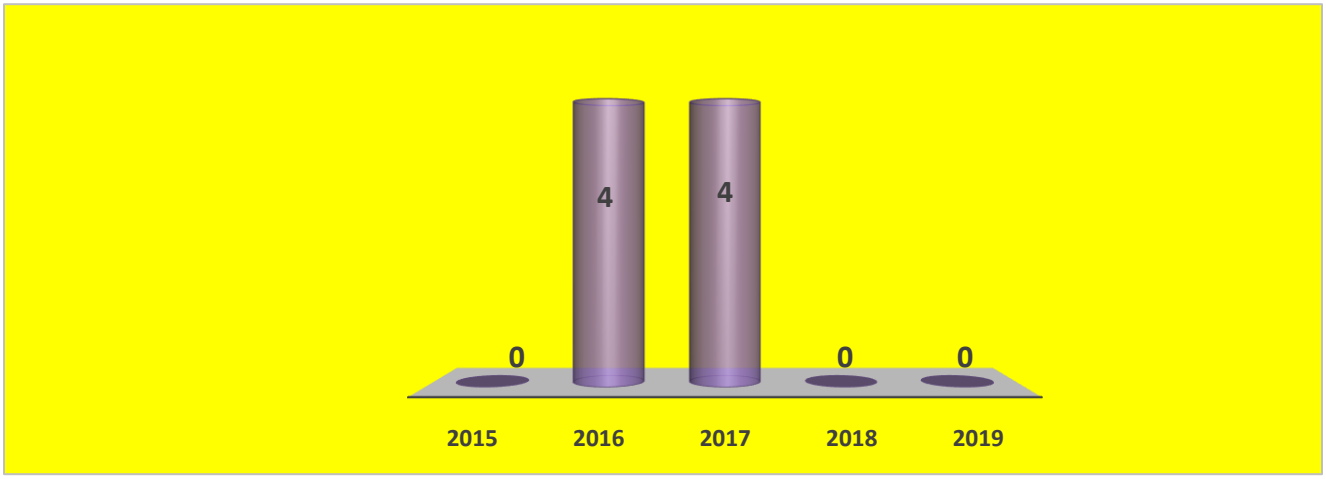


Table 2-2 **2015 through 2019 SPR Reportable Spills**

Date	Site	Material	Volume	Summary
03/31/2016	WH	Oil	1 – 2 Cups	While loading equipment on a barge at the site boat launch with a cherry picker, the picker developed a hydraulic oil leak causing approximately 2 cups of hydraulic oil to spill into Black Lake. Due to weather conditions, the oil was not able to be recovered and notifications to outside agencies were completed.
07/06/2016	BC	Oil	2 Gallons	While performing maintenance on crude oil header valve 4H000PV57, an estimated 2 gallons of crude oil was released into the swampy area (wetland) east of the roadway to Cavern 19. The area was cleaned and notifications to outside agencies were made per the Bayou Choctaw Site ERP.
08/28/2016	BC	Brine	3 – 4 Barrels	Bayou Choctaw security personnel discovered a brine leak near building 401. Operations personnel confirmed the material was brine and estimated 3 to 4 barrels of brine had been released. The fluid movements were suspended, the area was cleaned, notifications were completed, and the source of the leak was repaired.
11/25/2016	WH	Brine	4 – 5 Barrels	While completing a routine inspection of the brine disposal wells, a brine leak from tubing at brine disposal well 2D was discovered. The source of the leak was stopped, notifications were completed, and the area cleaned. It was estimated that 4 to 5 barrels of brine had been released. This is a reportable quantity in LA.
09/08/2017	BC	Brine	30 Barrels	A 30-barrel release of brine resulted from maintenance activities associated with the repair of a leaking raw water pipeline valve. When the pipe system was depressurized for maintenance, liquid from the brine pond siphoned back through it and flowed through the leak onto the ground. M&O personnel notified outside agencies as required and initiated clean up and recovery operations.
10/03/2017	WH	Oil	10 Barrels	A ten-barrel release of crude oil occurred within the secondary containment area of Cavern 115 as the result of leaking blow out preventers on the work over rig. The wind caused a crude oil mist over a 900-square foot area outside of the secondary containment. Later, rain caused a sheen originating from the impacted area to form in a drainage area that connects to a navigable water (Black Lake). West

Table 2-2 **2015 through 2019 SPR Reportable Spills**				
				Hackberry personnel closed the sluice gate upstream of Black Lake and deployed absorbent boom to stop the flow of the sheen and prevent it from reaching Black Lake. M&O personnel notified outside agencies as required and initiated clean up and recovery operations.
10/05/2017	BC	Brine	4 Barrels	A four-barrel release of brine resulted from maintenance activities associated with the brine disposal wells. The subcontractor performing the task did not utilize secondary containment, and during the movement of dewatering tanks, four barrels of brine spilled onto the ground. M&O personnel notified outside agencies as required and initiated clean up and recovery operations.
10/16/2017	BH	Diesel	8 Ounces	An eight-ounce release of diesel fuel to the GIWW resulted from the leaking day tank located on the RWIS. Due to the elevated storage of the day tank on the RWIS above the GIWW, windy conditions caused the leaking fuel to become airborne and deposit on the water creating a sheen. M&O personnel notified outside agencies as required and initiated clean up and recovery operations.

2.3 Environmental Concerns

2.3.1 Gassy Oil

When retrieving crude oil from salt dome storage, air emissions may be of concern. During retrieval, methane and ethane gases (non-regulated) that have migrated into the salt cavern are released, stripping regulated pollutants (VOCs) from crude oil into the atmosphere. Also, geothermal processes raise the crude oil temperature and vapor pressure. This elevated vapor pressure may exceed regulatory limits for storage in floating roof tanks, potentially affecting some of the SPR sites and the receiving commercial terminals (customers).

This environmental issue has been addressed by performing "degassing" operations. Beginning in 1995, the SPR commenced degassing operations to separate and remove gas from stored oil, as well as employing heat exchangers to cool oil prior to transport offsite. Degassing has since been performed at SPR sites on a continuous alternating schedule. Recent history is as follows:

- Big Hill, April 2004 - October 2006
- Bryan Mound, September 2007 - February 2011
- West Hackberry, August 2014 – October 2018

A portable degassing facility is being designed and will be constructed as part of the SPR Life Extension 2 project. The degas plant will initially be installed at Bayou Choctaw but can be relocated to any of the other three SPR sites as needed.

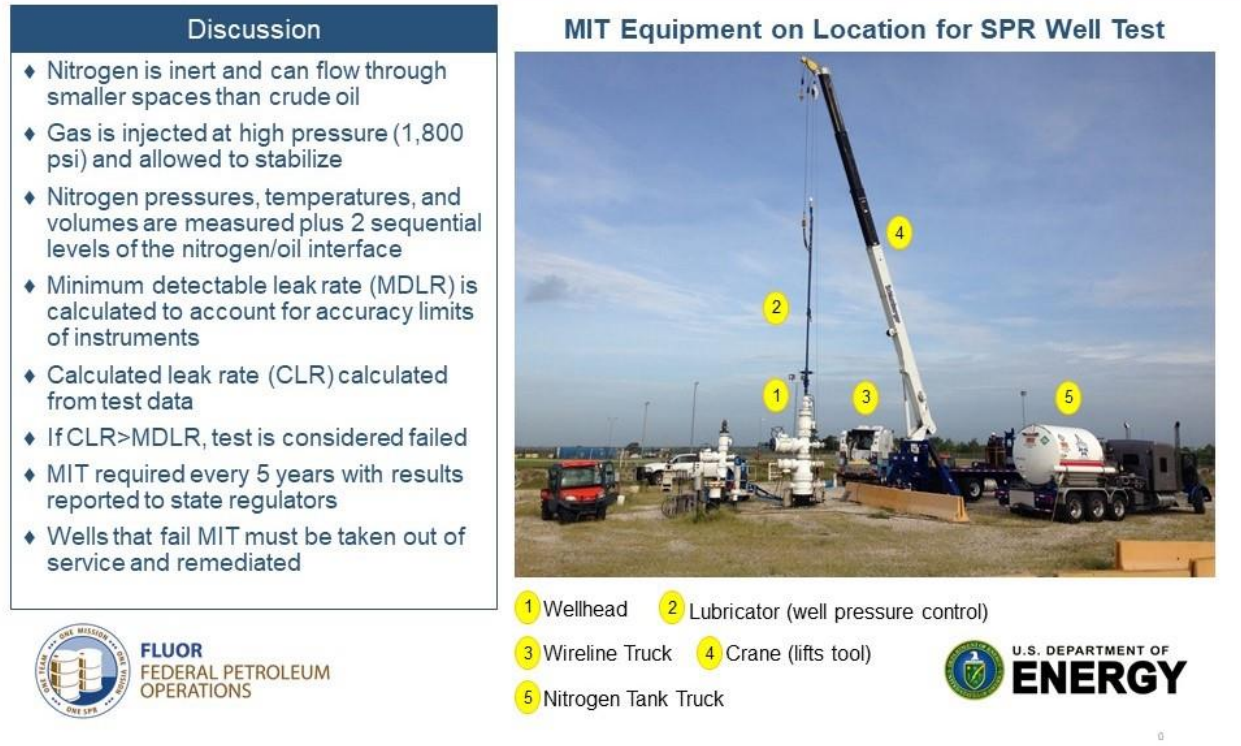
2.3.2 Cavern Integrity

SPR caverns and wells are operated and maintained in accordance with regulatory requirements of the LDNR at LAC Part XVII, Subpart 3, Statewide Order 29-M and the RRC at TAC, Title 16, Part 1, Chapter 3, Rule 3.95, in addition to DOE policies.

To ensure compliance, the SPR conducts a broad monitoring and inspection program, including continuous measurement and recording of fluid pressures in the caverns to keep the caverns within prescribed operating pressure ranges and as a check for the possible loss of containment. Mechanical integrity tests (refer to Figure 2-2) are performed at least once every five years using pressurized nitrogen gas to test fluid containment. A variety of wireline well logging tools, such as multi-arm calipers in the wells and sonars in the caverns, are used to measure subsurface conditions. On the surface, wellheads are inspected periodically for corrosion and loss of integrity, and each storage site is surveyed for ground subsidence as an indicator of salt dome movement and possible cavern-scale movement. When necessary, diagnostic workovers are performed to remove brine strings from wells, so that they can be logged and inspected. Well remediation is performed when a well loses mechanical integrity or shows severe deformation.

During 2019, FFPO completed eight diagnostic workovers and one well remediation. No violations were issued by either Louisiana or Texas state environmental regulators.

Figure 2-2 Mechanical Integrity Test (MIT)



2.3.3 Big Hill Brine Pond 9

In November 2006, an inspection revealed significant deterioration of the pond liner and recommended replacement. A method of replacement was submitted to the RRC via permit modification but denied in July 2013. In December 2013, it was determined that rather than repair the existing liner, the pond would be closed in-situ and capped. In January 2014, a Conceptual Closure Plan was submitted to the RRC. To facilitate closure, sediment samples were collected. Samples indicated chloride concentrations exceeding the regulatory threshold (3,000 ppm) and the presence of hydrocarbons. A Closure Plan was developed in May 2015.

In accordance with Phase I of the Closure Plan, a pilot test was performed in early 2016 and completed in July 2016. The pilot test included an in-pond small scale evaluation of a proposed chloride washing technique. The pilot test indicated a reduction of chloride content in anhydrite sediment after washing. With favorable results, a report of findings was submitted to RRC and permission requested to proceed with Phase II- Full Wash.

The RRC granted permission to proceed with Phase II. A contract was awarded in October 2016 and washing proceeded through 2017. However, by January 2018, it was determined that the washing method was not achieving the remedial goals as quickly as anticipated. Additional sampling and analysis were performed in June 2018. Based upon June 2018 findings, closure options were re-evaluated. It was determined that the soil washing technology, while successful for the porous, sandy anhydrite, would not achieve the originally anticipated results for the low permeability material located in the middle of the pond. An amended Closure Plan was developed and submitted to RRC on October 31, 2018. The Closure Plan recommended

excavation of the low permeability material with off-site disposal as the best feasible closure option. The RRC approved the amended closure plan on January 9, 2019. A contract was awarded in February 2019. A *Sampling and Analysis Plan for Excavation of Sediment at Anhydrite Pond 9* was issued in May 2019. The amended closure plan and sampling and analysis plan were followed, and work was successfully completed between May and November 2019. An *Environmental Closure Report* was issued in December 2019 and submitted to the RRC. The report details the work completed. In summary, between July and November 2019, 10,262 tons of sediment was excavated from Pond 9 and disposed off-site at the Golden Triangle Landfill, permit number 2027, as a Class 2 non-hazardous waste. Confirmation samples were collected in accordance with the sampling and analysis plan. All sediment exceeding remedial goals was removed from Pond 9. The sediment remaining in Pond 9 contains concentrations below remedial goals.

Figure 2-3 BH Brine Pond 9 Post Sediment Removal (10/24/2019)

2.3.4 Contaminants of Emerging Concern

The EPA has identified two "contaminants of emerging concern" that are present at SPR sites. These contaminants, perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) are part of a larger group of chemicals (per – and polyfluoroalkyl substances) which are generally referred to by their plural acronym, PFAS. PFAS are manmade chemicals not naturally found in the environment. They are extremely persistent and are sometimes referred to as "forever chemicals." They are known to bioaccumulate in humans and wildlife. These chemicals have multiple uses. At the SPR, PFAS-containing products are stored for emergency use to extinguish fires fueled by liquid hydrocarbons (e.g. petroleum). These fire-fighting compounds are commonly referred to as AFFF or aqueous film forming foam.

Manufacturers have developed less persistent formulations of AFFF in response to the USEPA 2010/2015 voluntary PFOA Stewardship Program. Most foam manufacturers have now transitioned to the production of short-chain (C6) AFFF. These modern AFFFs, or "C6 foams," do not contain or break down in the environment to PFOS or PFOA and are currently considered to be less toxic and have reduced potential to bioaccumulate as compared to long-chain (C8) AFFFs.

In 2019, a decision was made to identify environmentally friendly, short-chain AFFF products to replace long-chain AFFF at the SPR. AFFF materials were inventoried at each SPR site. Long-chain AFFFs were found at Big Hill and Bryan Mound. Approximately 13,185 gallons of long-chain AFFF product was inventoried at these two sites. Suitable replacement products were identified in May 2019 and discussed with site personnel. Long-chain PFAS will be replaced with less persistent fire-extinguishing chemicals when additional or new product is needed.

2.4 DOE Onsite Appraisals and M&O Organizational Assessments

SPRPMO management appraisal teams and the New Orleans M&O environmental group conduct visits to SPR sites annually to audit compliance with environmental programs and EMS practices. Assessors are independent of the operating sites and are not accountable to those directly responsible for the issues audited. Specific topics are chosen based on current management concerns and the results of previous audits. Issues and programs reviewed in 2019 included chemical and waste management, air and water quality, sustainability, EMS, and pollution prevention. In 2019, there were two environmental findings associated with the DOE Onsite Appraisals. The M&O identified one opportunity for improvement (OFI) and eight findings during 2019. Corrective action plans were developed and implemented for findings and OFIs. All audit findings are tracked to completion in the SPR's Assessment Tracking System.

2.5 Regulatory and ISO 14001 Registrar Inspections/Visits

There were sixteen inspections or visits by or on behalf of regulatory agencies and the ISO 14001 certification body to SPR facilities in 2019. These visits are summarized in Table 2-3. The visits are conducted on a routine basis by the regulatory agencies to ensure compliance or to address concerns regarding activities at the SPR facilities. The ISO 14001 registrar's visit was performed in November 2019 and was a surveillance audit to validate that the SPR's EMS follows the ISO 14001:2015 standard. There were zero nonconformances and zero OFIs identified. The M&O maintains ISO14001 registration.

Table 2-3 Summary of Regulatory and Third-Party Inspections/Visits in 2019

Site	Organization	Remarks
Bayou Choctaw	Louisiana Oil Spill Coordinator's Office (LOSCO)	Annual Preparedness for Response Exercise Program (PREP)
	ISO 14001 CB	Surveillance audit – certification remains in effect.
Big Hill	TGLO	Annual oil spill prevention and response audit - site passed.
	Louisiana Oil Spill Coordinator's Office (LOSCO)	Annual Preparedness for Response Exercise Program (PREP)
	ISO 14001 CB	Surveillance audit – certification remains in effect.
Bryan Mound	TGLO	Annual oil spill prevention and response audit - site passed.
	RRC	Observed Cavern 112 mechanical integrity testing (MIT) and inspected several wellheads for leaks.
	ISO 14001 CB	Surveillance audit – certification remains in effect.
	TCEQ	Purpose of the visit was to conduct an annual meter inspection under the Watermaster Program at the Bryan Mound site.
	United States Coast Guard (USCG)	Site tour and Emergency Response Familiarization
	Louisiana Oil Spill Coordinator's Office (LOSCO)	Annual Preparedness for Response Exercise Program (PREP)
New Orleans	ISO 14001 CB	Surveillance audit – certification remains in effect
St. James	ISO 14001 CB	Surveillance audit – certification remains in effect
West Hackberry	ISO 14001 CB	Surveillance audit – certification remains in effect.
	Louisiana Oil Spill Coordinator's Office (LOSCO)	Annual Preparedness for Response Exercise Program (PREP)
	LDNR	Visit to witness the mechanical integrity pressure testing at the brine disposal well (BDW)-1C.

2.6 Community Outreach Programs

SPR sites attempt to be good stewards of the environment and good neighbors. Community outreach programs have been established to promote healthy public relations and donations have been given to needy SPR site neighbors. Examples are as follows.

Big Hill Celebrates Earth Day 2019

Big Hill employees participated in Hamshire-Fannett Elementary School 2019 Earth Day celebrations. In addition to educating the students on the environment and ways to recycle, employees participated in planting activities that included distributing cups with soil, seeds, and water.

SPR Recognizes Earth Day and Arbor Day

This year, the SPR recognized Earth Day (April 22) and Arbor Day (April 26) with one combination celebration, focusing on the environmental benefits of trees. FFPO gave away a limited number of tree saplings to SPR employees at all sites. Also, the SPR planted a new Redbud tree at the New Orleans offices outside of the 850 Building.

Kids, Grandkids Visit Big Hill, West Hackberry and New Orleans Sites

The Big Hill, West Hackberry, and New Orleans offices welcomed children and grandchildren of SPR employees in 2019 for the annual celebration of Take Our Kids to Work Day.

At Big Hill, FFPO employees conducted presentations explaining how the SPR moves oil and brine, the importance of stopping work if something appears to be unsafe and the proper use of personal protective equipment. Protection Force Officers, including a canine officer, also performed a prohibited item/contraband detection demonstration.

BH — Prohibited item/contraband detection with canine officer.

At West Hackberry, Cavern Engineering personnel demonstrated how the site transfers oil, Emergency Response Team members showed the children how to operate the fire truck and Protection Force Officers demonstrated the skills of their talented canine members.

In New Orleans, activities included hands-on activities in which the kids made fizzy lemonade, created slime, built a catapult, explored prisms and cleaned up a simulated oil spill. Hurricane preparedness was also discussed.

NO —- Hurricane Preparedness

SPR Environmental Advisory Committee (EAC)

The SPR EAC was formed in 1988 as an independent scientific peer review group. The committee consists of eight members that are scientific/technical specialists in the environmental, emergency management, mining, and oil and gas fields, as well as community representatives of the cities near the four SPR sites. The purpose of the EAC is to supplement existing SPR environmental and emergency management efforts by providing independent assessments, evaluations, advice, and impartial information to management, the public, and media relative to the environment, safety, public perception, programs, and policies of the SPR.

The EAC meets every six months. The January 2019 EAC meeting was held at the Bryan Mound site. The EAC toured the site and visited the Sea Center Texas Marine Fish Hatchery in Lake Jackson, Texas.

The July 2019 EAC meeting was held in New Orleans. Topics discussed included air quality, water quality, and an EAC presentation on the Salt Mines of Louisiana.

Pictured above are: Bob Thoms, Mike Holmes, Cindy VanDuyne, Terry Baxter, Bob Sevcik, Karl Finch, Ray Chesson, and Paul Davidson. Not shown are: Gus Stacy and Ed Overton.

Recycling of Mardi Gras Beads

New Orleans employees collected and donated 670 pounds of Mardi Gras beads and throws to the ARC of Greater New Orleans (ArcGNO) Mardi Gras Recycling Center. ArcGNO employs individuals with intellectual and developmental disabilities to sort and package Mardi Gras throws for resale. The proceeds from the beads fund workers' salaries. This Mardi Gras bead recycling program supports a more than 60-year-old non-profit organization and diverts beads from local landfills.

Backpacks Donated to Schools

Backpacks filled with school supplies and money were donated to local schools.

Volunteers Sweep the Beach

Employees took part in the Lake Pontchartrain Basin Foundation Annual Beach Sweep. The volunteers picked up litter and trash to ensure the parks along the lakefront remain clean and attractive.

2019 Beach Sweepers

2.7 Awards

West Hackberry Recommended as Voluntary Protection Program (VPP) Star Facility

The West Hackberry site was assessed in 2019 by OSHA VPP and approved for continued participation in OSHA's VPP. The OSHA audit team was on-site for 4 days and performed a wall-to-wall physical assessment of the site, reviewed policies and procedures, assessed compliance, and looked at process safety management in detail. A team from multiple New Orleans departments assisted in specific areas of the audit. For example, Configuration Management members responded to specific questions about management of change, and industrial hygienists answered questions related to hazardous chemicals, monitoring, and ergonomics. Following the assessment, the OSHA VPP Team indicated they would recommend the West Hackberry site to continue as a Star facility. This means the site met or exceeded all requirements. The West Hackberry site was assessed during the week of August 26, 2019, and officially approved on November 26, 2019.

Bayou Choctaw, West Hackberry, Big Hill, and Bryan Mound Received "Region VI Star Among Stars Recognition Program" Awards

The "Region VI Star Among Stars Recognition Program" was established by OSHA VPP to recognize VPP participants within Region VI with total case incidence rates (TCIR) and days away/restricted/transferred (DART) case incidence rates well below the Bureau of Labor Statistics (BLS) national average. All four operating sites qualified for the Star Among Stars recognition program due to their performance during 2019. Bayou Choctaw, Big Hill, and Bryan Mound qualified for the "Star" level of recognition (TCIR and DART rates were at least 50 percent below the BLS average) and West Hackberry qualified for the "Star of Excellence" level of recognition (TCIR and DART rates were at least 90 percent below the BLS average). These awards will be received at the Region VI VPPPA Conference in May 2020.

SPR Receives FEMP 2019 Federal Energy and Water Management Director's Award

The SPR was one of three federal agencies that provided strategic leadership during the development of FEMP's Technical Resilience Navigator. The SPR shared lessons learned and best practices, which helped advance interagency collaboration. The SPR's feedback was key in developing resources to promote energy and water resilience planning for critical infrastructure across the Federal government.

3 Environmental Management System (EMS) and Sustainability

DOE Order 436.1 requires sites to have an EMS. The EMS must be certified to or in conformance with the ISO 14001 standard. On May 19, 2000, the EMS was first evaluated by an independent certification body accredited by the American National Standards Institute/ American Society for Quality (ANSI-ASQ) National Accreditation Board (ANAB) and certified in conformance with the ISO 14001 standard. The EMS was recertified in 2003, 2006, 2009, 2012, 2015, and 2018. The certification in 2018 was to change from ISO 14001:2004 Standard to the ISO 14001:2015 Standard. Between certification and recertification activities, surveillance audits are conducted by the certification body. This certification is valid through April 18, 2021.

The scope of the EMS is the operation and management of the SPR under the M&O and its personnel and on-site subcontractors. The EMS addresses activities conducted at SPR sites by FFPO and its subcontractors. The SPR sites encompass roughly 1700 acres, 160 buildings or structures, and 170 miles of offsite pipeline (crude oil, fresh/brackish water, and brine). Sites are directly supported by approximately 630 M&O contracted and subcontracted full-time personnel. Site personnel receive computer-based ISO 14001 EMS training annually. The training provides an overview of the ISO 14001 standard and the importance of conformity with the SPR's environmental policy and procedures.

DOE delegates responsibility and authority for the environmental component of the Integrated Safety Management (ISM) system to the M&O. The purpose of ISM is to ensure that environmental, safety, and health requirements are an integrated but discernible part of the performance of all work, from the initial planning stage through feedback and improvement. The SPR EMS Manual formalizes the environmental portion of ISM and defines the scope of the EMS regarding the elements of the ISO 14001:2015 Standard. Although compliance with ISM does not ensure compliance with the ISO 14001:2015 Standard, the M&O has tailored the EMS to comply with both standards.

The EMS is implemented to protect the environment and manage SPR environmental obligations in a safe and effective manner. It establishes the necessary organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, and maintaining the "SPR Environmental Policy." Conformance of the EMS to the ISO 14001 standard is illustrated through the SPR EMS Manual. The manual provides descriptions and references to SPR policies, plans, procedures, environmental aspects and impacts and objectives and targets that form the foundation of the EMS. Table 3-1 is a summary of the EMS objectives and targets with progress.

Table **3-1** FY 2019 Institutional Objectives and Targets with Performance

Aspect	Objective	Status 2019	Performance
1) Continual Improvement	Improve communication with sites and add significant aspects to environmental training.	Complete	N/A
2) Continual Improvement	Implement an evaluation of compliance database with findings for the past 2 years. This will provide an all-encompassing location to find succinct information on environmental findings. *Target: Implement the database by January 1, 2019.*	Complete	N/A
3) Continual Improvement	Further evaluate risk assessments in regard to the significant aspect list.	Complete	N/A
4) Discharges	Reduce permit exceedances reported on the Discharge Monitoring Reports *Target: ≤8/year*	One	Meets target
5) Spill, Air Emission, Monitoring, Wetlands Disturbance, Drainage, Navigation, Public Exposure	Avoid Clean Water Act, Clean Air Act, and RCRA (waste) enforcement actions (Notices of Violation – NOVs) *Minimum & Target: 0/year*	Zero	Zero Since FY00
6) Spills	Reduce reportable occurrences of releases from operational facilities *Minimum: No more than 1 reportable spill*	Zero	Meets target
7) Waste	Divert at least 50% Construction & Demolition Debris *Minimum: ≥50% Target: N/A*	21%	Below target
8) Waste	Divert at least 50% of Non-Hazardous Solid Waste *Minimum: 50% Target: N/A*	82%	Above target
9) Waste	Divert at least 20% of Hazardous Chemicals/Materials *Minimum: 20% Target: 20%*	N/A for FY 2019	
10) Waste, Spill, Air Emissions Resource Use	Review all P.R.s, designs, SOWs, and other documents submitted for Environmental review. *Minimum: N/A Target: 100%*	100%	100% since 2001
11) Monitoring and Surveillance Results	Submit environmental documents on time to DOE & Regulators (timeliness and quality) *Minimum: N/A Target: 100%*	100%	100% since 2001

Table **3-1** FY 2019 Institutional Objectives and Targets with Performance

Aspect	Objective	Status 2019	Performance
12) Spill Monitoring and Surveillance	Submit annual Pipeline Integrity Report. *Minimum: N/A Target: On Schedule*	Complete	Completed on Schedule
13) Spill	Ensure key emergency equipment is available. *Minimum: 90% Target: 100%*	100%	>Minimum since 2000
14) Spill Fire	Ensure emergency preparedness and response capabilities through quarterly training of ERT members. *Minimum: 95% ERT trained/site Target: 100% ERT trained/site*	100%	>Minimum since 2000
15) Spill	Complete PREP drills/exercises. *Minimum: N/A Target: 100% PREP objectives tested/site/yr.*	100%	100% for regulatory compliance
16) Spill Air Emissions Waste	Meet weighted average of quality of maintenance, preventive maintenance completion, maintenance support, scheduling effectiveness, productivity, corrective maintenance backlog, and readiness of critical must-operate equipment. *Minimum: 95%/month Target: 98%/month*	100%	>Minimum since 2000

EMS Performance Metrics

The following qualitative discussion describes the status of the EMS performance for 2019. The information provided below is excerpted from the SPR's 2019 EMS Compliance Report that was submitted through Fed Center. The EMS received a "Green" score based on the metrics listed below.

The EMS implementation team annually reviews activities, products, and services. Activities include but are not limited to maintenance, workovers, drawdowns, painting, and pipe integrity. Their associated environmental aspects (i.e., possible air impact, fire results, production of waste, etc.) are evaluated. The severity, frequency (likelihood), and rank are determined using the SPR Risk Coding Matrix. Severity rating descriptions range from negligible, to marginal, moderate, significant and severe. Frequency ratings range from very low to very high. Using severity and frequency ratings, ranks are determined. The Significant Aspect List is provided in Table 3-2. Significant Aspect List rating descriptions range from marginal, to moderate, significant and severe. Frequency (likelihood) ratings range from medium to very high, and risks are determined. The Significant Aspect List also includes an unmitigated severity, likelihood, and risk. Review results are documented, and changes are made when deemed necessary. The updated list of environmental aspects is published internally and is available outside DOE if requested.

The EMS has established documented, measurable environmental objectives. See Table 3-1 for a list of Objectives and Targets.

In 2019, operational controls associated with identified significant environmental aspects were established, implemented, controlled, and maintained in accordance with operating criteria.

During 2019, an environmental compliance audit program was in place. Audits were completed according to schedule, findings were documented, and corrective and preventive actions were defined/documented and either completed or placed on a schedule for completion. More information about the SPR audit program is in Section 2.4.

The EMS Compliance Report submitted through Fed Center requires reporting by DOE facilities about whether the 10 sustainability goals outlined in Executive Order 13834 are applicable and addressed in the EMS of the reporting facility. In 2019, all 10 of the sustainability goals were applicable and addressed in the SPR EMS. More information on the sustainability goals is contained in Table 3-3, 2019 Sustainability Goals, Performance, and Planned Actions.

Table 3-2 Significant Aspect-Impact List*

Aspect	Activity	Impact	Unmitigated Severity	Unmitigated Likelihood	Unmitigated Risk	Mitigated Severity	Mitigated Likelihood	Mitigated Risk	Aspect ID (Refer to ES&H Standards List)
Air Emissions	Maintain site structures and equipment	Air Quality	Moderate	Medium	Medium	Marginal	Medium	Low	1AE
	Workover-crude movement		Significant	High	High	Marginal	Medium	Low	
	**Degas crude		Severe	High	High	Negligible	Very Low	Very Low	
	Drawdown-crude to ships		Significant	High	High	Moderate	High	Medium	
Fire	Respond to upset conditions	Air Quality, Land, Water Quality	Significant	Medium	Medium	Moderate	Medium	Medium	7F
Waste	Sample/Test crude (receipt & storage)	Disposal Impact (Haz or Non-Haz)	Marginal	Very High	Medium	Marginal	Very High	Medium	14W
	Construction activities		Moderate	Very High	High	Marginal	Very High	Medium	
	Painting		Moderate	Medium	Medium	Marginal	Medium	Low	
	Sample/Test (degassing crude)		Marginal	Very High	Medium	Marginal	Very High	Medium	
	Sample/test (workovers and inter-cavern movements)		Marginal	Very Hugh	Medium	Marginal	Very High	Medium	
	Chemical use-Non-QPL		Marginal	Very High	Medium	Marginal	Very High	Medium	
	Maintain site structures		Marginal	Very High	Medium	Marginal	Very High	Medium	
Reportable Spills/ Releases	Workover- crude/brine movement	Water Quality	Significant	Very High	High	Moderate	High	Medium	11SR
	Crude storage tanks (before moving to caverns)		Moderate	Very High	High	Marginal	Very High	Medium	
	Respond to upset conditions	Air Quality, Land, Water Quality	Severe	Medium	High	Significant	Medium	Medium	
	Monitor onsite piping integrity		Moderate	Very High	High	Moderate	High	Medium	
	Monitor offsite pipeline integrity		Moderate	Very High	High	Moderate	High	Medium	
	Cathodic protection survey of crude oil pipelines		Significant	High	High	Moderate	Medium	Medium	
	Drawdown – move crude via piping		Significant	Very High	High	Moderate	High	Medium	

	BOAs (establish/maintain for spill response/ clean up) (failure)		Significant	Very High	High	Moderate	High	Medium	
	Leach caverns with raw water during drawdown	Land and Water Quality	Severe	High	High	Moderate	Medium	Medium	
	Pig pipelines to perform maintenance		Moderate	Very High	High	Marginal	Low	Low	
Natural Resource Preservation	Maintain site structure	Water Quality	Significant	Very High	High	Moderate	High	Medium	9NRP
	Maintain site structures	Wildlife	Significant	Very High	High	Marginal	Low	Low	
	Work in wildlife habitat areas		Moderate	Very High	High	Marginal	Very High	Medium	
Cavern Integrity	Leach caverns with raw water during drawdown	Cavern Integrity	Severe	High	High	Marginal	Medium	Low	16CI
	**Cavern (drill wells)		Severe	High	High	Negligible	Very Low	Very Low	
	Store crude in caverns	Environment	Severe	Low	Medium	Significant	Very Low	Low	
Discharges	Maintain site structures	Water Quality	Significant	Very High	High	Moderate	Low	Low	3D
Energy Use	**Degas crude oil	Energy/Material Consumption	Significant	Very High	High	Negligible	Very Low	Very Low	

*Severity, frequency, and rank were determined using the SPR Risk Coding Matrix (AAA9020.1057).
The risk information provided on this table is based upon requirements in the ISO 14001: 2015 standard and does not directly correlate with the FFPO Enterprise Risk Matrix.

** Degas Plant and Drilling of Cavern Wells were not conducted in FY 2019.

EMS and Mission Effectiveness

Since its inception, the EMS has contributed to the effectiveness of the SPR mission. The EMS has reduced risk to the organizational mission, contributed to an improved fiscal efficiency/cost avoidance, provided greater understanding and recognition of environmental issues at all levels and improved community relations. Below are specific examples of how the EMS has contributed to mission effectiveness.

- Allows the SPR to operate more efficiently during congressionally mandated oil sales due to strong control of significant environmental aspects.
- Improves SPR's relationship with neighbors and regulators.
- Saves taxpayer money otherwise spent to correct environmental upsets such as crude oil spills and discharges that exceed permit limitations.
- Provides a management system to ensure compliance with compliance obligations.
- Provides a system to reduce environmental liability and risk.
- Formalizes the environmental portion of the ISM.

EMS Best Practices

In 2019, there were several EMS best practices implemented at the SPR. Every year a strategy is developed with recommendations for reaching the sustainability goals of EO 13834. Based on the strategy developed, DOE chooses which objectives to fund. This process is conducted annually to confirm choices for the following year and provide an opportunity to evaluate new strategies or programs. Quarterly sustainability meetings were held to evaluate progress in achieving EO 13834 goals. Progress is discussed at management review team meetings.

Additional 2019 EMS best practices included:

1. Updated significant aspect list to have an unmitigated risk column,
2. Created an ISO 14001 "Review Guide,"
3. Created an OA compliance table,
4. Added Significant Impact and Aspects slide to Environmental Trainings.

EMS Implementation Challenges

In 2019, there were three EMS implementation challenges identified:

1. Setting appropriate and achievable goals for the SPR, in support of overall DOE sustainability goals,
2. Ensuring the management system is adhered to and effective at all operating site locations,
3. Implementing effective training for site personnel; turnover rate - having to retrain employees,
4. Consistent EMS implementation at all four sites.

3.1 Sustainability

The SPR Sustainability Program was initiated in 2007 with the advent of EO 13423, broadened in 2009 with EO 13514, revised with EO 13693 in 2015, and revoked by EO 13834 in May 2018. EO 13834 focuses on resource conservation and pollution prevention of air, water, waste, and chemicals. The sustainability program is planned, implemented, monitored, measured, evaluated, reported, and improved through the SPR EMS.

Many SPR sustainability goals – identified as "objectives" in the EMS – were created during the initial development of the SPR EMS, after evaluating SPR activities and recognizing the environmental aspects of these activities that must be controlled. These are referred to as SPR-specific "institutional" objectives (see Table 3-1.) Other sustainability goals identified and mandated by the executive orders were included in the EMS in 2007, 2009, and 2015. All goals/objectives and their targets are called "performance measures" (see Table 3-3) and are discussed as follows.

Forty-five performance measures were tracked by the SPR EMS in FY19 (twenty-five sustainability goals/sub-goals and twenty institutional performance measures). A target is established for each objective/goal. Some objectives have two targets, a "minimum" level that all DOE contractors should meet and a more challenging "stretch" level.

Performance measures are either identified in the M&O contractor's contract Work Authorization Directives (WADs) as contract objectives, or they support the WADs, or they are delineated by the goals of EO 13834. FY19 was completed and tracked using EO 13834. Implementing instructions for EO 13834 were published in April 2019.

Performance measures are agreed upon for each fiscal year by DOE and the M&O contractor and tracked for success. Some focus on specific disciplines (such as the Environmental or Emergency Management departments), while others involve all disciplines. All performance measures were related to significant environmental aspects or interests of top management.

Refer to Tables 3-1 and 3-3 for a synopsis in meeting performance measures. Institutional performance measures have been monitored and measured annually for more than 12 years. They are based strictly on SPR-specific environmental aspects.

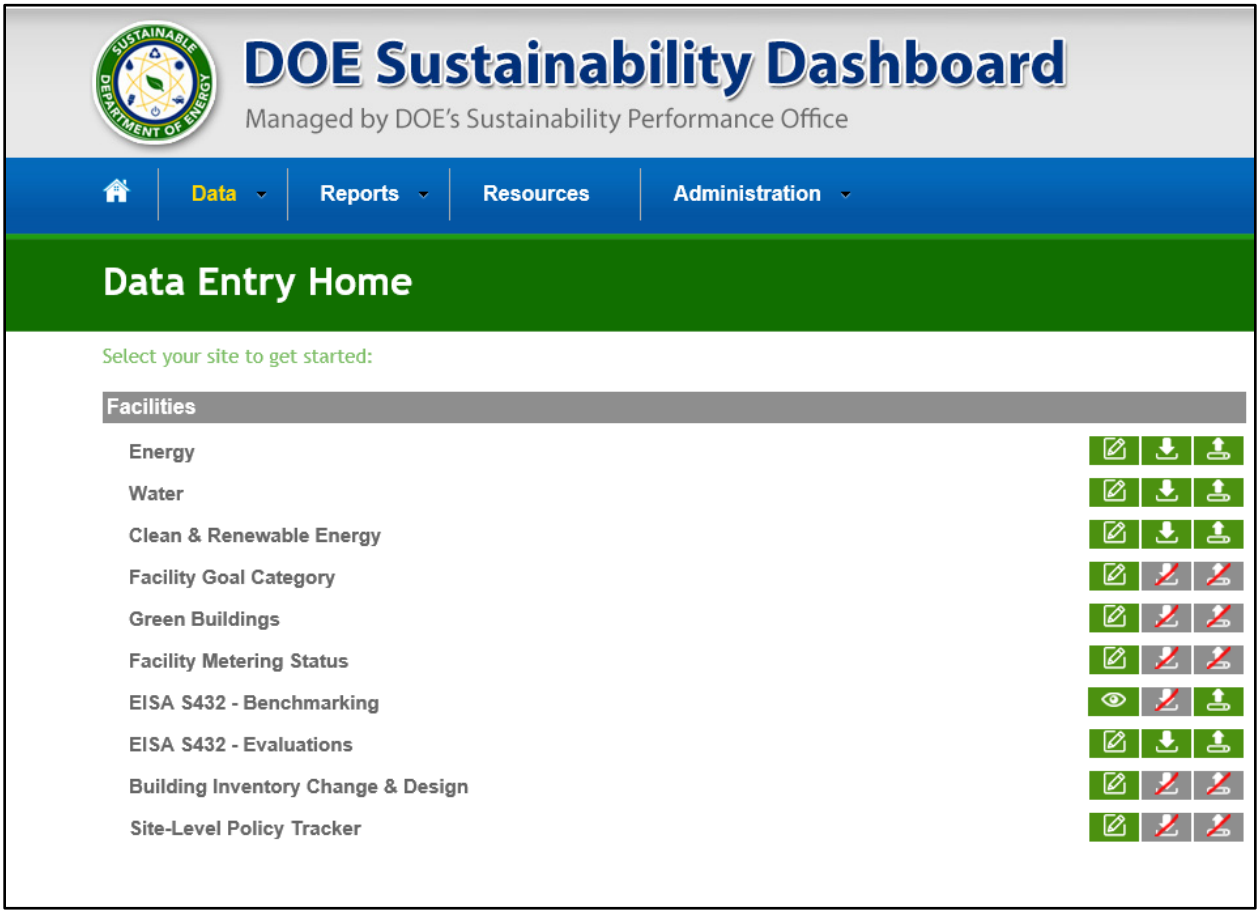
SPR sustainability goals, performance, and plans are now reported in and tracked by the DOE Sustainability Dashboard (Dashboard). A screenshot of a portion of the Dashboard input window is included as Figure 3-1. Table 3-3 provides a summary of the SPR performance toward meeting the goals. It also provides a summary of planned actions to meet the goals. Sustainability data for the SPR is annually entered into the Dashboard. The Dashboard calculates the SPR performance and displays it in a Comprehensive Scorecard. The Comprehensive Scorecard is used by the Dashboard to populate the table for performance. The Site Sustainability Plan (SSP) is included in the Dashboard. The Dashboard uses the SSP to populate the performance and plans in the table.

Table 3-3 FY 2019 Sustainability Goals, Performance, and Planned Actions				
Prior DOE Goal	**Current Performance Status**	**2 Year Performance & Plans**	**5 Year Performance & Plans**	**10 Year Performance & Plans**
Energy Management				
30% energy intensity (Btu per gross square foot) reduction in goal-subject buildings by FY 2015 from a FY 2003 baseline and 1.0% year over year thereafter.	Crude oil sales and LE 2 impacting consumption until smart metering is functional to exempt SPR HEMSF in the future.	Continue to replace fluorescent and sodium bulbs with LEDs and upgrade HVAC systems as necessary.	TBD	TBD
EISA Section 432 continuous (4-year cycle) energy and water evaluations.	Completed BH in FY19.	Complete WH during FY20 & start the new 4-year cycle in 2021 with BC.	Complete BM in FY22, BH in FY23, and WH in FY24.	Start the next 4-year cycle in FY25 with BC BM in FY26, BH in FY27, & WH in FY28.
Meter all individual buildings for electricity, natural gas, steam and water, where cost-effective and appropriate.	Implementing project to enhance metering system to improve data reliability.	Complete enhancements to metering system. Dependent on funding.	Use data from metering systems to develop projects.	TBD
Water Management				
20% potable water intensity (Gal per gross square foot) reduction by FY 2015 from a FY 2007 baseline and 0.5% year over year thereafter.	Crude oil sales and LE 2 impacting current activity.	Crude oil sales will affect use through 2028. Implement rainwater capture systems to replace potable water use in process and fire protection, and upgrades to building appliances using water. Dependent on funding. Previous DOE goal is unachievable under current mission.	TBD	TBD
Non-potable freshwater consumption (Gal) reduction of industrial, landscaping, and agricultural (ILA). Year over year reduction; no set target.	Crude oil sales and LE 2 impacting current activity.	Crude oil sales will affect use through 2028. Previous DOE goal is unachievable under current mission.	TBD	TBD
Waste Management				
Reduce at least 50% of non-hazardous solid waste, excluding construction and demolition debris, sent to treatment and disposal facilities.	82% diversion	Continue current successful processes and programs.	Continue current successful processes and programs.	Continue current successful processes and programs.
Reduce construction and demolition materials and debris sent to treatment and disposal facilities. Year over year reduction; no set target.	21% diversion	Continue current successful processes and programs.	Continue current successful processes and programs.	Continue current successful processes and programs.

Fleet Management				
20% reduction in annual petroleum consumption by FY 2015 relative to a FY 2005 baseline and 2.0 % year over year thereafter.	Have met annual reduction in overall consumption of petroleum and year over year thereafter.	Continued effort to acquire more fuel-efficient vehicles and reduce travel. Enforce employee business carpooling and vanpooling in leased vehicle fleet. Continue annual vehicle fleet optimization exercise. Promote video conferencing.	Continue from 2-Year Plan.	Continue from 5-Year Plan.
10% increase in annual alternative fuel consumption by FY 2015 relative to a FY 2005 baseline; maintain 10% increase thereafter.	Not feasible due to non-availability of alternative fuel.	Submitted an AFV waiver for FY 2018. Continued effort to replace conventional light-duty gasoline vehicles will depend upon fueling infrastructure. Infrastructure dependent upon funding.	Continue from 2-Year Plan.	Continue from 5-Year Plan.
75% of light-duty vehicle acquisitions must consist of alternative fuel vehicles (AFV).	Vehicles purchased based upon availability of fuel.	AFVs will be evaluated if light duty vehicles are purchased. Currently 65% of the leased fleet is classified as AFVs (E-85 fuel compatible)- Dependent on funding.	Continue from 2-Year Plan.	Continue from 5-Year Plan.
Clean & Renewable Energy				
"Renewable Electric Energy" requires that renewable electric energy account for not less than 7.5% of a total agency electric consumption by FY 2013 and each year thereafter.	Purchased 8.3% of consumption in Wind RECs.	Continue to purchase RECs as directed, based on statutory requirement and dependent on funding.	Continue from 2-Year Plan.	Continue from 5-Year Plan.
Continue to increase non-electric thermal usage. YOY increase; no set target but an indicator in the OMB scorecard.	Nothing active.	Funding dependent-install renewable energy generating equipment.	Continue from 2-Year Plan.	Continue from 5-Year Plan.
Green Buildings				
At least 15% (by count) of owned existing buildings to be compliant with the *revised* Guiding Principles for HPSB by FY 2020, with annual progress thereafter.	Nothing to report.	Funding dependent-building upgrades.	TBD	TBD
Net Zero Buildings: All new buildings (>5,000 GSF) entering the planning process designed to achieve energy net-zero beginning in FY 2020.	Not applicable, not reporting.			
Increase regional and local planning coordination and involvement.	Established programs involved with the regional and local planning.	Continue involvement.	Continue involvement.	Continue involvement.
Acquisition & Procurement				
Promote sustainable acquisition and procurement to the maximum extent practicable, ensuring BioPreferred and biobased provisions and clauses are included in all applicable contracts.	100%	Continue current successful processes and programs.	Continue current successful processes and programs.	Continue current successful processes and programs.
Measures, Funding, & Training				
Annual targets for sustainability investment with appropriated funds and/or financed contracts to be implemented in FY 2019 and annually thereafter.	On schedule for completing the current 4-year cycle on time.	Continue EISA Section 432 surveys and training personnel for energy	Continue from 2-Year Plan.	Continue from 5-Year Plan.

		management and other programs.		
Electronic Stewardship				
Purchases: 95% of eligible acquisitions each year are EPEAT-registered products.	99.4%	Continue current successful processes and programs.	Continue current successful processes and programs.	Continue current successful processes and programs.
Power management: 100% of eligible PCs, laptops, and monitors have power management enabled.	100%	Continue current successful processes and programs.	Continue current successful processes and programs.	Continue current successful processes and programs.
Automatic duplexing: 100% of eligible computers and imaging equipment have automatic duplexing enabled.	100%	Continue current successful process and programs.	Continue current successful process and programs.	Continue current successful process and programs.
End of Life: 100% of used electronics are reused or recycled using environmentally sound disposition options each year.	100% recycled	Continue current processes and programs-either donate or recycle old electronics.	Continue current processes and programs-either donate or recycle old electronics.	Continue current processes and programs-either donate or recycle old electronics.
Data Center Efficiency: Establish a power usage effectiveness target for new and existing data centers; discuss efforts to meet targets.	Evaluated metering data center, determined not feasible or practical.	Continue current life cycle equipment replacement to improve data center performance.	Continue from 2-Year Plan.	Continue from 5-Year Plan.
Organizational Resilience				
Discuss overall integration of climate resilience in emergency response, workforce, and operations procedures and protocols.	Resilience strategies being considered and included in project designs on an ongoing basis.	Resiliency strategies and projects will be incorporated into the Sustainability Program to the extent practicable. Incorporate natural hazards and resiliency plans into LE2 program planning and design.	Continue as stated.	Continue as stated.
Multiple Categories				
Year over year scope 1 and 2 GHG emissions reduction from a FY 2008 baseline.		Funding dependent-Complete conversion of all lighting to LEDs and purchase and use the most efficient vehicles on site.	Continue from 2-Year Plan	TBD
Year over year scope 3 GHG emissions reduction from a FY 2008 baseline.		Continue current processes and programs.	Continue current processes and programs.	Continue current processes and programs.

Figure 3-1 Dashboard Input Screenshot



4 Environmental Radiological Program Information

Radioactive sources at the SPR consist of electrically-generated X-rays that are used in laboratory and security scanning equipment or other sealed sources brought on site for performing radiography and cavern wire-line type logging operations. Procedures are in place to protect personnel from exposure during these operations. The SPR is subject to inspections by the nuclear regulatory agencies (Nuclear Regulatory Commission and National Nuclear Security Administration) and required notices to employees are posted on each X-ray scanning device and at entry points to rooms containing this equipment.

4.1 Sealed Sources

Sealed sources of radiation are used at the SPR for monitoring activities related to the physical properties of storage caverns and pipeline integrity. There were no issues involving sealed sources in 2019.

5 Environmental Permits and Programs

5.1 Environmental Permits

Environmental permits required to construct, operate, and maintain the four SPR storage sites are discussed in the following subsections.

The SPRPMO negotiated a 20-year long-term leasing arrangement, effective January 1, 2020, for continued use of the St. James site by ExxonMobil. ExxonMobil retains all responsibility for maintaining necessary permits at St. James concurrent with their operations of that lease.

There are no permits for the Stennis Warehouse facility. A Certificate of No Exposure, declaring that all activities are conducted in a manner that will not expose potential pollutants to storm water, was approved by the MDEQ instead of operating under a multi-sector general permit. The Certificate of No Exposure to storm water was renewed in October 2019 and is valid for five years. Air emissions from DOE's Stennis Warehouse operations are *de minimus*, requiring no permitting or reporting activity.

5.1.1 Bayou Choctaw Permits

Bayou Choctaw permits are listed in Table 5-1. Individual work permits are received from the Louisiana Underground Injection Control Division of LDNR for each well work over performed. State inspectors periodically visit the site to observe SPR operations. Bayou Choctaw operates under the water and air programs delegated to Louisiana by EPA.

Table 5-1 BC Environmental Permits

Permit Type	Permit Description	Issuing Agency	Permit Number	Effective Date	Expiration Date
Air	BC Air Emissions	LDEQ	1280-00015-03	6/12/17	6/11/27
Water	LPDES Water Discharge	LDEQ	LAG480540	3/28/16	11/30/20
Water	LPDES MSGP Storm Water Discharge	LDEQ	LAR050000	5/9/16	5/8/21
Water	LPDES Hydrostatic Test Water Discharge	LDEQ	LAG679016	3/23/18	3/22/23
Injection Wells	Letter of financial responsibility to plug and abandon BC injection wells	LDNR	None	1/11/83	Open
Construct & Maintain	Bull Bay 24" brine disposal pipeline	COE	LMNOD-SP (Bull Bay) 3	1/30/79	*

Table 5-1 BC Environmental Permits

Permit Type	Permit Description	Issuing Agency	Permit Number	Effective Date	Expiration Date
Construct & Maintain	BC brine disposal well pads	COE	LMNOD-SP (Iberville Parish Wetlands) 7	9/26/77	*
Construct & Maintain	BC brine disposal well pads and access roads	COE	LMNOD-SP (Iberville Parish Wetlands) 10	6/12/78	*
Construct & Maintain	Access roads to BC brine disposal well area	COE	LMNOD-SP (Iberville Parish Wetlands) 17	11/6/78	*
Construct & Maintain	Well pad, levees, access road, and equipment - BC Cavern 102	COE	LMNOD-SP (Iberville Parish Wetlands) 31	5/27/80	*
Construct & Maintain	Ring levee, drill site and equipment – BC Cavern 101	COE	LMNOD-SP (Iberville Parish Wetlands) 102	9/26/77	*
Construct & Maintain	36” petroleum products pipeline under and across Bayou Plaquemine	COE	LMNOD-SP (Bayou Plaquemine)	9/26/77	*
Construct & Maintain	Fill with culverts for parking	COE	WN-20-020-0168	4/2/02	*
Construct & Maintain	Culverts and fill for minor roadway crossings	COE	WT-20-020-2654	8/20/02	*
Construct & Maintain	Security fence with a concrete footing and curbing	COE	WT-20-020-3621	9/17/02	*
Construct & Maintain	Replacement N-S bridge at BC	COE	CT-20-030-1379-0	3/12/03	*
Construct & Maintain	Replacement brine disposal access road bridge	COE	CT-20-030-1501-0	3/28/03	*
Construct & Maintain	Bulkhead and fill for bank stabilization in N-S Canal at BC	COE	CT-20-030-3087-0	7/25/03	*
Construct & Maintain	Refurbished Bailey bridge crossing over Wilbert’s Canal	COE	MVN-2004-4453-CT	10/14/04	*
Construct & Maintain	Expanded clear sight security perimeter zone	COE	MVN-2003-2234-CT	2/2/06, 10/4/11	*

* COE permits remain active for the life of the structure.

5.1.2 Big Hill Permits

BH permits are listed in Table 5-2.

In 2019, the site appropriated 252.2 million gallons of water from the Gulf Coast Intracoastal Waterway (GIWW) exclusive of water for fire protection. This represents 3 percent of the annual water usage authorized. The certified annual report of water usage was forwarded to the TCEQ as required in 2019.

The M&O contractor is registered with TCEQ as a Public Water System Operations Company (registration # WC0000183) since Big Hill provides sanitary control of their purchased water distribution system on-site. The M&O contractor is also registered as a Wastewater Operations Company (registration #OC0000202).

Required annual reporting for 2019 involved the performance of a brine line integrity test sent to Region 6 EPA, raw water usage to TCEQ, Water Conservation Plan implementation reporting to the Texas Water Development Board; and crude oil pipeline system operations renewal (T4C) to the RRC.

Table 5-2 BH Environmental Permits

Permit Type	Permit Description	Issuing Agency	Permit Number	Effective Date	Expiration Date
Air	BH Air Emissions	TCEQ	9256	3/19/18	3/19/28
Air	BH Leaching Emissions	TCEQ	PBR 100485	1/24/12	Open
Air	BH Frac Tank Emissions	TCEQ	PBR 107009	2/20/13	Open
Water	NPDES Water Discharge	EPA	TX0092827	2/1/20	1/31/24
Water	Water Discharge	RRC	UHS-006	11/1/14	9/04/24
Water	Water Use	TCEQ	4045A	11/14/83	Open
Caverns	Operate & Construct & Maintain BH caverns	RRC	02939	11/28/83	Open
Construct & Maintain	RWIS, 48” raw water pipeline, 48” brine disposal pipeline, and 36” crude oil pipeline.	COE	SWGCO-RP 16536 (01,02,03,04,05)	1/11/84	Dredging clause to 12/2008 (Renew dredging clause when needed.)
Construct & Maintain	48” brine pipeline	F&WS	P-7	7/31/86	6/30/36

5.1.3 Bryan Mound Permits

BM permits are listed in Table 5-3. The Bryan Mound site has a permit from TCEQ for the appropriation of state waters for the cavern leaching program, site utility, and fire protection systems that are under the jurisdiction of the Brazos River Water Master Program for administration. The permit requires a monthly tally and forecasting communication and annual tally to be provided to the agency to assess management fee. In 2019, the site used a total of 197.2 million gallons of water from the Brazos River Diversion Channel, representing 2.0 percent of the annual water usage authorized.

The M&O contractor is registered with TCEQ as a Public Water System Operations Company (registration # WC0000183) since BM provides sanitary control of their purchased water distribution system on-site. The M&O contractor is also registered as a Wastewater Operations Company (registration #OC0000202).

Required annual reporting for 2019 included the successful brine line integrity test sent to Region 6 EPA, raw water usage to TCEQ, Water Conservation Plan implementation reporting to the Texas Water Department Board; and crude oil pipeline system operations renewal (T4C) to the RCC.

Table 5-3 BM Environmental Permits

Permit Type	Permit Description	Issuing Agency	Permit Number	Effective Date	Expiration Date
Air	BM Air Emissions	TCEQ	6176B	5/31/13	5/31/23
Air	BM Frac Tank Emissions	TCEQ	PBR Regulation	5/13/13	Open
Air	BMT-2 Air Emissions	TCEQ	PBR 142987	10/27/16	Open
Air	BM Leaching Emissions	TCEQ	PBR 100484	1/24/12	Open
Water	NPDES Water Discharge	EPA	TX0074012	2/1/20	1/31/24
Water	Water Discharge	RRC	UHS-004	11/1/14	9/04/24 (Application under Review by RRC)
Water	Water Use	TCEQ	5332A	7/20/81	Open
Pipelines	Operate BM Crude Oil Pipelines	RRC	04994	8/1/00	Open
Construct & Maintain	Maintenance dredging of BM Raw Water Intake Structure	COE	SWGCO-RP-12347 (03), SWG-2006-2568	2/22/78	12/31/2028
Construct & Maintain	30” crude oil pipeline to 3 miles SW from Freeport	COE	SWGCO-RP-11666	10/15/77	*
Construct & Maintain	30” crude oil pipeline to 2 miles S from Freeport	COE	SWGCO-RP-12112	7/25/77	*

Table 5-3 BM Environmental Permits

Permit Type	Permit Description	Issuing Agency	Permit Number	Effective Date	Expiration Date
Construct & Maintain	36" brine disposal pipeline and diffuser	COE	SWGCO-RP-12062 (03)	10/10/78	*
Construct & Maintain	General permit for pipeline crossings by directional drilling in navigable waters	COE	SWGCO-RP-14114 (01)	5/18/85	*
Construct & Maintain	6" PVC potable water line	COE TDH&PT	SWGCO-RP-16177, 82-8475	9/7/82 1/1/83	*
Construct & Maintain	BM cavern pads 101, 102, 103, 111 and 113.	COE	SWGCO-RP-13435 (01)	5/21/79	*

* COE permits remain active for the life of the structure.

5.1.4 West Hackberry Permits

West Hackberry permits are listed in Table 5-4.

Table 5-4 WH Environmental Permits

Permit Type	Permit Description	Issuing Agency	Permit Number	Effective Date	Expiration Date
Air	WH and Degas Air Emissions	LDEQ	0560-00019-04	2/20/12	8/20/21
Water	LPDES Water Discharge	LDEQ	LA0053031	6/1/16	5/31/21
Water	LPDES MSGP Storm Water Discharge	LDEQ	LAR050000	5/9/16	5/8/21
Water	LPDES Hydrostatic Test Water Discharge	LDEQ	LAG679016	3/23/18	3/22/23
Injection Wells	Letter of financial responsibility to close all WH injection wells	LDNR	None	1/11/83	Open
Injection Wells	Construct and Operate WH wells 117A and 117B	LDNR	971198-9	9/27/83	Open
Construct & Maintain	RWIS and 42" raw water pipeline	COE	LMNOD-SP (LTCS) 26	2/8/79	*
Construct & Maintain	Maintenance dredging for firewater canal and extended boat slip access	COE	LMNOD-SP (Black Lake) 31	10/26/82	*
Construct & Maintain	Erosion control dike and riprap	COE	LMNOD-SP (Black Lake) 43	7/26/84	*
Construct & Maintain	Parallel pipeline. Offshore brine line and diffuser remain inactive.	COE	LMNOD-SP (Gulf of Mexico) 2574	8/11/80	*

Table 5-4 WH Environmental Permits

Permit Type	Permit Description	Issuing Agency	Permit Number	Effective Date	Expiration Date
Construct & Maintain	36” crude oil pipeline from WH to Texoma/Lake Charles Meter Station	COE	LMNOD-SE (LTCS) 40	5/25/88	*
Construct & Maintain	42” crude oil pipeline	COE	LMNOD-SP (Cameron Parish Wetlands) 162	3/9/78	*
Construct & Maintain	42” crude oil pipeline crossings of waters and waterways in Texas	COE	SWGCO-RP-12342	3/28/78	*
Construct & Maintain	Brine disposal wells, well pads, and brine disposal pipelines (12”, 20” and 24”)	COE	LMNOD-SP (Cameron Parish Wetlands) 152	3/16/78	*
Construct & Maintain	Well pads, levees, and access roads (WH wells 110, 111, 112, 113, 114 and 115)	COE	LMNOD-SP (Cameron Parish Wetlands) 276	2/11/80	*
Construct & Maintain	Repair of exposed 42” crude oil pipeline	COE	WN20-000-3972-0	8/31/00	*
Construct & Maintain	Restored riprap along north perimeter dike adjacent to WH Cavern 6 and Black Lake	COE	WO-20-020-1136	1/25/02, 2/19/02	*
Construct & Maintain	Deposited fill in fire ditch	COE	WO-20-020-3607	10/23/02	*
Construct & Maintain	Boat ramp modifications and erosion control breakwater in Black Lake along the north side of WH.	COE	WW-20-030-3748	10/22/03	*
Construct & Maintain	Maintenance dredging of WH RWIS	COE	MVN-1997-00068-WW	6/09/15	6/09/20

* COE permits remain active for the life of the structure.

5.2 Air Quality Program

Air quality is maintained at the SPR via compliance with applicable provisions of the Clean Air Act and State Implementation Plans. The SPR sites operate in accordance with the provisions of the applicable state air permits.

The SPR sites are permitted by the LDEQ and TCEQ as minor sources for the following criteria pollutants: non-methane/non-ethane volatile organic compounds (VOC), nitrogen oxides (NOx), sulfur dioxides (SO_2), carbon monoxide (CO), and particulate matter less than 10 microns (PM_{10}). The Bayou Choctaw and West Hackberry air permits also include emission rates for the following hazardous air pollutants: benzene, ethylbenzene, n-hexane, toluene, and xylene.

The SPR sites are in attainment areas for all National Ambient Air Quality Standards, except for ozone. The Bryan Mound site is currently in an ozone non-attainment area. The Bayou Choctaw, Big Hill and West Hackberry sites are in ozone attainment areas.

The SPR ensures compliance with air permit limits by monitoring usage of emergency generators and pumps, volumes of crude oil, brine, diesel, and gasoline in the site tanks, and volume of paint used.

Fugitive monitoring of piping components (valves and pump seals) in crude oil service are inspected for VOC leaks by outside contractors (annually in Louisiana and biennially in Texas) using an organic vapor analyzer (OVA). Flanges are also inspected weekly by site operators in Texas. Annual fugitive monitoring was performed at Bayou Choctaw in September 2019 and at West Hackberry in August 2019. There were no leaks detected at either site. Biennial fugitive monitoring was not required at Big Hill or Bryan Mound in 2019.

The Big Hill and Bryan Mound external floating roof tanks require inspection of the primary seal (every 5 years) and the secondary seal (semi-annually) for visible tears, holes, or cumulative gaps exceeding regulatory limits. The BHT-7 semi-annual secondary seal inspections were performed in April and October 2019. The BMT-3 semi-annual secondary seal inspections were performed in June and December 2019. The secondary seals on both tanks had no visible holes, tears or other openings. There were no gaps exceeding 0.5 inches and the total gap area was less than 1.0 square inch per tank diameter for both tanks for all inspections. T he 5-year primary seal inspections of BHT-7 and BMT-3 were not required at Big Hill or Bryan Mound in 2019.

Annual air emissions were reported to TCEQ by Bryan Mound and Big Hill in 2019. The Bayou Choctaw and West Hackberry sites did not require reporting because they were below the required emission limit for reporting in Louisiana.

Table 5-5 is a summary of the SPR Site Air Emissions in Tons/Year (Metric Tons/Year) from 2014-2019. SPR emissions complied with permit limits for all six years, except for the 2015 Bryan Mound VOC emissions due to the roof failure of the BMT-4 crude oil tank.

Table 5-5 SPR Site Air Emissions in Tons/Year (Metric Tons/Year)

BC SPR Site	Volatile Organic Compounds	Nitrogen Oxides	Carbon Monoxide	Sulfur Dioxide	Particulates (less than 10 microns)
2014	0.54 (0.49)	0.47 (0.43)	0.10 (0.09)	0.00 (0.00)	0.03 (0.03)
2015	0.37 (0.34)	0.91 (0.83)	0.21 (0.19)	0.00 (0.00)	0.03 (0.03)
2016	0.65 (0.59)	0.21 (0.19)	0.05 (0.05)	0.00 (0.00)	0.01 (0.01)
2017	2.51 (2.28)	0.72 (0.65)	0.16 (0.15)	0.00 (0.00)	0.03 (0.03)
2018	0.56 (0.51)	0.47 (0.43)	0.10 (0.09)	0.00 (0.00)	0.02 (0.02)
2019	0.54 (0.49)	0.69 (0.63)	0.16 (0.15)	0.00 (0.00)	0.03 (0.03)
BH SPR Site	**Volatile Organic Compounds**	**Nitrogen Oxides**	**Carbon Monoxide**	**Sulfur Dioxide**	**Particulates (less than 10 microns)**
2014	2.57 (2.33)	0.22 (0.20)	0.05 (0.05)	0.01 (0.01)	0.01 (0.01)
2015	2.56 (2.32)	1.85 (1.68)	0.41 (0.37)	0.06 (0.05)	0.09 (0.08)
2016	2.77 (2.51)	0.42 (0.38)	0.09 (0.08)	0.02 (0.02)	0.02 (0.02)
2017	1.36 (1.23)	1.32 (1.20)	0.30 (0.27)	0.02 (0.02)	0.05 (0.05)
2018	5.96 (5.41)	0.25 (0.23)	0.06 (0.05)	0.01 (0.01)	0.01 (0.01)
2019	1.23 (1.12)	0.55 (0.50)	0.12 (0.11)	0.02 (0.02)	0.03 (0.03)
BM SPR Site	**Volatile Organic Compounds**	**Nitrogen Oxides**	**Carbon Monoxide**	**Sulfur Dioxide**	**Particulates (less than 10 microns)**
2014	4.55 (4.13)	9.56 (8.67)	2.19 (1.99)	0.03 (0.03)	0.29 (0.26)
2015	[3] 54.97 (49.87)	4.00 (3.63)	0.95 (0.86)	0.03 (0.03)	0.13 (0.12)
2016	[4] 15.90 (14.42)	15.94 (14.46)	3.65 (3.31)	0.04 (0.04)	0.48 (0.44)
2017	[4] 16.77 (15.21)	0.63 (0.57)	0.14 (0.13)	0.01 (0.01)	0.03 (0.03)
2018	[2], [4] 20.20 (18.33)	[2] 2.69 (2.44)	[2] 0.62 (0.56)	[2] 0.02 (0.02)	[2] 0.08 (0.07)
2019	[4] 18.00 (16.36)	0.46 (0.42)	0.10 (0.09)	0.01 (0.01)	0.02 (0.02)
WH SPR Site	**Volatile Organic Compounds**	**Nitrogen Oxides**	**Carbon Monoxide**	**Sulfur Dioxide**	**Particulates (less than 10 microns)**
2014	6.52 (5.91)	2.01 (1.82)	1.93 (1.75)	0.03 (0.03)	0.12 (0.11)
2015	8.69 (7.88)	5.13 (4.65)	5.00 (4.54)	0.02 (0.02)	0.36 (0.33)
2016	7.90 (7.17)	5.96 (5.41)	5.85 (5.31)	0.03 (0.03)	0.42 (0.38)
2017	11.35 (10.30)	5.05 (4.58)	6.08 (5.52)	0.02 (0.02)	0.42 (0.38)
2018	8.91 (8.08)	4.60 (4.17)	4.47 (4.06)	0.02 (0.02)	0.32 (0.29)
2019	9.72 (8.84)	0.47 (0.43)	0.11 (0.10)	0.00 (0.00)	0.01 (0.01)

[1] Footnote deleted.
[2] Includes emergency generator emissions from major maintenance project
[3] Includes BMT-4 tank failure emissions and BMT-3 landing losses
[4] Includes BMT-3 landing losses

5.3 Water Discharge Effluent Monitoring Program

COMPLIANCE DURING 2019

The SPR had one non-compliance from analyzed discharges for all sites.

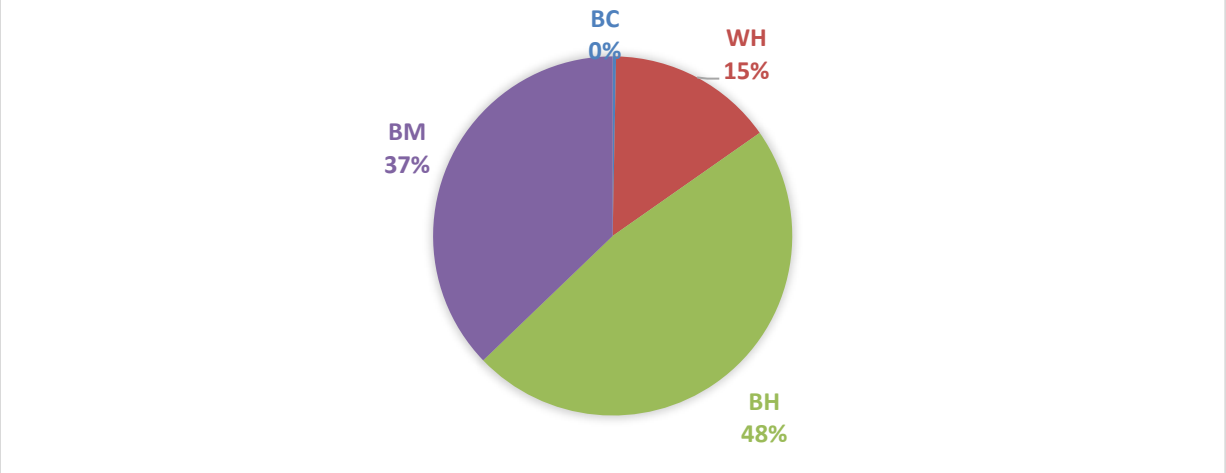
The water discharge permit-monitoring program fulfills the requirements of the EPA NPDES, and corresponding RRC Rule 8 and Louisiana LPDES programs. All SPR point source discharges are conducted in compliance with these federal and state programs.

SPR personnel regularly conducted point source discharges from the four storage sites: Bayou Choctaw, Big Hill, Bryan Mound and West Hackberry during 2019. These discharges are grouped as follows:

a. Brine discharged to the Gulf of Mexico (from Big Hill and Bryan Mound sites);
b. Storm water runoff from tank, well, and pump pads;
c. Rinse water from vehicles to permitted outfalls;
d. Efluent from packaged sewage treatment plants; and
e. Hydrostatic test water from piping and/or tanks.

The SPR disposed of 530 million m^3 of brine during 2019. Approximately 85% of the brine was disposed into the Gulf of Mexico via the Big Hill (48% of the total) and Bryan Mound (37% of the total) brine disposal pipelines. The remaining 15% was disposed in saline aquifers via injection wells at West Hackberry (15% of the total) and BC (0% of the total).

Figure 5-1 - SPR Brine Disposal 2019



Parameters monitored varied by site and point source discharge. Measurements and compliance rates observed during 2019 specific to each of the storage sites are discussed in the following subsections.

Discharge Monitoring Reports (DMRs) were prepared and submitted in accordance with site-specific permit requirements. All discharge permits issued to the SPR require quarterly reporting

to the appropriate agency(s) (LDEQ, RRC and EPA). Should a non-compliance or reportable bypass occur during the reporting period, an explanation of the cause and actions taken to correct the event are included in the corresponding quarterly report.

As a testament to safe operations and commitment to protecting the environment during 2019, the SPR had only one non-compliance from analyzed discharges. It occurred at bayou Choctaw and is described in the following subsection.

5.3.1 Bayou Choctaw

Table 5-6 includes permitted outfalls, required monitoring parameters, number of permit exceedances, samples collected, compliant samples, and percent of samples in compliance for the Bayou Choctaw outfalls.

Monitoring is related to water discharges regulated under the LDEQ Office of Water Resources LPDES permit. Discharges are from two packaged sewage treatment plants, a vehicle/equipment rinsing station and storm water runoff from well pads, pump pads, and containment areas. The LPDES MSGP provides storm water runoff limitations and monitoring requirements. A LPDES permit also exists for the discharge of hydrostatic test water. There were, however, no hydrostatic test water discharges during 2019.

There was **one** permit non-compliance during 2019. Outfall 01A exceeded the permit limit for TSS. The remaining parameters were within limits and indicate a properly working sanitary wastewater system. The TSS exceedance was caused by improper sampling. The sample was collected while the circulating pump was in use, causing solids to be agitated. A subsequent TSS sample was collected using correct sampling conditions and produced results within the permit limit. Due to the TSS exceedance, the site was 96 percent compliant. There have been two permit non-compliances in 2015, zero in the following years and only the one TSS exceedance in 2019.

Table 5-6 Bayou Choctaw Outfall Sampling Parameters

Permit	Outfall	Parameters	# of Permit Exceed-ances	# of Samples Taken	# of Compliant Samples	Permit Com-pliance	Date(s) Exceeded	Description/ Solution
LAG480540	01A 01B Treated sanitary wastewater	Flow BOD_5 TSS pH Fecal Coliform	1	24	23	96%	N/A	N/A
	002 Exterior vehicle and equipment wash water	Flow COD TSS O&G pH	0	15	15	100%	N/A	N/A
	009 Storm water runoff	Systematic Visual Observation	N/A	N/A	N/A	100%	N/A	N/A
LAG679016	001 Hydrostatic test water	Flow, TSS TSS-NetO&G TOC, Benzene Total BenzeneTotal BTEX Lead, Total pH	N/A	0	N/A	100%	N/A	N/A

5.3.2 Big Hill

Table 5-7 includes permitted outfalls, required monitoring parameters, number of permit exceedances, samples collected, compliant samples, and percent of samples in compliance for the Big Hill outfalls. There were **zero** permit non-compliances during 2019. The site was 100 percent compliant. There have been four permit non-compliances in previous years: 1 in 2015, 2 in 2014, and 1 in 2013.

Table 5-7 Big HillH Outfall Sampling Parameters

Permit	Outfall	Parameters	# of Permit Exceed-ances	# of Samples Taken	# of Compliant Samples	Permit Com-pliance	Date(s) Exceeded	Description/ Solution
TX0092827	001 Brine to the Gulf of Mexico	Flow Exit Velocity Density O&G TDS TSS pH Biomonitoring Integrity Tests	0	146	146	100%	N/A	N/A
	002 Hydroclone Blowdown	Flow pH TSS	N/A	0	N/A	100%	N/A	N/A
	Storm water: 003-14 cavern pads 005-electrical substation pump 006-Surge Tank area 007-Meter prover & crude oil meter skids 008-RWIS	pH Salinity O&G TOC	0	59	59	100%	N/A	N/A
	004 Treated sanitary wastewater	Flow TSS BOD_5 pH	0	48	48	100%	N/A	N/A
	009 Recirc. water at RWIS	Flow pH	0	22	22	100%	N/A	N/A

Monitoring is related to water discharges regulated under the EPA NPDES permit program and the similar RRC discharge permit program (Rule 8). Discharges are brine to the Gulf of Mexico, hydroclone blow down into the Intracoastal Waterway, storm water from well pads and pump pads, effluent from the sewage treatment plant, and recirculated raw water at the RWIS. There were no discharges during 2019 from the hydroclone blow down system.

5.3.3 Bryan Mound

Table 5-8 includes permitted outfalls, required monitoring parameters, number of permit exceedances, samples collected, compliant samples, and percent of samples in compliance for the Bryan Mound outfalls. There were **zero** permit non-compliances during 2019. The site was 100 percent compliant. There have been five permit non-compliances in previous years: 1 in 2016, and 4 in 2014.

Monitoring is related to water discharges regulated under the EPA NPDES permit program and the similar RRC discharge permit program (Rule 8). Discharges are brine to the Gulf of Mexico, storm water from well pads and pump pads, effluent from the sewage treatment plant, and recirculated raw water at the RWIS.

Table 5-8 Bryan Mound Outfall Sampling Parameters

Permit	Outfall	Parameters	# of Permit Exceed-ances	# of Samples Taken	# of Compliant Samples	Permit Com-pliance	Date(s) Exceeded	Description/ Solution
TX0074012	001 Brine to the Gulf of Mexico	Flow Exit Velocity Density O&G TDS TSS pH Biomonitoring Integrity Tests	0	156	156	100%	N/A	N/A
	002 Treated sanitary wastewater	Flow pH TSS BOD_5	0	48	48	100%	N/A	N/A
	Storm water: 003- 20 cavern pads & other 004-HPPP 005- Tank farm	pH Salinity O&G TOC	0	24	24	100%	N/A	N/A
	006 Recirculated water at RWIS	Flow pH	0	22	22	100%	N/A	N/A

5.3.4 West Hackberry

Table 5-9 provides permitted outfalls, required monitoring parameters, number of permit exceedances, samples collected, compliant samples, and percent of samples in compliance for the West Hackberry outfalls. There were **zero** permit non-compliances during 2019. The site was 100 percent compliant. There have been zero permit non-compliances in the previous 5 years.

Monitoring is related to water discharges regulated under the LDEQ Office of Water Resources LPDES permit. Discharges are from a packaged sewage treatment plant, a vehicle/equipment rinsing station, non-contact cooling tower blowdown and storm water runoff from the degasification plant. Although not listed as an outfall, storm water runoff from well pads, pump pads, and containment areas are visually inspected quarterly. The LPDES MSGP provides storm water runoff limitations and monitoring requirements. A LPDES permit also exists for the discharge of hydrostatic test water. There were, however, no hydrostatic test water discharges during 2019. There were no discharges during 2019 from the hydroclone blow down system.

Table 5-9 West Hackberry Outfall Sampling Parameters

Permit	Outfall	Parameters	# of Permit Exceed-ances	# of Samples Taken	# of Compliant Samples	Permit Com-pliance	Date(s) Exceeded	Description/ Solution
LA0053031	002 Treated sanitary wastewater	Flow BOD_5 TSS pH Fecal Coliform	0	20	20	100%	N/A	N/A
	003 Exterior vehicle and equipment wash water	Flow COD TSS O&G pH	0	20	20	100%	N/A	N/A
	004 Non-contact cooling tower	Flow TOC pH Temperature	N/A	0	N/A	100%	N/A	N/A
	005 Storm water runoff from the degasser unit	Flow TOC O&G pH	0	16	16	100%	N/A	N/A
LAG679016	001 Hydrostatic test water	Flow TSS TSS-Net O&G TOC Benzene Total BTEX Lead, Total pH	N/A	0	N/A	100%	N/A	N/A

5.4 Surface Water Quality Surveillance Monitoring Program

Surface waters at the Bayou Choctaw, Big Hill, Bryan Mound, and West Hackberry SPR sites are scheduled to be sampled monthly for general water quality according to the SPR EMP. Water quality monitoring is conducted to provide early detection of potential surface water quality degradation possibly resulting from SPR operations. It is separate from, and in addition to, the water discharge permit monitoring program.

The parameters monitored are pH, salinity, total organic carbon (TOC), dissolved oxygen (DO), oil and grease (O&G), and temperature.

- pH is a measure of the acidity/alkalinity of water. It ranges from 0 to 14, with 7 being neutral. Excessively high and low pH can be detrimental to water usage.
- Salinity is the measure of all the salts dissolved in water. The average ocean salinity is 35 ppt and the average river water salinity is 0.5 ppt or less.
- TOC is a measure of the total amount of carbon in organic compounds in water and can be an indication of contamination.
- DO refers to microscopic bubbles of gaseous oxygen (O_2) that are mixed in water and available to aquatic organisms for respiration. DO can be affected by natural influences such as temperature and salinity. DO concentration decreases as water temperature increases. DO concentration decreases as salinity increases. Thus, salinity and temperature are monitored to correlate with DO results.
- O&G can interfere with biological life in surface waters and create unsightly films.

Maps with locations of the surface water monitoring stations at each site are included in Appendix D, Figures D-1, D-3, D-5 and D-7. The number of surface water monitoring stations varies at each site:

- Bayou Choctaw-7
- Big Hill-5 (Includes Station A that is no longer sampled because it does not hold water and has been backfilled with vegetation over the years.)
- Bryan Mound-10
- West Hackberry -6.

Data from 2019 from each site is presented in Appendix D, Tables D-1, D-3, D-5 and D-7. Surface water at all sites exhibited neutral pH, and O&G readings were below the detectable limit of 5 mg/l. This indicates no oil impacts from SPR activities during any of the 2019 sampling episodes.

Annual averages of parameters measured in the last 5 years at each site are included in Tables D-2, D-4, D-6 and D-8. Graphical representation of the data is included in Figures D-2, D-4, D-6 and D-8. The parameter results have not fluctuated significantly within the last 5 years at each site.

The small fluctuations in the data are likely due to non-standardized time of sampling, differing meteorological conditions, and varying seasonal and environmental factors. The overall surface water data at the SPR sites has remained consistent indicating no evident surface water quality impacts from SPR operations.

5.5 Waste Management and Pollution Prevention Programs

The Waste Management Program is responsible for managing hazardous and non-hazardous waste generated by SPR operations. Site personnel and waste management personnel collaborate to ensure all waste generated at the SPR is accumulated, characterized and disposed or recycled in accordance with federal, state, and local regulations.

SPR operations, maintenance, and construction activities generate a variety of waste streams. Common wastes and recyclable materials generated at the SPR include:

1. Hazardous waste such as lab waste and crude oil contaminated material with a hazardous characteristic,
2. Non-hazardous waste such as office trash and industrial waste without a hazardous waste characteristic or code,
3. Recyclable materials such as paper, plastic, batteries, and used oil,
4. Construction and demolition (C&D) waste such as scrap metal and concrete, and
5. Exploration and production (E&P) waste such as brine or crude oil contaminated products without a hazardous waste characteristic.

The SPR characterizes all E&P wastes to determine if they exhibit hazardous characteristics. Wastes that exhibit a hazardous characteristic are managed and disposed of as hazardous waste. Non-hazardous wastes generated by the E&P process are disposed at state-approved E&P disposal facilities.

Quantities of waste generated for each waste category over the past five years at the SPR are provided in the bottom portion of Figure 5-2, and their percentages charted in the top portion of the figure. The SPR generated a significant amount of C&D and E&P waste in 2019 compared to previous years. The increase in C&D and E&P waste in 2019 is attributed to two episodic generation events.

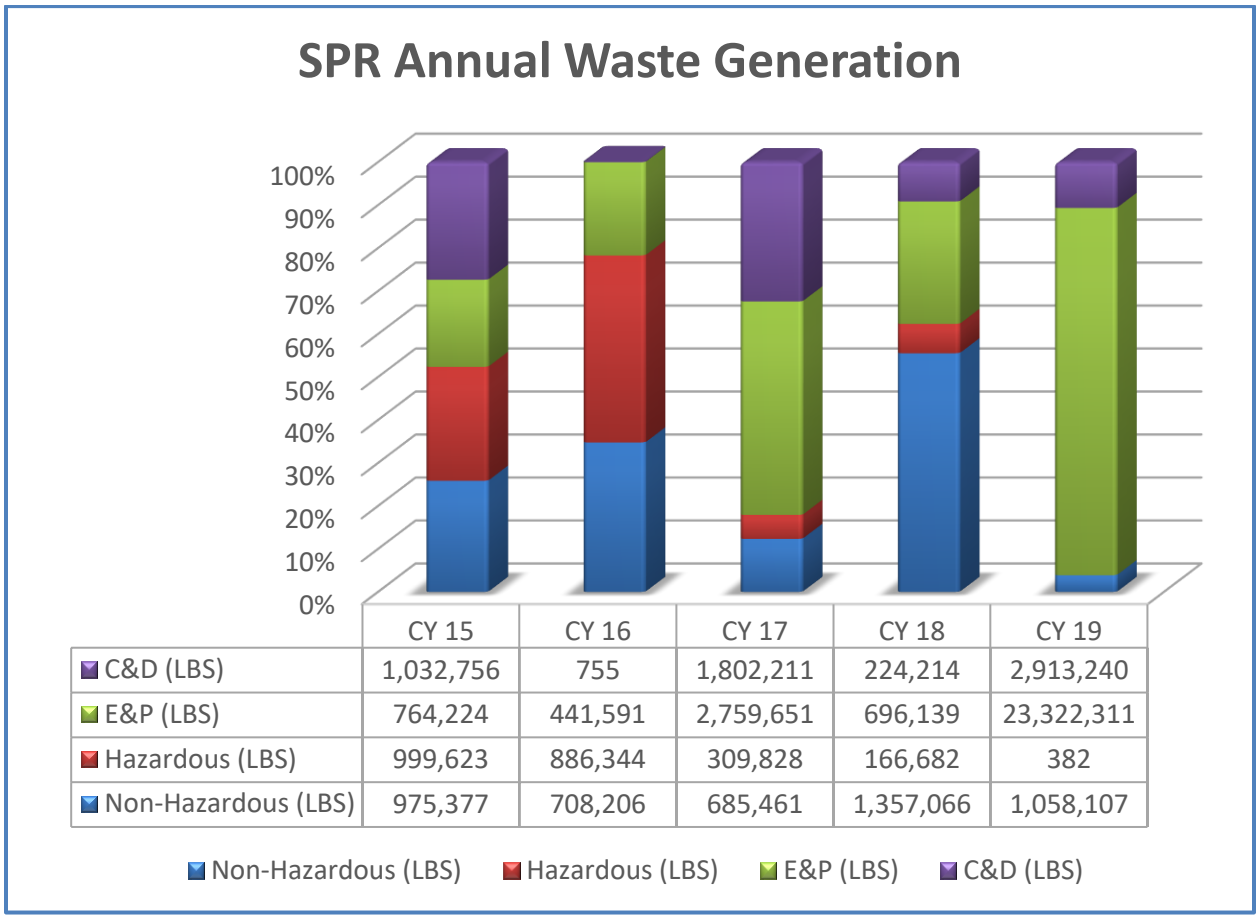
The first episodic event was the brine pond sediment remediation project that generated 20,558,220 pounds of excavated sediment. The sediment excavated during this project accounts for 75% of the total amount of waste generated at the SPR in 2019. A brine pond (Pond 9) was constructed during the primary construction of the Big Hill site in the mid 1980's. Pond 9 operated as a settling pond for brine generated by the leaching process used to create subsurface caverns for petroleum storage in a salt dome. The pond was used for various operation activities after cavern construction was completed. During the years of operation, insoluble solids settled in the pond including anhydrite and trace amounts of hydrocarbons. The SPR decided to close Pond 9 and create a shallower operating pond in its location. A Closure Plan was developed for removal of pond sediment with chloride and total petroleum hydrocarbon concentrations above established remedial goals. Sediment exceeding remedial goals was characterized as non-hazardous E&P waste and successfully removed between May and November 2019.

The second episodic generation event that occurred in 2019 was the generation of timber mats associated with the construction of a 220,000-barrel tank at Bryan Mound (BMT-2). The contractor constructing BMT-2 used wooden mats around the base of the tank to support heavy

equipment and machinery. Upon completion of construction, the mats were required to be removed. During the removal process, it was impossible to segregate the disintegrated wooden pieces of the mats from the surrounding mud. Therefore, the mud and wood mixture was excavated and hauled off for disposal. A total of 2,084,770 pounds of the mud and wood mixture were disposed. The extremely high quantity of waste generated prevented the SPR from achieving the 50% diversion goal for C&D waste for fiscal year 2019, marking the only year the goal wasn't met since the C&D diversion goal was established in 2014. If the mud and wood mixture was excluded from the total C&D waste for FY19, the 50% diversion rate would have been met, as the SPR recycled 577,610 pounds out of a total 646,870 pounds of C&D waste generated in FY 2019.

The SPR generated less hazardous waste in 2019 compared to previous years, because all waste generated during well workover was characterized as non-hazardous waste. During a typical year, well workover activities will generate a vacuum box of waste with a hazardous characteristic that is sent for reclamation.

Figure 5-2 SPR Annual Waste Generation



	CY 15	CY 16	CY 17	CY 18	CY 19
C&D (LBS)	1,032,756	755	1,802,211	224,214	2,913,240
E&P (LBS)	764,224	441,591	2,759,651	696,139	23,322,311
Hazardous (LBS)	999,623	886,344	309,828	166,682	382
Non-Hazardous (LBS)	975,377	708,206	685,461	1,357,066	1,058,107

Some of the activities that SPR waste management personnel conducted or supported in 2019 include:

- Coordinated with Construction personnel during the Pond 9 sediment excavation project in which over 20 million pounds of sediment was excavated.
- Coordinated with Construction personnel to recycle asphalt and concrete generated during a fire line repair at the Bryan Mound site.
- Coordinated with Construction and Engineering personnel to recycle concrete and scrap metal and dispose of timber mats generated during the construction of a 220,000-barrel crude oil storage tank at the Bryan Mound site.
- Coordinated with Construction personnel to recycle hydroexcavated soil generated during a seaway terminal excavation at the Bryan Mound site.
- Coordinated with Construction and Industrial Hygiene personnel to dispose of asbestos containing material (ACM) abated from the crude oil laboratory at the Big Hill site, a bathroom at the West Hackberry site, and from window caulking from a building at the Bayou Choctaw site.
- Coordinated with Operations personnel to recycle spent blast media generated during blasting and painting activities on wellheads at the Big Hill site.
- Coordinated with Lab Chemists to manage hazardous waste generated from crude oil testing associated with transporting 14.19 million barrels (MMbbl) of crude oil during oil sales.
- Coordinated with Construction personnel to ensure proper management of C&D waste generated during the demolition of Building 413 at the Bayou Choctaw site.
- Coordinated with Construction personnel to recycle 154,150lbs of concrete generated during the sewage treatment plant demolition project at West Hackberry.
- Coordinated with site construction personnel at Bryan Mound to dispose of AFFF that was evacuated from a fire water line.
- Coordinated with Operations staff to recycle spent blast media and soils generated during cellar cleanout activities at the West Hackberry site.
- Coordinated the reclamation of material generated from cleaning out an oil water separator and the pigging of crude oil transmissions lines from the West Hackberry site.
- Coordinated with Caverns personnel to ensure waste generated during well workover activities on Cavern 109 at West Hackberry was correctly managed.
- Coordinated with Caverns and Operations personnel to recycle 1,089,700 lbs. of sand generated during the brine disposal well cleanout activities at the West Hackberry site.
- Coordinated with Operations personnel to reclaim crude oil-contaminated solids that were generated from a crude oil release that occurred from a valve at the Big Hill Site.

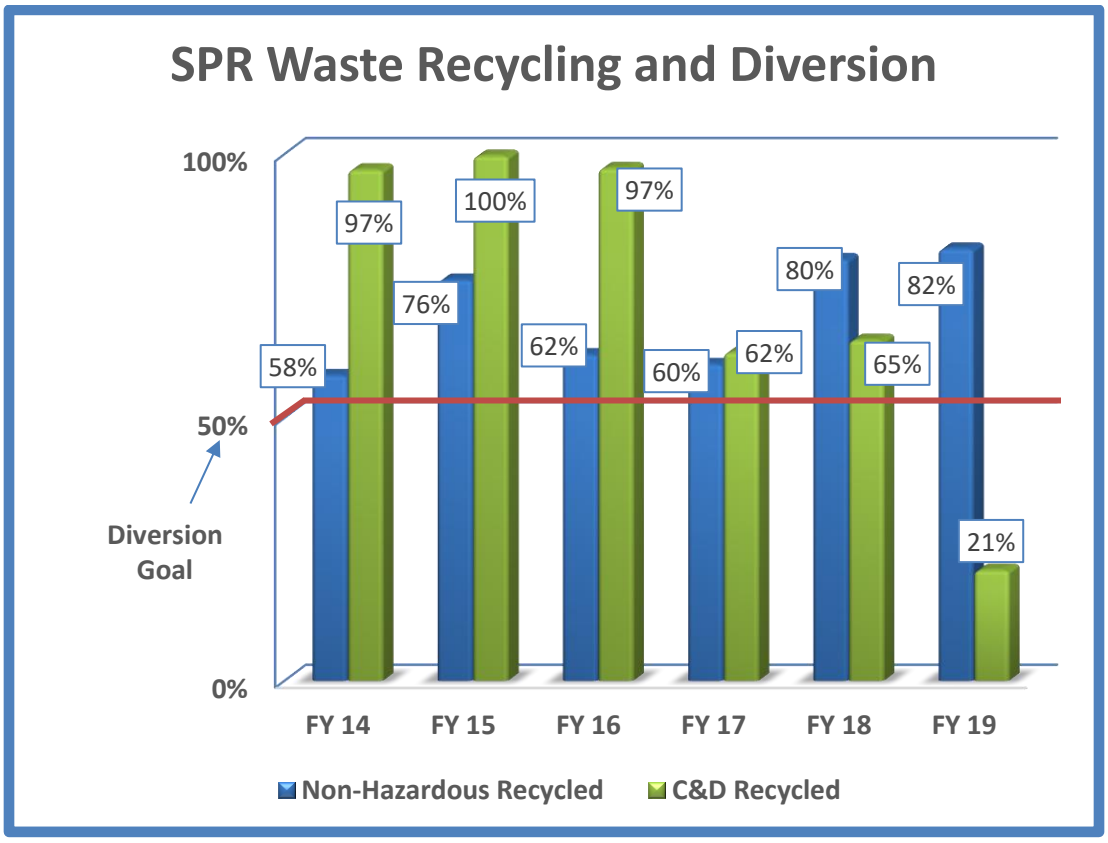
The SPR places a high priority on protecting the environment. Since its creation in 1997, the SPR's Pollution Prevention Program has worked to minimize risks to the environment while supporting the SPR's mission. Waste minimization is a key component of the Pollution Prevention program. Waste minimization is considered in all levels of decision making at the SPR and is the responsibility of all employees. Planned activities to minimize waste generation include:

- Eliminate product need.
- Reduce the amount of product needed and procure only enough to complete the task.

- Select appropriate package sizes to prevent excess.
- Reuse products until they are completely spent.

The SPR exceeded the DOE departmental goals to divert (recycle) 50% of non-hazardous waste and 50% of C&D waste over the previous five years (2014 through 2018). A combination of SPR employees following the waste minimization planned activities and managing a rigorous recycling program contributed to the SPR exceeding the waste diversion goals. However, as previously mentioned in this section of the report, the SPR did not achieve the waste diversion goal for C&D waste in 2019 due to an episodic event at the BMT-2 project. Figure 5-3 shows the percentage of non-hazardous and C&D waste that was recycled from FY 2014 through FY 2019.

Figure 5-3 SPR Waste Recycling and Diversion



Significant SPR projects that contributed a substantial amount of recyclable material in 2019 included:

- The asphalt and concrete generated during a fire line repair at the Bryan Mound site,
- Concrete and scrap metal generated during construction of BMT-2 at the Bryan Mound site,
- Hydroexcavated soil generated during a Seaway Terminal excavation at the Bryan Mound site,
- Spent blast media generated during blasting and painting of wellheads at the Big Hill site,

- Concrete generated during the demolition of Building 413 at the Bayou Choctaw site,
- Concrete generated during the sewage treatment plant demolition project at the West Hackberry site,
- Spent blast media and soils generated during cellar cleanout activities at the West Hackberry site,
- Oil-impacted material generated from cleaning out an oil water separator and pigging crude oil transmissions lines from West Hackberry site,
- Sand generated during the brine disposal well cleanout activities at the West Hackberry site, and
- Crude oil-contaminated soil from the clean-up associated with a crude oil release at the Big Hill Site.

Materials recycled in 2019 are summarized in Table 5-10.

Table 5-10 SPR Recycled Materials

Category	Recycled (lbs.)	Recycled (kg.)
Aluminum-Plastic Comingled	1,165	528
Asphalt (C&D)	58,000	26,308
Ballasts	60	27
Blast Abrasives	184,288	83,591
Brine and Crude Contaminated Inert Solids	1,089,700	494,279
Brine and Crude Residual Contaminated Concrete Slurry (E&P)	80,782	36,642
Brine and Crude Residual Contaminated Concrete and Soil Cuttings (E&P)	60,416	27,404
Brine and Crude Residual Contaminated Wash Solution (E&P)	216,898	98,383
Capacitors	23	10
Cardboard	34,622	15,704
Concrete (C&D)	294,910	133,768
Crude Oil Contaminated Inert Solids (E&P)	1,112,445	504,596
Crude Oil Contaminated Pigging Solids (Hazardous)	357	161
Electronics	137	62
Fuel Filters	10	4
Lamps (Hazardous)	3.4	1
Lamps (Non-Hazardous)	354	160
Oil Filters	163	73
Oil Water Separator Sludge (E&P)	11,300	5,125
Office Paper	150,729	68,369
Plastic	889	403

Scrap Metal	76,572	34,732
Scrap Metal (C&D)	379,680	172,219
Soil Miscellaneous	340,000	154,221
Toner Cartridges	1,090	494
Used Oil	2,452	1,112

While waste minimization and recycling are key aspects of the SPR's Pollution Prevention program, there are several other elements that are critical to the success of the program. The other elements include:

- Toxic substance reduction/substitution
- Resource conservation (water, energy)
- Sustainable acquisition, i.e., affirmative procurement, bio-based products, environmentally preferable products, and energy and water efficient products
- Greenhouse gas reduction

These elements, except for sustainable acquisition, are discussed in other sections of this report as they pertain to either Sustainability (Section 3) or Chemical Management (Section 5.6).

The SPR achieved the 100% affirmative procurement target for FY19. All purchases qualified as recycled products or justified products. There were no unjustified purchases of virgin products in 2019.

Pollution Prevention announcements and suggestions are communicated to SPR personnel through the SPR's newsletter "What's Happening," and routine email distributions including pertinent local information and useful web links. These communications are published on the M&O Contractor Environmental webpage, which is available to all SPR employees.

5.6 Chemical Management Program

5.6.1 Qualified Products List and SARA Title III Tier Two Reports

Chemical containing products used at the SPR must be on the Qualified Products List (QPL). The QPL is used to control and limit the quantity of toxic constituents found in chemical products and minimize hazardous waste generated.

Chemicals requested for QPL inclusion are reviewed for potential impacts to the environment, generation of wastes, adherence to the SPR building specifications and green requirements for paints, adhesives and sealants; recycled content in materials; and minimization or exclusion of constituents that contain EPA's 17 High Priority Toxic Chemicals.

SARA Title III Tier Two reports, also known as Emergency Planning and Community Right-to-Know Act (EPCRA) Section 312 reports, were prepared and submitted to state agencies as required by March 1, 2020. The SARA reports were also distributed to

appropriate state and local emergency planning committees and local fire departments. Table 5-11 contains a summary of the inventory information that was submitted for 2019.

Table 5-11 2019 SARA Title III Tier Two Summary for the SPR

SPR Site	Chemical Name (Category)	*Inventory Amount (lbs.)	Location on Site
BC	Crude Oil Petroleum	> 1 Billion	Site Tanks, Piping, Underground Caverns
	Diesel Fuel	24,999 – 49,999	Emergency Generator Fuel Tank, Workover Rig
	Diesel Fuel #2	24,999 – 49,999	Property Tank #2
	Gasoline, Including Casing Head	5,000– 9,999	Property Tank 1
	GMA Garnet	1,000 – 4,999	Flammable Storage Building
	Nitric Acid	0 – 99	Environmental Laboratory
	Nitrogen Balance Gas	0 – 99	Control Building
	Sulfur in Petroleum Crude Oil	0 - 99	Environmental Laboratory
	Xylene	0 – 99	Envir Flam. Cabinet
BH	Asphalt	10,000 – 24,999	Laydown Yard
	Aer-O-Water 3EM 3%	10,000 – 24,000	Operations Buildings 834 and 805
	Chemguard 3% MS AFFF C301	25,000 – 49,999	Operations Buildings 16, 805 and 834
	Crude Oil Petroleum	> 1 Billion	Flammable Storage Building, Site Tanks, Piping, Underground Caverns
	Diesel Fuel	25,000 – 49,999	Operations, BHT-4, 11, and 50, BHSE-196 Trailer, and Property Annex BHT-51
	Gasoline	10,000 – 24,999	BHT-52
	GMA Garnet	10,000 – 24,999	Maintenance Laydown Yard
	Hydrochloric Acid	0 – 99	Environmental Laboratory
	Hydrogen Sulfide	0 – 99	I&C Office
	Nitric Acid	0 – 99	Environmental Laboratory
	Non-Flammable Gas Mixture	0 – 99	I&C Office
	Potassium Chloride	0 – 99	Environmental Laboratory
	Sulfur in Petroleum Crude Oil	0 – 99	Environmental Laboratory
	Sulfuric Acid	0 – 99	Environmental Laboratory
	Xylene	0 – 99	Crude Oil Storage Bldg.

Table 5-11 2019 SARA Title III Tier Two Summary for the SPR

SPR Site	Chemical Name (Category)	*Inventory Amount (lbs.)	Location on Site
BM	1-125 PPM Vol. Hydrogen Sulfide Balance Nitrogen – Cal. Gas	0 – 99	Warehouse
	Chemguard 3% MS AFFF C301	75,000– 99,999	Operations Buildings 206 and 242
	Crude Oil Petroleum	1 Billion	Site Tanks, Piping, Underground Caverns
	Diesel	25,000 – 49,999	Fuel Tank, BMT-20, 29 and 18
	Gasoline	10,000 – 24,999	Fuel Tank and Operations Building 242
	1PPM H2S Cricket Gas	100 – 499	Buildings 201 and 244
	Non-Flammable Gas Mixture 4-1 F/Calibration Gas	0 – 99	Buildings 201 and 244
	Non-Flammable Gas Mixture – 25PPM H2S (58)	0 - 99	Warehouse
	Sealed Lead Acid Battery	500 – 900	Warehouse
Offsite Pipelines	Crude Oil, Petroleum	50,000,000 – 99,999,999	Pipelines in Calcasieu Parish, La (West Hackberry)
	Crude Oil, Petroleum	10,000,000 – 49,999,999	Pipelines in Cameron Parish, La (West Hackberry)
NO	Diesel Fuel	100 – 999	Tank, Building 850
	Diesel Fuel	1,000 – 4,999	Tank, Building 900
Stennis	Motor Oil 15W 40	25,000 – 49,999	West Wall
WH	Amercoat 68 HS Powder	100 – 999	Flammable Storage Building
	Amerlock 2 Cure	100 – 999	Paint Locker
	Ansulite 3% AFFF	5,000 – 9,999	Operations Foam Storage Building
	Crude Oil Petroleum	> 1 Billion	LCMS Piping, Site Tanks, Piping, Underground Caverns
	Diesel Fuel	5,000 – 9,999	MTC, Fuel Pump Tank
	Diesel Fuel #2	1,000 – 4,999	Workover Rig
	FC-203CF Lightwater Brand AFFF	5,000 – 9,999	Operations Foam Storage Building
	Gasoline	10,000 – 24,999	Fuel Pump Tank, Laydown Yard and HPPP Flammable Cabinet
	GMA Garnet	5,000 – 9,999	MTC, Paint Laydown Yard
	Hydrochloric Acid	0 – 99	Environmental Laboratory
	Mobil DTE Oil BB	1,000 – 4,999	Degas General
	Mobil DTE Oil Heavy	5,000 – 9,999	Degas General
	Nitrogen	5,000 – 9,999	MTC Laydown Yard
	Sulfur in Petroleum Crude Oil	0 - 99	Environmental Lab
	Synfilm Air Compressor Oil NGL 48	1,000 – 4,999	Flammable Storage Building
	Sulfuric Acid	0 – 99	Environmental Lab

* Reporting range specified by LA and TX SARA Title III Tier Two Reporting Requirement.

5.6.2 Toxic Chemical Release Inventory (TRI) Form R

SPR sites are required to report under EPCRA Section 313, by submitting the Toxic Chemical Release Inventory (TRI) Form R when reporting thresholds, from crude oil placed in commerce, are exceeded. Specifically, when crude oil is placed in commerce, it is repackaging of hazardous substances and must be reported. This form must be submitted by July 1 for the reporting thresholds exceeded during the preceding calendar year. The submittal of a TRI Form R was required for the BH, BM and WH sites in 2019 because the SPR introduced crude oil into commerce from the 2019 Crude Oil Sales. TRI reporting was not applicable to BC in 2019.

5.7 Wildlife Program

The four SPR storage sites are located on the Central and Mississippi Flyways. The coastal locations of Bayou Choctaw, Big Hill, Bryan Mound, and West Hackberry make them the last resting and feeding stop for migrating birds before they make the arduous trip across the Gulf of Mexico to the wintering areas in Central and South America, and the first stopover when they migrate back to North America in the spring. Without places along the way that provide an adequate food supply for the replenishment of fat reserves, water, and shelter from predators, many of these birds would not survive.

Eastern Meadowlark (Sturnella magna)

Selected habitat at Bayou Choctaw, Big Hill, B and West Hackberry are not mowed from early fall through spring to provide food, shelter and nesting areas for migrating and resident birds. West Hackberry and Big Hill have Purple Martin houses to attract the mosquito-eating birds, and Eastern Bluebird nest boxes and Wood Duck nest boxes are installed at BC. When nests are discovered for ground nesting birds, such as terns, Black-necked Stilts, Killdeer and Common Nighthawk, they are flagged until the chicks have fledged. Equipment harboring active bird nests are designated for limited/restricted use.

BC, BH, and BM also conduct periodic avian inventories per the Memorandum of Understanding between F&WS and DOE. Inventories are uploaded to the Cornell University Ornithology Laboratory database and are used to assess the health and populations of migratory birds. The SPR has an active dialog with Cornell University and the Louisiana Department of Wildlife and Fisheries researchers and ornithologists regarding unusual observations.

The SPR's management of habitat for migrating and resident birds is good for the environment and indirectly contributes to the economy of Texas and Louisiana. Hunting and birding activities have a positive economic impact on state economies.

Black-bellied Whistling Duck (Dendrocygna autumnalis)

6 Site Hydrology, Ground Water Monitoring, and Public Drinking Water Protection

Ground water monitoring is performed at the four SPR storage sites to ensure the protection of water quality and comply with related state and federal regulations and orders. Specifically, DOE Order 5400.1 requires a ground water surveillance system/program for each SPR site. Ground water that is or could be impacted by DOE activities is monitored to determine and document the effects of operations on ground water quality.

Monitoring has been performed at all four sites since the 1980's. Through the years of operation, both before and during SPR usage, there have been spills/leaks that have or could have impacted the shallow ground water at each site. Monitoring results have confirmed or disproved impacts and have been included in the ASER.

Significant historical investigations performed include:

- 1991— *Contamination Assessment Report and Corrective Action Plan for Bryan Mound*- no recovery action was advised for brine contamination due to soil characteristics.
- 1991— *Contamination Assessment Report and Remedial Alternatives Analysis for West Hackberry*- additional recovery wells and brine pond repair or replacement were advised.
- 1992 — Phase I of II, non-invasive survey, *Final Report on Baseline Hydrogeological Screening Surveys, SPR Sites, Louisiana and Texas*.
- 1996 — Phase II of II, *Multi-Site Hydrogeological Investigation, SPR Sites, Louisiana and Texas.* (Also referred to as the Verification Well Study in which periphery wells were installed.) A surveillance monitoring system was established after this study and includes a network of wells that encompasses brine pond/storage area and periphery areas.

Monitoring wells are present at each site, and shallow ground water is analyzed to determine the presence of contaminants that could be indicative of site operations. The first and second (when present) encountered water-bearing strata are monitored at each site. Monitored ground water is not used for drinking water purposes. All sites purchase potable water.

Salinity is measured as an indicator of brine and the potential presence of hydrocarbons is screened using the TOC test. Other parameters such as pH and temperature are also recorded. Depth to ground water is collected to determine ground water flow direction.

Monitoring is required at WH in accordance with a monitoring plan agreed to by DOE and LDNR. As agreed, monitoring data is included in each ASER and will be submitted to LDNR. Monitoring is also required at BM in accordance with the closure of a brine pond, under the direction of the RRC. Monitoring data is included in each ASER and submitted to the RRC. Wells surrounding the operating brine storage and disposal pond systems at BH monitor ground water as part of permit required leak detection.

Available ground water salinity data collected at each site for the past five years are included and presented graphically in Appendix C. These data are discussed within each site-specific section.

6.1 Bayou Choctaw

The Plaquemine Aquifer is the main source of fresh water for the site and surrounding communities. The aquifer occurs at depths of 60 to 600 ft. bls. Atchafalaya Clay is present from near ground surface to just above the aquifer. BC purchases its potable water from the Iberville Hwy. 1148 Water District. LA regulations do not require a potable water monitoring program and BC is recognized as a water purchaser only.

Four monitoring wells (BC MW1 through BC MW4) were installed in 1989/1990 near the brine storage pond (Figure C-1). These wells were drilled to approximately 30 ft. bls at three of the corners of the pond. One well was drilled farther southeast to monitor the potential impact from the brine storage pond and any other potential nearby shallow contamination sources.

Periphery wells (BC PW1, BCPW2, and BC PW4 through BC PW8) (Figure C-1) were installed in areas identified as possibly being impacted based on results of the 1991 Phase I non-intrusive survey. They are screened to capture the first encountered ground water and are monitored to enhance evaluation of ground water flow direction and outlying salinity movements and variation.

Monitoring activities in 1996 provided evidence that the water in the shallow zone moves in a generally radial direction off the main site and underlying dome, loosely mimicking the topography. Water levels collected in August 2019 also indicate radial ground water movement from a high point south of Cavern 15 (Figure C-2).

Ground water salinity results from samples collected during 2019 showed a slight salinity increase at wells BC MW1, MW2, MW4 and PW5, PW6 and PW7 in December 2019. This slight increase is likely due to colder temperatures. Historically, slight increases in salinity levels have been recorded during colder months, with levels decreasing to below detection limit in subsequent monitoring periods (Figure C-3). Brine impacts are not evident.

For perspective, the average five-year salinity values for the BC wells are as follows:

Table 6-1
5-Year Salinity Values in BC Wells

BC Well	Salinity (ppt)
BC MW1	1.6
BC MW2	1.3
BC MW3	2.4
BC MW4	4.4
BC PW1	9.7
BC PW2	8.7
BC PW4	1.6
BC PW5	6.5
BC PW6	3.1
BC PW7	8.6
BC PW8	4.6

BC MW3, at the south-east downgradient corner of the brine pond, historically captured the most saline site ground water. It now exhibits an essentially stable and decreasing trend. Impacts from a historical 1991 brine piping leak appear to have completely passed this well in an easterly downgradient direction.

BC PW2 is near an area with impacted ground water from historically impacted surface soil. The salinity values at BC PW2 have shown a steady decrease of salinity to ambient values. All site PW wells indicate decreasing or flat five-year salinity trends.

6.2 Big Hill

The Evangeline and Chicot aquifers provide potable water to the BH area. Near the BH salt dome, the base of the Chicot aquifer is approximately 1,200 feet below msl. However, fresh water is reported to occur in the upper 100 feet of the Chicot aquifer on top of the dome. The town of Winnie, west of BH, uses fresh water from the upper Chicot Aquifer. Beaumont and Port Arthur, north and northeast of the site, (as well as most of Jefferson County) draw fresh water from the lower Chicot Aquifer.

BH purchases its potable water from the Trinity Bay Conservation District. It is classified by TX regulations as a "non-transient, non-community" public water distribution system and is required to have a potable monitoring program. In 2019, potable water samples were collected monthly for coliform monitoring, and weekly for residual chloramine (disinfectant). Average disinfectant levels were reported to TCEQ on a Disinfectant Level Quarterly Operating Report. Calculated results did not exceed the regulatory MCLs for disinfectants. Coliform results were also below their MCL.

Potable water is sampled and tested for lead and copper every three years at BH. In 2019, testing for disinfection byproducts (trihalomethanes and haloacetic acids) was conducted through TCEQ. Results were below their MCLs. Other potable water parameters monitored for compliance include asbestos, nitrite, and nitrate with varied monitoring schedules. A TCEQ contractor tested for nitrate and nitrite in 2019. Results were below their MCLs.

Six monitoring wells (BH MW-1 through BH MW-6) were installed in 1987 around the brine disposal pond (Figure C-4). These wells were screened in the first water-bearing zone, approximately 15 to 20 ft. bls, consisting of silty sands and fine sands. Overlying this zone are near-surface organic silts, clays, and sandy clays. The zone is underlain by silty organic clays.

Periphery wells (BH PW1, and BH PW3 through BH PW6) were installed in areas identified as possibly being impacted via results of the 1991 Phase I non-intrusive survey. They are screened to capture the first encountered ground water (Figure C-4).

Monitoring activities in 1996 provided evidence that the water in the shallow zone on the east side of the site flows to the southeast and on the west side flow to the southwest. Water levels collected in April 2019 indicate the same flow directions. The flow directions are generally consistent with surface topography at the BH site (Figure C-5).

Ground water salinity results from samples collected during 2019 at all wells are BDL (Figure C-6). One half of the detection limit is recorded as results in Figure C-6. Brine impacts are not evident.

For perspective, the average five-year salinity values for the BH wells are as follows:

Table 6-2
5-Year Salinity Values in BH Wells

BH Well	Salinity (ppt)
BH MW1	0.5
BH MW2	0.5
BH MW3	0.5
BH MW4	0.5
BH MW5	0.8
BH MW6	0.5
BH PW1	0.5
BH PW3	0.5
BH PW4	0.5
BH PW5	0.5

Salinity data collected from wells surrounding the ponds and the verification wells have indicated complete and consistent results indicating no ground water effects associated with pond operation.

6.3 Bryan Mound

The Evangeline and Chicot aquifers provide potable water to the BM area and are fresh to slightly saline in the BM area. Fresh water for Brazoria County is obtained from the upper portions of the Chicot aquifer upgradient of the BM salt dome.

BM purchases its potable water from Freeport Water Utilities. It is classified by TX regulations as a "non-transient, non-community" public water distribution system and is required to have a potable monitoring program. In 2019, potable water samples were collected monthly for coliform monitoring, and weekly for residual chloramine (disinfectant). Average disinfectant levels were reported to TCEQ on a Disinfectant Level Quarterly Operating Report. Calculated results did not exceed the regulatory MCLs for disinfectants. BM had a positive Coliform result in September 2019. The site conducted a Revised Total Coliform Rule (RTCR) Level 1 Assessment and it was determined that a water line break caused the positive coliform result. Approximately, over half a million gallons of water was released through the system before getting the leak contained. The line was repaired and disinfected. All subsequent monthly coliform results were negative.

Potable water is also sampled and tested for lead and copper tri-annually at BM. In 2019, testing for disinfection byproducts (trihalomethanes and haloacetic acids) was conducted through TCEQ. Results were below their MCLs. Other potable water parameters monitored for compliance include asbestos, nitrite, and nitrate with varied monitoring schedules. A TCEQ

contractor tested for nitrate and nitrite in 2019. Results were below their MCLs.

The BM site is underlain by two water-bearing zones. The shallow zone occurs at depths of 8 – 12 ft. bls and extends to 25- 30 ft. bls and averages 15 ft. in thickness. The deep zone occurs at depths of 40-50 ft. bls and averages 10 ft. in thickness. The water-bearing zones consist of fine and silty sands and clayey silts. A clay layer approximately 10 to 20 feet thick separates the two zones. No usable quantities of fresh water exist in these zones.

Fifteen monitoring wells were installed between 1981 and 1990 in both the shallow (denoted as "S") and deep (denoted as "D") encountered water-bearing zones (Figure C-7). Three wells (BM BP1S, BM BP2S, and BM PZ2S) were removed from service due to casing damage. Five additional shallow wells and one additional deep well (BM PW1 through BM PW5 and BM PW2D) were installed during the 1996 Verification Well Study, and were incorporated into the site monitoring network.

Water level data collected in September 2019 indicate the ground water flow direction for the shallow zone in the northern portion of the site is to the north-northwest. Ground water flow for the shallow zone in the southern portion of the site exhibits predominately a radial flow from BM PW2-S (Figure C-8). The direction of the ground-water flow in the deep zone is primarily to the north toward Blue Lake (Figure C-9).

Salinity values for 2019 and previous years from the 18 monitored wells (12 shallow zone and 6 deep zone) and are included in Figure C-10.

Elevated salinity measured in shallow monitor wells since their installation (BM PZ1S, BM MW1S, and former BM BP1S), has speculatively been associated with the large SPR brine storage pond. The large brine pond (with a Hypalon® (chlorosulfonated polyethylene) membrane) was originally constructed in 1978 and subsequently enlarged (height added) with installation of a new Hypalon® liner and a concrete weight coat in 1982. It was removed from service in September 1998 and closed in early Spring 1999. The salinity measurements observed to the northeast (BM PW4) and east (BM MW1S and D of the closed pond area) could be the result of seepage occurring from before the 1982 renovations of the pond and/or its subsequent closure, or also from operations preceding SPR ownership.

Brine effects are not evident in the northwest and southern portions of the site. Shallow zone wells BM MW3 and BM MW4S, and deep well BM MW4D (west of the former brine pond), have historically remained stable in the 5 to 15 ppt range. Wells in the southern portion of the site are consistently below 50 ppt.

In 2019, five of the site's monitoring wells were inundated with water due to heavy rains. The following wells were only sampled in the first and second quarters: PW1, PW3, PW4, and PW5. For perspective, the average five-year for salinity for most of the BM wells are depicted in the table below:

Table 6-3 5-Year Salinity Values in BM Wells	
BM Well	**Salinity (ppt)**
BM BP1D	6.4
BM MW1D	157.5
BM MW1S	81.5
BM MW2D	56.1
BM MW2S	10.8
BM MW3	7.4
BM MW4D	4.7
BM MW4S	9.7
BM MW5	45.3
BM PW1	26.9 (3-Year Average)
BM PW2D	20.0
BM PW2S	7.9
BM PW3	53.2 (3-Year Average)
BM PW4	113.3 (3-Year Average)
BM PW5	47.0 (2-Year Average)
BM PZ1D	23.4
BM PZ1S	48.5
BM PZ3	22.5 (3-Year Average)

6.4 West Hackberry

The Chicot Aquifer provides potable water to the WH area. Much of the ground water pumping from the Chicot Aquifer takes place in the Lake Charles area. Pumping is so great that a cone of depression has been created which has reversed the regional southerly flow direction towards the north near the coast, south of Lake Charles. The fresh/saline water interface is approximately 700 ft. bls. WH purchases its potable water from the Cameron Parish Waterworks. Louisiana regulations do not require a potable water monitoring program and WH is recognized as a water purchaser only.

The WH site is underlain by two water-bearing zones. The shallow zone occurs at depths of 6-13 ft. bls, is 3- 12 ft. thick, and consists of fine and silty sands. The deep zone occurs at depths of 40-50 ft. bls, averages 10 ft. thick, and consists of silty sand with increasing amounts of fines (silt and clay) to the west and north of the former brine pond area. A clay layer approximately 10 to 20 feet separates the two zones.

The 1991 *Contamination Assessment Report and Remedial Alternatives Analysis* identified the former brine pond as a source of ground water contamination. The decommissioned brine pond was one of five adjoining ponds comprising a pond system and solids management system that handled brine and anhydrite solids pumped from the construction of storage caverns. Brine pond construction activity implemented per the state approved brine pond-decommissioning plan was concluded in November 1999.

Eleven monitoring wells and 15 former recovery wells have been installed on the WH site in five phases from 1988-1990. They were used to either monitor or control brine movement beneath the brine pond system. The 1996 Verification Well Study added 7 periphery wells (PW) screened in the shallow zone. The surveillance monitoring network is shown on Figure C-11. It consists of wells screened in the shallow zone (denoted as "S") and deep zone (denoted as "D").

Water level data collected during September 2019 were used to determine ground water flow directions in the shallow and deep water-bearing zones. Results are shown on Figures C-12 and C-13, respectively. Water in the shallow zone flows in a radial direction from a site high at WH PW6 (near Cavern 105 in the southwestern portion of the site). Water in the deep zone exhibits radial flow from most monitored wells, with the northwest portion monitored flowing toward the northwest (to Black Lake) and the southern portion flowing to the southeast.

Salinity data gathered over the past five years at all wells is depicted in Figure C-14. Four of the seven wells originally installed for 1996 Verification Well Study were retained for additional water level measurement around the periphery of the main site.

Certain wells are analyzed for salinity only once per year per the 2002 site-wide monitoring proposal approved by LDNR in early 2004, with the remainder analyzed quarterly.

The five-year salinity average for the WH wells are depicted in the table below:

Table 6-4
5-Year Salinity Values in WH Wells

WH Well	Salinity (ppt)
WH MW1D	1.2
WH P11	0.9
WH P12D	9.6
WH P12S	11.7
WH P13D	3.1
WH P13S	0.5
WH P1D	9.8
WH P1S	1.2
WH P2D	3.9
WH P2S	2.4
WH P3D	8.3
WH P3S	28
WH P4D	16.7
WH P4S	21.8
WH P5S	0.6
WH P6D	1.6
WH P6S	0.5
WH P8	0.5
WH P9	0.5
WH PW2	9.0
WH PW4S	3.2

Table 6-4 5-Year Salinity Values in WH Wells	
WH Well	**Salinity (ppt)**
WH PW5	0.5
WH PW6	0.5
WH RW2S	0.5
WH RW3D	0.5
WH RW4D	2.9
WH RW5D	13.0

With the passage of years, the slug of impacted shallow water from seepage of the former brine pond has dissipated. The brine pond source has been removed. The slug has changed shape, is smaller, and has moved towards the east while elongating northerly. In 2019, shallow impacted wells (WH P3S, WH P4S, and WH P12S) exhibited lessening or consistent salinity values. One deep well, WH P4D, exhibited 6.4 ppt, with past 5-year results ranging from 18- 26 ppt.

Site ground water salinity levels continue to improve and exhibit long-term gradual lessening trends. The improvement commenced shortly after the pond system was shut-off in early 1999 for pond closure construction and resumed when recovery pumping ended in Spring 2001.

Wells north, west and south of the former brine pond system (shallow and deep) do not exhibit salinity impacts.

7 Quality Assurance (QA)

The primary policy, requirements, and responsibilities for ensuring QA is performed at US DOE facilities are provided in:

- DOE Order 414.1D, Admin Chg 1, "Quality Assurance" (5-8-2013)
- 10 CFR 830, Subpart A, "Quality Assurance Requirements"

DOE Order 414.1D specifies 10 criteria of a quality program:

1. Management/Program
2. Management/Personnel Training and Qualification
3. Management/Quality Improvement
4. Management/Documents and Records
5. Performance/Work Processes Performance
6. Performance/Standards for Design and Verification
7. Performance/Procurement Requirements
8. Performance/Inspection & Acceptance Testing
9. Assessment/Management Assessment
10. Assessment/Independent Assessment

FFPO follows a "Management and Operations Contractor, Quality Assurance Procedure" (AS15700.15) that incorporates the above ten criteria. QA is performed to provide confidence in the results of effluent monitoring and environmental surveillance programs performed at the SPR sites. Data of high quality is necessary so that appropriate assessments and decisions based on those data can be made. Effluent is monitored at each SPR site in accordance with state and federal discharge permits. Environmental surveillance is performed via surface water and groundwater sampling at each site. Results are used to identify the presence or absence of SPR impacts on the surrounding media.

The SPR sites undergo biannual internal audits, as well as inspections by outside federal and state agencies. Every January and July, site laboratories (performing both environmental and crude oil sampling) are internally audited using a laboratory checklist. Audits performed in January and July of 2019 at each site are included in Appendix E. Regarding environmental samples, all audited were acceptable.

7.1 Field Quality Control

Effluent and surveillance monitoring activities are performed in accordance with procedures in the M&O Contractor Laboratory Programs and Procedures Manual (MSI7000.133), the Environmental Monitoring Plan (ASL5400.57), and in individual sampling and analytical work instructions. These procedures include maintenance of chain-of-custody, collection of quality control (QC) samples, and field documentation.

7.2 Data Management

SPR and contractor laboratories generate data. All data generated by SPR laboratories are recorded and maintained in bound, numbered, and signed laboratory notebooks. Contractor laboratory data and accompanying QC data are received by the site laboratory or environmental department and retained on site as part of the original data file.

Water quality data are added to the SPR ES&H Data Management System for retention, manipulation, and interpretation. The data are compiled and appear in various reports such as this SER, and in support of assessments of the SPR.

7.3 Laboratory Accuracy and Precision Program

The SPR laboratory quality assurance program is based on the U.S. EPA Handbook for Analytical Quality Control in Water and Wastewater Laboratories. This program focuses on the use of solvent or standard and method blanks, check standards, and for instrumental methods, final calibration blanks and final calibration verification standards with each analytical batch to verify quality control. Additionally, replicate and spiked samples are analyzed at a 10 percent frequency to determine precision and accuracy, respectively.

Analytical methodology is based on the procedures listed in Table 7-1. Sufficient quality assurance analyses were performed in 2019 to verify the continuing high quality of SPR laboratory data.

Table 7-1 SPR Wastewater Analytical Methodology

Parameter	Method	Source*	Description
Biochemical Oxygen Demand	5210(B) 405.1	SMEWW EPA-1	5 Day, 20 °C 5 Day, 20 °C
Chemical Oxygen Demand	D1252-88(B) 410.4 5220(D)	ASTM EPA-1 SMEWW	Micro Spectrophotometric Proc. Colorimetric, Manual Closed Reflux, Colorimetric
Fecal Coliform	Part III-C-2 9222(D)	EPA-2 SMEWW	Direct Membrane Filter Method Membrane Filter Procedure
Residual Chlorine	4500-C1(G) 330.5 8021	SMEWW EPA-1 Hach	DPD Colorimetric Spectrophotometric, DPD DPD Method
Oil & Grease (Total, Recoverable)	1664 Rev. A; 1664 Rev. B	EPA-1	Gravimetric, Separatory Funnel Extraction
Oil & Grease (Partition, Gravimetric)	5520-(B)	SMEWW	Gravimetric, Separatory Funnel Extraction

Table 7-1 SPR Wastewater Analytical Methodology			
Parameter	**Method**	**Source***	**Description**
Total Organic Carbon	415.1 D4839-88 5310(C) D2579(A) 5310(B)	EPA-1 ASTM SMEWW ASTM SMEWW	Combustion or Oxidation Persulfate – UV Oxidation, IR Persulfate – UV Oxidation, IR Combustion – IR Combustion - IR
Dissolved Oxygen	D888-87(D) 360.1 360.2 4500-O(C) 4500-O(G)	ASTM EPA-1 EPA-1 SMEWW SMEWW	Membrane Electrode Membrane Electrode Modified Winkler Method Winkler Method with Azide Modification Membrane Electrode
Hydrogen Ion conc. (pH)	D1293-84(A&B) 150.1 4500-H^+(B)	ASTM EPA-1 SMEWW	Electrometric Electrometric Electrometric
Total Dissolved Solids (Residual, Filterable)	160.1 2540(C)	EPA-1 APHA	Gravimetric, Dried at 180°C Gravimetric, Dried at 180°C
Total Suspended Solids (Residual, Non-Filterable)	160.2 2540(D)	EPA-1 SMEWW	Gravimetric, Dried at 103-105°C Gravimetric, Dried at 103-105°C
Salinity	D4542-85 (Sect. 7) 2520(B) 2510 (C)	ASTM SMEWW (16th Ed.) SMEWW (16th Ed.)	Refractometric Electrical Conductivity Density Method
Biomonitoring	1006.0 1007.0	EPA-3 EPA-3	*Menidia beryllina* 7-day survival *Mysidopsis bahia* 7-day survival

*Source:

SMEWW= American Public Health Association, et al., Standard Methods for the Examination of Water and Wastewater, most recent edition.

EPA-1 = U.S. Environmental Protection Agency, Methods for Chemical Analysis of Water and Wastes, Document No. EPA - 600/4-79-020.

EPA-2 = U.S. EPA, Microbiological Methods for Monitoring the Environment: Water and Wastes, Document No. EPA-600/8-78-017.

ASTM = American Society for Testing and Materials, Annual Book of Standards, Section 11 - Water, Volumes 11.01 and 11.02.

Hach = Hach Company, Hach Water Analysis Handbook.

EPA-3 = U.S. EPA, Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, Document No. EPA/600/4-87/028.

7.4 Control of Subcontractor Laboratory Quality

The M&O Contractor subcontracts some of the required analytical work. The Laboratories Programs and Procedures Manual contains mandatory guidelines by which such contracts must be prepared. Also, the respective laboratory staff and M&O Contractor Quality Assurance, Operations and Maintenance, and Environmental staff review laboratory procurement documents.

Only subcontractor laboratory service vendors that are state-accredited under the National Environmental Laboratory Accreditation Program are approved for use on the SPR.

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- Emergency Response Procedures. All sites: BCI5500.3, Bayou Choctaw; BHI5500.4, Big Hill; BMI5500.5, Bryan Mound, WHI5500.9, West Hackberry, AAA9020.159 New Orleans and AAA9020.160 Stennis.
- ISO 14001 Environmental Management Systems Manual. ASI5400.55.
- Laboratory Programs and Procedures Manual, MSI7000.133.
- Pollution Prevention Plan, ASL5400.41.
- Spill Prevention Control and Countermeasures Plans. All sites: BCL5400.16, Bayou Choctaw; BHL5400.21, Big Hill; BML5400.17, Bryan Mound; WHL5400.20, West Hackberry.
- SPR Environmental Monitoring Plan, ASL5400.57.

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Appendix A

Appendix A1 — Environmental Standards List

Appendix A2 — Strategic Petroleum Reserve Project Management Office Environmental Safety and Health Directives

Appendix A1 – Environmental Standards List

DESCRIPTION	STANDARD
National Environmental Policy Act Implementing Procedures	10 CFR 1021
Compliance with Flood Plain/Wetlands Environmental Review	10 CFR 1022
Occupational Radiation Protection - Applicable and Enforceable Portions	10 CFR 835
Storage, treatment, and disposal of nondefense toxic and hazardous materials	10 USC 2692
Boiler and Pressure Vessels - Degas Project Only	120 IAC
(Aviation) Operating Requirements: Domestic, Flag, and Supplemental Operations	14 CFR 121
(Aviation) Certifications and Operations	14 CFR 125
(Aviation) Certification and Operations of Scheduled Air Carriers with Helicopters	14 CFR 127
(Aviation) Rotorcraft External Load Operations	14 CFR 133
(Aviation) Operating Requirements: Commuter and On-Demand Operations	14 CFR 135
(Aviation) Agricultural Aircraft Operations	14 CFR 137
(Aviation) Certification and Operation: Land Airport Serving Certain Air Carriers	14 CFR 139
(Aviation) Repair Stations	14 CFR 145
(Aviation) Objects Affecting Navigable Airspace	14 CFR 77
(Aviation) Notification and Reporting - Accidents and Incidents	14 CFR 830
(Aviation) General Operating and Flight Rules	14 CFR 91
Oil and Gas Division	16 TAC 1.3
Environmental Recycling	16 TAC 1.4
Standards for Management of Hazardous Oil and Gas Waste	16 TAC 3.98
Fish and Wildlife Coordination Act	16 U.S.C. §§ 661-666c
Bald and Golden Eagle Protection Acts	16 U.S.C. §§ 668-668d
Migratory Bird Treaty Act	16 U.S.C. §§ 703-711
Endangered Species Act	16 USC Parts 1531-1544
Radiation Control	25 TAC 1.289
Commerce in Explosives (ATF)	27 CFR 55
Imminent Danger	29 CFR 1903.13
Posting of Notice: Availability of the Act, Regulations, and Applicable Standards	29 CFR 1903.2
Recordkeeping and Reporting Occupational Injuries and Illnesses	29 CFR 1904
General (1 through 8)	29 CFR 1910 SUBPART A
Adoption and Extension of Established Federal Standards (11 through 19)	29 CFR 1910 SUBPART B
Walking-Working Surfaces (21 through 30)	29 CFR 1910 SUBPART D
Means of Egress (35 through 38)	29 CFR 1910 SUBPART E
Powered Platforms, Manlifts, and Vehicle Mounted Work Platforms (66 through 68)	29 CFR 1910 SUBPART F
Occupational Health and Environmental Control (94 through 98)	29 CFR 1910 SUBPART G
Hazardous Materials (101 through 126)	29 CFR 1910 SUBPART H
Personal Protective Equipment (132 through 139)	29 CFR 1910 SUBPART I
General Environmental Controls (141 through 147)	29 CFR 1910 SUBPART J
Medical and First Aid (151)	29 CFR 1910 SUBPART K

DESCRIPTION	STANDARD
Fire Protection (155 through 165)	29 CFR 1910 SUBPART L
Compressed Gas and Compressed Air Equipment (169)	29 CFR 1910 SUBPART M
Materials Handling and Storage (176-179, 181, 183-184)	29 CFR 1910 SUBPART N
Machinery and Machine Guarding (211 through 213, 215, 219)	29 CFR 1910 SUBPART O
Hand/Portable Powered Tools and Other Handheld Equipment (241 through 244)	29 CFR 1910 SUBPART P
Welding, Cutting, and Brazing (251 through 255)	29 CFR 1910 SUBPART Q
Special Industries (269) Power generation, Transmission	29 CFR 1910 SUBPART R
Special Industries (268) Telecommunications	29 CFR 1910 SUBPART R
Electrical (301 through 306, 331–335, 399)	29 CFR 1910 SUBPART S
Commercial Diving Operations (401 through 402, 410, 420-427, 430, 440-441)	29 CFR 1910 SUBPART T
Toxic and Hazardous Substances (1000 through 1450 except 1029, 1043, 1045, 1047, 1050-1051)	29 CFR 1910 SUBPART Z
Designations for General Industry Standards Incorporated into Body of Construction Standards	29 CFR 1926 APP. A
General (1 through 5)	29 CFR 1926 SUBPART A
General Interpretations (10 through 16)	29 CFR 1926 SUBPART B
General Safety and Health Provisions (20 through 35)	29 CFR 1926 SUBPART C
Occupational Health and Environmental Controls (50 through 66)	29 CFR 1926 SUBPART D
Personal Protection and Life Saving Equipment (95 through 107)	29 CFR 1926 SUBPART E
Fire Protection and Prevention (150 through 159)	29 CFR 1926 SUBPART F
Signs, Signals, and Barricades (200 through 203)	29 CFR 1926 SUBPART G
Materials Handling, Storage, Use, and Disposal (250 through 252)	29 CFR 1926 SUBPART H
Tools - Hand and Power (300 through 307)	29 CFR 1926 SUBPART I
Welding and Cutting (350 through 354)	29 CFR 1926 SUBPART J
Electrical (400 through 408, 416-417, 431-432, 441, 449)	29 CFR 1926 SUBPART K
Scaffolds (450 through 454)	29 CFR 1926 SUBPART L
Fall Protection (500 through 503)	29 CFR 1926 SUBPART M
Cranes, Derricks, Hoists, Elevators, and Conveyors (550 through 555)	29 CFR 1926 SUBPART N
Motor Vehicles, Mechanized Equipment, and Marine Operations (600 through 606)	29 CFR 1926 SUBPART O
Excavations (650 through 652)	29 CFR 1926 SUBPART P
Concrete and Masonry Construction (700 through 706)	29 CFR 1926 SUBPART Q
Steel Erection (750 through 752)	29 CFR 1926 SUBPART R
Demolition (850 through 860)	29 CFR 1926 SUBPART T
Blasting and the Use of Explosives (900 through 914)	29 CFR 1926 SUBPART U
Power Transmission and Distribution (950 through 960)	29 CFR 1926 SUBPART V
Rollover Protective Structures; Overhead Protection (1000 through 1003)	29 CFR 1926 SUBPART W
Stairways and Ladders (1050 through 1060)	29 CFR 1926 SUBPART X
Diving (1071 through 1092)	29 CFR 1926 SUBPART Y
Toxic and Hazardous Substances (1100 through 1152 except 1129, 1145, 1147)	29 CFR 1926 SUBPART Z
Hazardous Materials Information Development, Preparedness and Response Act	30 LA RS 2361-2379 SARA Title III

DESCRIPTION	STANDARD
DELETED General Provisions - Document Filing Procedures	30 TAC 1.1.10 DELETED
General Air Quality Rules	30 TAC 1.101
Permits by Rule	30 TAC 1.106
Control of Air Pollution from Visible Emissions and Particulate Matter	30 TAC 1.111
Control of Air Pollution from Sulfur Compounds	30 TAC 1.112
Control of Air Pollution from Hazardous Air Pollutants	30 TAC 1.113
DELETED Control of Air Pollution from Motor Vehicles	30 TAC 1.114 DELETED
Control of Air Pollution from Volatile Organic Compounds	30 TAC 1.115
Control of Air Pollution by Permits for New Construction or Modification	30 TAC 1.116
Control of Air Pollution from Nitrogen Compounds	30 TAC 1.117
Control of Air Pollution Episodes	30 TAC 1.118
DELETED Federal Operating Permits Program	30 TAC 1.122 DELETED
Electronic Reporting	30 TAC 1.19.3
DELETED - July 2014 Environmental Testing Laboratory Accreditation and Certification	30 TAC 1.25 - DELETED
Water Quality Certification	30 TAC 1.279
Applications Processing	30 TAC 1.281
Public Drinking Water	30 TAC 1.290
Water Rights, Procedural	30 TAC 1.295
Water Rights, Substantive	30 TAC 1.297
Occupational Licenses and Registrations	30 TAC 1.30
Surface Water Quality Standards	30 TAC 1.307
Sludge Use, Disposal, and Transportation	30 TAC 1.312
Used Oil	30 TAC 1.324
Spill Prevention and Control	30 TAC 1.327
Waste Minimization and Recycle	30 TAC 1.328
Municipal Solid Waste	30 TAC 1.330
Underground and Aboveground Storage Tanks	30 TAC 1.334
Industrial Solid Waste and Municipal Hazardous Waste	30 TAC 1.335
Radioactive Substance Rules	30 TAC 1.336
Groundwater Protection Recommendation Letters and Fees	30 TAC 1.339
Regulatory Flexibility	30 TAC 1.90
MOU between TCEQ and RRC	30 TAC 7.117
Planning Division	31 TAC 1.15
Oil Spill Prevention and Response	31 TAC 1.19
Natural Resource Damage Assessment	31 TAC 1.20
Oil Spill Prevention and Response Hearings Procedures	31 TAC 1.21
Fisheries	31 TAC II.57
Wildlife	31 TAC II.65
Resource Protection	31 TAC II.69
Coastal Management Program	31 TAC XVI.501

DESCRIPTION	STANDARD
Coastal Management Program Boundary	31 TAC XVI.503
Coastal Management Program	31 TAC XVI.504
Council Procedures for State Consistency with Coastal Management Program Goals and Policies	31 TAC XVI.505
Council Procedures for Federal Consistency with Coastal Management Program Goals and Priorities	31 TAC XVI.506
Certain vehicles must stop at all railroad grade crossings (Explosives)	32 LA RS 173.1
Permission for operation; crossing railroad grade crossings; markings	32 LA RS 251 Subpart J. Vehicles Transporting Explosives or Inflammables
Equipment and inspection (Explosives)	32 LA RS 252
Handling Class I (Explosive) Materials or Other Dangerous Cargo	33 CFR 126
Control of Pollution by Oil and Hazardous Substances, Discharged Removed	33 CFR 153
Facilities Transferring Oil or Hazardous Material in Bulk	33 CFR 154
Oil and Hazardous Material Transfer Operations	33 CFR 156
Reception Facilities for Oil, Noxious Liquid Substances, and Garbage (MARPOL)	33 CFR 158
Permits for Structures or Work in or Affecting Navigable Waters of the U.S.	33 CFR 322
Permits for Discharges of Dredged or Fill Material into Waters of the U.S.	33 CFR 323
Process of Department of Army Permits	33 CFR 325
Enforcement	33 CFR 326
Definition of Waters of the United States	33 CFR 328
Definition of Navigable Waters of the United States	33 CFR 329
Nationwide Permits	33 CFR 330
Compensatory Mitigation for Losses of Aquatic Resources	33 CFR 332
Markings of Structures, Sunken Vessels and Other Obstructions	33 CFR 64
Private Aid to Navigation	33 CFR 66
Aids to Navigation on Artificial Islands and Fixed Structures	33 CFR 67
Risk Evaluation/Corrective Action Program	33 LAC I.13
Groundwater Fees	33 LAC I.14
Permit Review	33 LAC I.15
Departmental Administrative Procedures	33 LAC I.3
Notification Regulations and Procedures for Unauthorized Discharges	33 LAC I.39
Policy and Intent	33 LAC I.45
Program Requirements	33 LAC I.47
Organization and Personnel Requirements	33 LAC I.49
On-site Inspection/Evaluation	33 LAC I.51
Quality System Requirements	33 LAC I.53
Sample Protocol/Sample Integrity	33 LAC I.55
Maintenance of Accreditation	33 LAC I.57
Emergency Response Regulations	33 LAC I.69
General Provisions	33 LAC III.1

DESCRIPTION	STANDARD
Control of Emissions of Smoke	33 LAC III.11
Emission Standards for Particulate Matter	33 LAC III.13
Conformity	33 LAC III.14
Emission Standards for Sulfur Dioxide	33 LAC III.15
Rules and Regulations for the Fee System of the Air Quality Control Programs	33 LAC III.2
Control of Emission of Organic Compounds	33 LAC III.21
Odor Regulations	33 LAC III.29
Standards of Performance for New Stationary Sources	33 LAC III.30
Permit Procedures	33 LAC III.5
DELETED Comprehensive Toxic Air Pollutant Emission Control Program	33 LAC III.51 DELETED
DELETED Area Sources of Toxic Air Pollutants	33 LAC III.53 DELETED
Prevention of Air Pollution Emergency Episodes	33 LAC III.56
DELETED Chemical Accident Prevention and Minimization of Consequences	33 LAC III.59 DELETED
Ambient Air Quality	33 LAC III.7
General Regulations on Control of Emissions and Emission Standards	33 LAC III.9
General Provisions	33 LAC IX.1
Surface Water Quality Standards	33 LAC IX.11
Louisiana Water Pollution Control Fee System Regulation	33 LAC IX.13
Water Quality Certification Procedures	33 LAC IX.15
Rules Governing Disposal of Waste Oil, Oil Field Brine, and All Other Materials Resulting from the Drilling for, Production of, or Transportation of Oil, Gas or Sulphur (as amended January 27, 1953)	33 LAC IX.17
State of Louisiana Stream Control Commission	33 LAC IX.19
The LPDES Program Definitions and General Program Requirements	33 LAC IX.23
Permit Application and Special LPDES Program Requirements	33 LAC IX.25
LPDES Permit Conditions	33 LAC IX.27
Transfer, Modification, Revocation and Reissuance, and Termination of LPDES Permits	33 LAC IX.29
Permits	33 LAC IX.3
General LPDES Program Requirements	33 LAC IX.31
Specific Decision-making Procedures Applicable to LPDES Permits	33 LAC IX.33
Enforcement	33 LAC IX.5
Effluent Standards	33 LAC IX.7
Spill Prevention and Control	33 LAC IX.9
General Provisions and Definitions	33 LAC V.1
Definitions	33 LAC V.109
Generators	33 LAC V.11
Transporters	33 LAC V.13
Treatment, Storage and Disposal Facilities	33 LAC V.15
Containment Buildings	33 LAC V.18
Tanks	33 LAC V.19
Containers	33 LAC V.21

DESCRIPTION	STANDARD
Prohibitions on Land Disposal	33 LAC V.22
Corrective Action Management Units and Temporary Units	33 LAC V.26
Transportation of Hazardous Liquids by Pipeline	33 LAC V.30
Financial Requirements	33 LAC V.37
Universal Wastes	33 LAC V.38
Small Quantity Generators	33 LAC V.39
Used Oil	33 LAC V.40
Recyclable Materials	33 LAC V.41
Lists of Hazardous Wastes	33 LAC V.49
Fee Schedules	33 LAC V.51
Manifest System for TSD Facilities	33 LAC V.9
General Provisions and Definitions (solid waste regulations)	33 LAC VII.1
Recycling and Waste Reduction Rules	33 LAC VII.103
Waste Tires	33 LAC VII.105
Scope and Mandatory Provisions of the Program	33 LAC VII.3
Solid Waste Management System	33 LAC VII.5
Solid Waste Standards	33 LAC VII.7
Enforcement	33 LAC VII.9
Program Applicability and Definitions	33 LAC XI.1
Enforcement	33 LAC XI.15
Registration Requirements, Standards and Fee Schedule	33 LAC XI.3
Spill and Overfill Control	33 LAC XI.5
Methods Release Detection and Release Reporting, Investigation, Confirmation and Response	33 LAC XI.7
Out of Service UST Systems and Closure	33 LAC XI.9
General Provisions	33 LAC XV.1
Notices, Instructions, and Reports to Workers; Inspections	33 LAC XV.10
Regulation and Licensing of Naturally Occurring Radioactive Material (NORM)	33 LAC XV.14
Transportation of Radioactive Material	33 LAC XV.15
Licensing and Radiation Safety Requirements for Irradiators	33 LAC XV.17
Registration of Radiation Machines and Facilities	33 LAC XV.2
Radiation Safety Requirements for Wireline Service Operations and Subsurface Tracer Studies	33 LAC XV.20
Fee Schedule	33 LAC XV.25
Licensing of Radioactive Material	33 LAC XV.3
Standards for Protection Against Radiation	33 LAC XV.4
Radiation Safety Requirements for Industrial Radiographic Operations	33 LAC XV.5
Radiation Safety Requirements for Analytical X-Ray Equipment	33 LAC XV.8
Advisory Council on Historical Preservation	36 CFR 800
Pesticides	4 TAC I.7
Asbestos	40 CFR 763

DESCRIPTION	STANDARD
Criteria for State, Local, and Regional Oil Removal Contingency Plans	40 CFR 109
Discharge of Oil	40 CFR 110
Oil Pollution Prevention	40 CFR 112
Designation of Hazardous Substances	40 CFR 116
Determination of Reportable Quantities for Hazardous Substances	40 CFR 117
State Certification of Activities Requiring a Federal License or Permit	40 CFR 121
EPA Administrated Permit Programs: The National Pollutant Discharge Elimination System	40 CFR 122
Procedures for Decision Making	40 CFR 124
Criteria and Standards for NPDES	40 CFR 125
Toxic Pollutant Effluent Standards	40 CFR 129
Water Quality Planning and Management, Water Quality Standards	40 CFR 131
Secondary Treatment Regulation	40 CFR 133
Guidelines Establishing Test Procedures for the Analysis of Pollutants	40 CFR 136
National Primary Drinking Water Regulations	40 CFR 141
National Primary Drinking Water Regulations Implementation	40 CFR 142
National Secondary Drinking Water Regulations	40 CFR 143
Underground Injection Control Program	40 CFR 144
Underground Injection Control Program: Criteria and Standards	40 CFR 146
State Underground Injection Control Programs	40 CFR 147
Sole Source Aquifers	40 CFR 149
NEPA Purpose, Policy and Mandate	40 CFR 1500
NEPA and Agency Planning	40 CFR 1501
NEPA Environmental Impact Statement	40 CFR 1502
NEPA Commenting	40 CFR 1503
NEPA Pre-decision Referrals to the Council of Proposed Federal Actions Determined to be Environmentally Unsatisfactory	40 CFR 1504
NEPA and Agency Decision Making	40 CFR 1505
Other Requirements of NEPA	40 CFR 1506
NEPA Agency Compliance	40 CFR 1507
NEPA Terminology and Index	40 CFR 1508
Freedom of Information Act Procedures	40 CFR 1515
Privacy Act Implementation	40 CFR 1516
Pesticide Registration and Classification Procedures	40 CFR 152
Labeling Requirements for Pesticides and Devices	40 CFR 156
Reporting of Accidental Releases	40 CFR 1604
Worker Protection Standards (Pesticides)	40 CFR 170
Certification of Pesticide Applicators	40 CFR 171
General	40 CFR 220
Section 404 (b) (1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material	40 CFR 230

DESCRIPTION	STANDARD
Guidelines for Storage and Collection of Residential, Commercial, and Institutional Solid Wastes	40 CFR 243
Comprehensive Procurement Guideline for Products Containing Recovered Materials	40 CFR 247
Hazardous Waste Management System: General	40 CFR 260
Identification and Listing of Hazardous Waste	40 CFR 261
Standards Applicable to Generators of Hazardous Wastes	40 CFR 262
Standards applicable to transporters of hazardous wastes	40 CFR 263
Standards for Owners and Operators of Hazardous Waste, Treatment, Storage, and Disposal Facilities	40 CFR 264
Standards for Management of Specific Hazardous Wastes	40 CFR 266
Land Disposal Restrictions	40 CFR 268
Requirements for Authorization of State Hazardous Waste Programs	40 CFR 271
Approved State Hazardous Waste Management Programs	40 CFR 272
Standard for Universal Waste Management	40 CFR 273
Standards for Management of Used Oil	40 CFR 279
Technical Standards and Corrective Action Requirements for Owners and Operators of UST	40 CFR 280
Approved Underground Storage Tank Programs	40 CFR 282
National Oil and Hazardous Substances Pollution Contingency Plans	40 CFR 300
Designation of Reportable Quantities and Notification	40 CFR 302
Emergency Planning and Notification	40 CFR 355
Hazardous Chemical Reporting: Community Right-to-Know	40 CFR 370
Toxic Chemical Release Reporting: Community Right-to-Know	40 CFR 372
Reporting Hazardous Substance Activity When Selling or Transferring Federal Real Property	40 CFR 373
General Provisions	40 CFR 401
General Pretreatment Regulations for Existing and New Sources of Pollution	40 CFR 403
Approval & Promulgation of Implementation Plans	40 CFR 52
Ambient Air Monitoring	40 CFR 53
Standards of Performance for New Stationary Sources	40 CFR 60
Determination of Emissions from Volatile Compounds Leaks	40 CFR 60, Appendix A, Method 21
DELETED National Emission Standards for Hazardous Air Pollutants	40 CFR 61 DELETED
National Emission Standards for Hazardous Air Pollutant for Source Categories	40 CFR 63
Assessment and Collection of Noncompliance Penalties	40 CFR 66
State Operating Permit Programs	40 CFR 70
General	40 CFR 700
PCB Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions	40 CFR 761
Regulations of Fuels and Fuel Additives	40 CFR 80
EPA Regulations Designating Areas for Air Quality Planning	40 CFR 81
Protection of Stratospheric Ozone	40 CFR 82
Confiscation and disposal of explosives	40 LA RS 1472.11

DESCRIPTION	STANDARD
Unlawful storage of explosives	40 LA RS 1472.12
Abandonment of explosives	40 LA RS 1472.13
Careless use of explosives	40 LA RS 1472.18
Reckless use of explosives	40 LA RS 1472.19
License; manufacturer-distributor, dealer, user, or blaster of explosives	40 LA RS 1472.3
Possession without license prohibited; exceptions (Explosives)	40 LA RS 1472.4
Reports of losses or thefts; illegal use or illegal possession (Explosives)	40 LA RS 1472.7
Energy Policy Act of 2005	42 USC 15801
Energy Conservation Reauthorization 1998	42 USC 6201 et seq.
Energy Policy and Conservation Act 1975 and 1994	42 USC 6291-6309
RCRA and Affirmative Procurement	42 USC 6962
National Environmental Policy	42 USC Chapter 55
Air Pollution Prevention and Control	42 USC Chapter 85
National Energy Policy Act of 1992	42 USC Chapter 91
Coastal Management	43 LAC I.7
Water Resources Management	43 LAC VI
Underwater Obstructions	43 LAC XI.3
Pipeline Safety	43 LAC XI.5
General Provisions (Statewide Order 29-B)	43 LAC XIX.1
Pollution Control - Onsite Storage, Treatment and Disposal of Exploration and Production Waste (E&P Waste) Generated from the Drilling and Production of Oil and Gas Wells (Oilfield Pit Regulations)	43 LAC XIX.3
Pollution Control (Class II Injection/Disposal Well Regulations)	43 LAC XIX.4
Off-Site Storage, Treatment and/or Disposal of Exploration and Production Waste Generated from Drilling and Production of Oil and Gas Wells	43 LAC XIX.5
Fees	43 LAC XIX.7
Reporting	43 LAC XIX.9
Class I, III, IV, and V Injection Wells (Statewide Order 29-N-1)	43 LAC XVII.1
Hydrocarbon Storage Wells in Salt Dome Cavities (Statewide Order 29-M)	43 LAC XVII.3
Certification (Water and Wastewater Operator Certification)	48 LAC V.73
Drinking Water Program	48 LAC V.77
Oil Spill Prevention and Response Plans	49 CFR 130
General Information, Regulations, and Definitions	49 CFR 171
Hazardous Material Tables, Hazardous Materials Communications Requirements and Emergency Response Information Requirements	49 CFR 172
Shippers - General Requirements for Shipments and Packaging	49 CFR 173
Carriage by Public Highway	49 CFR 177
DOT Response Plans for Onshore Pipelines	49 CFR 194
Transportation of Hazardous Liquids by Pipeline	49 CFR 195
Drug and Alcohol Testing	49 CFR 199
Commercial Driver's License Standards; Requirements and Penalties	49 CFR 383
Endangered and Threatened Wildlife and Plants and Migratory Bird Permits	50 CFR 10, 13, 17, 21, 22

DESCRIPTION	STANDARD
General Provisions	50 CFR 450
Disposal of Birds or Quadrupeds Becoming a Nuisance	56 LA RS 112
US Department of Agriculture Federal Bio-based Products Preferred Procurement Program	7 CFR 3201-3202
Pesticide	7 LAC XXIII
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	7 USC 136
Farm Security and Rural Investment Act (FSRIA) of 2002, Section 9002	7 USC 8102
Control of Nuisance Wild Quadrupeds	76 LAC V.1.25
Nuisance Wildlife Control Operator Program	76 LAC V.1.27
Stennis Warehouse Spill Prevention, Control, and Countermeasures Plan	AAA 4010.10
Property Management Manual	AAA 7003.7
Threshold Limit Values for Chemical Substances - Current Year & Applicable Substances	ACGIH TLV
Area Contingency Plan for Lake Charles	ACP USCG
Area Contingency Plan for Port Arthur	ACP USCG
Area Contingency Plan for New Orleans	ACP USCG
Area Contingency Plan for Galveston	ACP USCG
Area Contingency Plan for EPA Region 6	ACP-EPA
Hazardous Materials Management Education Program Observations and Recommendations: Environmental Mgmt., Hazardous Waste Minimization, and Pollution Prevention for the SPR Operations	AIHMM
OBSOLETE- July 2014 Drill and Exercise Program Plan	AL 5500.11- OBSOLETE
Standard Methods for the Examination of Water and Wastewater	American Public Health Assoc.
OSHA Referenced Standards	ANSI Standards
Environmental Management Systems Specification with Guidance for Use	ANSI/ISO 14001:2004
Compilation of Air Pollutant Emission Factors	AP-42
Permit Regulations for the Construction and/or Operation of Air Emissions Equipment (Mississippi)	APC-S-2
Amer. Petroleum Institute - Recommended Practices and Guides	API
API Standard 653 for Tank Inspection, Repair, Alteration, and Reconstruction	API - Standard
Environmental Effects of Army Actions	AR 200-2
OBSOLETE - July 2014 Conduct of Training for the SPR M&O Contractor	ASI 3400.1 - OBSOLETE
Integrated Logistics Support Procedures	ASI 4000.10
SPR Plant Maintenance System	ASI 4330.16
Environmental Instructions Manual	ASI 5400.15
Conduct of Operations at the SPR	ASI 5480.19
Accident Prevention Manual	ASI 5480.22
Quality Assurance Instructions	ASI 5700.15
Design Review Procedure	ASI 6430.15
Configuration Management	ASL 4700.1
SPR Environmental Monitoring Plan	ASL 5400.57

DESCRIPTION	STANDARD
Fire Protection Manual	ASL 5480.18
Emergency Readiness Assurance Plan	ASL 5500.10
Emergency Response Team Organization and Training Plan	ASL 5500.25
Emergency Management Plan and Implementing Procedures	ASL 5500.58
Drawdown Management Plan	ASL 6400.18
Cavern Inventory and Integrity Control Plan	ASL 6400.30
Drawdown Readiness Program Plan	ASL 7000.397
OSHA Referenced Standards	ASME Standards
Environmental Policy	ASP 5400.2
DELETED - July 2014 SPR Crosstalk Information Exchange Program	ASR 7000.2 - DELETED
Readiness Review Board	ASR 7000.7
Membership in BRAMA	BC BRAMA
Membership in Greater Baton Rouge Industry Alliance	BC Greater BR Industry Alliance
Membership in Iberville CAER	BC Iberville CAER
Membership in the Iberville LEPC	BC Iberville LEPC
Membership in West Baton Rouge LEPC	BC West Baton Rouge LEPC
Bayou Choctaw Emergency Response Procedures	BCI 5500.3
Bayou Choctaw Spill Prevention, Control, and Countermeasures Plan	BCL 5400.16
Safety Agreement with NEWPARK	BH & NEWPARK
Membership in the LEPC	BH LEPC
Membership in the Local Law Enforcement Agency for BH	BH LLEA
Membership in Sabine-Neches Chiefs Mutual Aid	BH Sabine-Neches Chiefs Mutual Aid
Big Hill Emergency Response Procedures	BHI 5500.4
Big Hill Spill Prevention, Control, and Countermeasures Plan	BHL 5400.21
Membership in the BMAT for BM	BM BMAT
Membership in the Brazosport CAER	BM CAER
Membership in the LEPC	BM LEPC
Membership in the Local Law Enforcement Agency at BM	BM LLEA
Agreement between BM and VDD on restrictions to working on Hurricane Levees near BM	BM VDD
Bryan Mound Emergency Response Procedures	BMI 5500.5
Bryan Mound Spill Prevention, Control, and Countermeasures Plan	BML 5400.17
Seminar on Site Characterization for Subsurface Remediations	CERI-89-224
Fire Prevention and Protection; Emergency Services and Communication; and Hazardous Materials	Chapter 13 Jefferson Parish Code of Ordinances
County Regulation of Matters Relating to Explosives and Weapons Subchapter A. Explosives	Chapter 235 TX Statutes, Local Government, Title 7

DESCRIPTION	STANDARD
Operation and Movement of Vehicles (Explosives)	Chapter 545 TX Statutes, Transportation, Title 7
Vehicle Equipment (Explosives)	Chapter 547 TX Statutes, Transportation, Title 7
Hoisting and Rigging Handbook	DOE HDBK, 1090-9
DOE Waste Minimization reporting Requirements, Nov. 1994	DOE Guideline
Waste Minimization Reporting System (Wmin) User's Guide	DOE Handbook
Pollution Prevention Handbook	DOE Handbook
Guidance for the Preparation of the Waste Minimization and Pollution Prevention Awareness Plan, Dec 1993	DOE Handbook
EPA's Interim Final Guidance to Hazardous Waste Generators on the Elements of a Waste Minimization Program	DOE Memorandum
For all applicable DOE Orders See Contract No. DE-FE0011020 Applicable Standards List	DOE Orders
Pollution Prevention Program Plan	DOE S-0118
Paint Repair of Exterior Metal Surfaces	DOE Standard Spec. 17900
Management of Polychlorinated Biphenyls (PCBs)	DOE/EH-0350
Performance Objectives and Criteria for Conducting DOE Environmental Audits	DOE/EH-0358
Annual report on Waste Generation and Waste Minimization Progress	DOE/EM-0276
Standard for Fire Protection of DOE Electronic Computer/Data Processing Systems	DOE/EP-0108
Waste Minimization/Pollution Prevention Crosscut Plan 1994	DOE/FM-0145
Fire Protection	DOE-STD-1066-2012
Fire Protection for Relocatable Structures	DOE-STD-1088-95
All SPR Environmental Permits as listed in the Annual Site Environmental Report (SER)	Environmental Permits
Protection and Enhancement of Environmental Quality	EO 11514
Floodplain Management	EO 11988
Protection of Wetlands	EO 11990
Federal Compliance with Pollution Control Requirements	EO 12088
Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations	EO 12898
Marine Protected Area	EO 13158
Responsibilities of Federal Agencies to Protect Migratory Birds	EO 13186
Energy Efficient Standby Power Devices	EO 13221
Preserve America	EO 13287
REVOKED Strengthening Federal Environmental, Energy, and Transportation Management	EO 13423 REVOKED
REVOKED Federal Leadership in Environmental, Energy, and Economic Performance	EO 13514 REVOKED
REVOKED Planning for Sustainability in the Next Decade	EO 13693 REVOKED
Efficient Federal Operations	EO 13834
Protocol for Equipment Leak Emission Estimates, Jun 1993	EPA 453/R-93-026
Practical Guide for Groundwater Sampling	EPA 600/2-85/105
Handbook for Analytical Quality Control in Water and Wastewater Laboratories	EPA 600/4-79-019

DESCRIPTION	STANDARD
Methods for Chemical Analysis of Water and Wastes	EPA 600/4-79-020
Handbook for Sampling and Sample Preservation of Water and Wastewater	EPA 600/4-82-029
Addendum to Handbook for Sampling and Sample Preservation, EPA 600/4-82-029	EPA 600/4-83-039
Microbiological Methods for Monitoring the Environment, Water and Wastes	EPA 600/8-78-017
Facility Pollution Prevention Guide	EPA 600/R-92/088
Short Term Methods for Measuring Acute Toxicity of Effluents to Aquatic Organisms	EPA 821-R-02-014
Water Measurement Manual	EPA 832B81102
Storm Water Management for Industrial Activities	EPA 833-R-92-002
Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, 4/1/86	EPA Region IV
Current National Water Quality Criteria	EPA Web Site
EPA Waste Minimization Opportunity Assessment Manual	EPA,ISBN:0-86587-752-1
Specification for 8’ and 12’ Unlighted and Externally Lighted Wind Cone Assembly	FAA AC 150/5345-27
Heliport Design, January 4, 1988	FAA AC 150/5390-2
Obstruction Marking and Lighting, October 1985	FAA AC 70/7460-1G
For all applicable FAR and DEAR Clauses see Contract DE-FE0011020, Applicable Clauses List	FAR and DEAR Clauses
Factory Mutual - Approval Guide and Loss Prevention Data Sheets	FM
Hazardous Waste Management Regulations (Mississippi)	HW-1
Oil Cos. International. Marine Forum - International Oil Tanker & Terminal Safety Guide	ICIMF
OSHA Referenced Standards	IEEE Standards
OBSOLETE: Strategic Petroleum Reserve Management and Operating and Constuction Management Services Contractors- Environmental	IWA: DOE-DM-AGSC OBSOLETE
OBSOLETE: Strategic Petroleum Reserve Management and Operating And Constuction Management Services Contractors- Safety and Health	IWA: DOE-DM-AGSC OBSOLETE
Pollution Prevention Assessment Manual for Texas Businesses	LP 92-03
Surface Water and Ground Water Use and Protection (Mississippi)	LW-2
Regarding Implementation of the Executive Order 13186, “Responsibilities of Federal Agencies to Protect Migratory Birds"	MOU USFWS with DOE
MOU with ATFE for Louisiana Sites during Emergencies	MOU with ATFE in LA
MOU with ATFE for the Texas Sites during Emergencies	MOU with ATFE TX
MOU with the BCSO for BM during Emergencies	MOU with BCSO
MOU with Cameron Parish Sheriff's Office for WH during Emergencies	MOU with CamPSO
MOU with Calcasieu Parish Sheriff's Office for WH during Emergencies	MOU with CPSO
MOU with Entergy	MOU with Entergy
MOU with the FBI for Louisiana Sites during Emergencies	MOU with FBI in LA
MOU with the FBI for the Texas Sites during Emergencies	MOU with FBI TX
MOU with Ft. Polk for Louisiana Sites during Emergencies	MOU with Ft. Polk
MOU with JCSO for BH during Emergencies	MOU with JCSO
MOU with LA Homeland Security for Louisiana Sites during Emergencies	MOU with LA Homeland Security

DESCRIPTION	STANDARD
MOU with LA State Police for Louisiana Sites during Emergencies	MOU with LA State Police
MOU with US Army 797th Explosive Ordinance Co. for the Texas Sites during Emergencies	MOU with US Army 797 EOC
SPR Gas and Geothermal Heat Effects on Crude Oil Vapor Pressure, Dec. 1994	MP 94W0000131
Power to capture or destroy animals injurious to property	MSC Section 49-1-39
Nuisance Wildlife	MSC Section 49-7-1
Laboratory Programs & Procedures	MSL 7000.133
National Standards. The latest edition of the nationally recognized standards herein, in effect at the time of design contract award, shall be used during design and construction.	**National Standards**
SPR Qualified Products List	No number
SPRPMO Level III Design Criteria	No number
Earth Manual, 3rd Ed., U.S. Department of the Interior, Bureau of Reclamation	No number
OBSOLETE - Louisiana's Suggested Chemical Weed Control Guide for 1994 (LA Cooperative Extension Services)	No number
The Sterling Brine Handbook (Int'l Salt Co.)	No number
Technical Guidance Package for Chemical Sources, Storage Tanks, TCEQ, Feb 2001	No number
Membership in Louisiana Environmental Leadership Program (LaELP) http://www.deq.state.la.us/assistance/elp	No number
OBSOLETE - July 2014 Environmental, Safety, and Health Management Plan (FY 1998 - FY 2002)	No number - OBSOLETE
OBSOLETE: DM/AGT cooling water discharge agreement	No Number OBSOLETE
OBSOLETE- Membership in Clean Texas Program http://www.cleantexas.org/index.cfm	No number OBSOLETE
Organizational and Management Assessments	NOI 1000.72
Pipkin Ranch Road use restrictions in emergencies	Pipkin Ranch Road
Mississippi DWFP Nuisance Animals	Public Notice LE-3799 and LEI 3799
Louisiana Department of Environmental Quality Risk Evaluation/Corrective Action Program	RECAP (2003)
Pollution Prevention Assessment Manual	RG-133
SPR Standard Specifications. All SPR standard specifications listed as SPR Design Criteria Level III with Green Aspects	**Standard Specifications**
DOE Policy on Signatures of RCRA Permit Applications	SEN-22-90
Nonhazardous Solid Waste Management Regulations and Criteria (Mississippi)	SW-2
Special Licenses and Permits	TPWC Chapter 43
Birds; Protection of Nongame Birds; Destroying Nests or Eggs	TPWC Chapter 64
Alligators	TPWC Chapter 65
Disposition of Protected Wildlife	TPWC Section 43.024
Alligators in Texas: Rules, regulations, and general information, 2013-2014	TPWD
Texas Regulations for Control of Radiation - General provisions	TRCR part 11
Texas Regulations for Control of Radiation - Fees	TRCR part 12
Texas Regulations for Control of Radiation - Hearing and Enforcement Procedures	TRCR part 13

DESCRIPTION	STANDARD
Standards for Protection Against Radiation - Permissible Doses, Precautionary Procedures, Waste Disposal	TRCR part 21
Notices, Instructions and Reports to Workers; Inspections	TRCR part 22
Radiation Safety Requirements and Licensing and Registration Procedures for Industrial Radiography	TRCR part 31
Licensing of Radioactive Material -Exemptions, Licenses, General Licenses, Specific Licenses, Reciprocity, Transport	TRCR part 41
State Fire Marshall (Explosives)	TX Statute Chapter 417 State Fire Marshall
Fire Protection Engineering for Facilities	UFC 3-600-01
International Conference of Building Officials - Uniform Building Code and Uniform Fire Code	UFC/UBC
Underwriter's Laboratory - Building Materials, Fire Resistance, Fire Prot. Equip., & Haz. Location Equip. Directories	UL
West Hackberry Emergency Response Procedures	WHI 5500.9
West Hackberry Spill Prevention, Control, and Countermeasures Plan	WHL 5400.20

Appendix A2 – SPR Project Management Office ES&H Directives

DIRECTIVE	DESCRIPTION
DOE O 151.1D	Comprehensive Emergency Management System
DOE O 225.1B	Accident Investigations
DOE O 231.1B Admin Chg. 1	Environment, Safety and Health Reporting
DOE O 420.1C Change 1	Facility Safety
DOE O 422.1 Admin Chg. 1, Admin Chg. 2	Conduct of Operations
DOE O 430.1B, Change 1, Change 2	Real Property Asset Management
DOE O 436.1	Departmental Sustainability
DOE O 440.2C, Admin Change 1	Aviation Management Safety
DOE O 450.2 Chg. 1 (MinChg)	Integrated Safety Management
DOE O 460.1D	Packaging and Transportation Safety
DOE O 460.2A	Departmental Materials Transportation and Packaging Management
DOE P 450.4A	Safety Management System Policy
SPRPMO O 232.1A	Occurrence Reporting and Processing System
SPRPMO O 420.1D	Conduct of Operations Requirements for SPR Facilities
SPRPMO O 436.1A	Site Sustainability
SPRPMO O 440.2B	Aviation Implementation Plan
SPRPMO O 451.1D	National Environmental Policy Act Implementation Plan
SPRPMO P 451.1E	SPR Environmental Policy
SPRPMO N 450.11	Strategic Petroleum Reserve Environmental, Security, Safety & Health, and Emergency Preparedness Goals FY 2017
SPRPMO N 450.4	Implementation of Environmental, Safety and Health Contractor Requirements Documents

Appendix B

Strategic Petroleum Reserve Environmental Policy

U. S. Department of Energy
STRATEGIC PETROLEUM RESERVE PROJECT MANAGEMENT OFFICE
New Orleans, La.

POLICY

SPRPMO P 451.1G

APPROVED: 3/25/20

SUBJECT: SPR ENVIRONMENTAL POLICY STATEMENT

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1. **PURPOSE AND SCOPE.** This environmental policy applies to the facilities and pipelines that comprise the Strategic Petroleum Reserve (SPR). The mission of SPR is to store petroleum and maintain drawdown readiness. To achieve its mission, the Department of Energy (DOE) and SPR contractors will design, develop, construct, operate, and maintain SPR facilities and operations in a manner that shall be sustainable, resource-efficient, and will protect the quality of the environment consistent with all applicable environmental laws, regulations, and standards. Environmental protection will be integrated at all management levels and into all phases of activity.

   This environmental policy is established, implemented, and maintained by SPR top management through an environmental management system (EMS) under an integrated safety management umbrella.

2. **POLICY STATEMENT.** *The SPR operates only in an environmentally responsible manner*.

   Environmentally responsible manner means top management pledges that all functional levels will abide by the following:

   a. Comply with applicable Federal, State, and local environmental compliance obligations and regulatory requirements which relate to the environmental aspects of SPR activities;

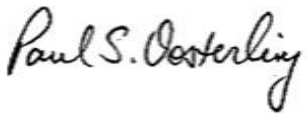
   b. Prevent pollution by undertaking measures to prevent the generation of wastes and other residual materials requiring disposal or release to the environment through recycling, reuse, and source reduction. Where the

generation of such wastes cannot be avoided, the SPR Project Management Office will take action to reduce their volume and toxicity and ensure proper disposal; and

c. Improve environmental performance, continually, via the EMS and by establishing and maintaining documented environmental objectives and targets.

This SPR Environmental Policy provides the framework for setting and reviewing environmental objectives and targets that assure excellence in environmental management. Management communicates the Policy to all persons working for, or on behalf of, the SPR. It is available on request at all SPR facilities and on-line at www.spr.doe.gov and www.fluorfpo.com.

The SPR Environmental, Safety, and Health Division of Technical Assurance is responsible for prompting DOE and Fluor Federal Petroleum Operations top management to periodically review and update this Policy.



Paul S. Oosterling
Project Manager
Strategic Petroleum Reserve

Appendix C

GROUND WATER SURVEILLANCE MONITORING

DURING 2019

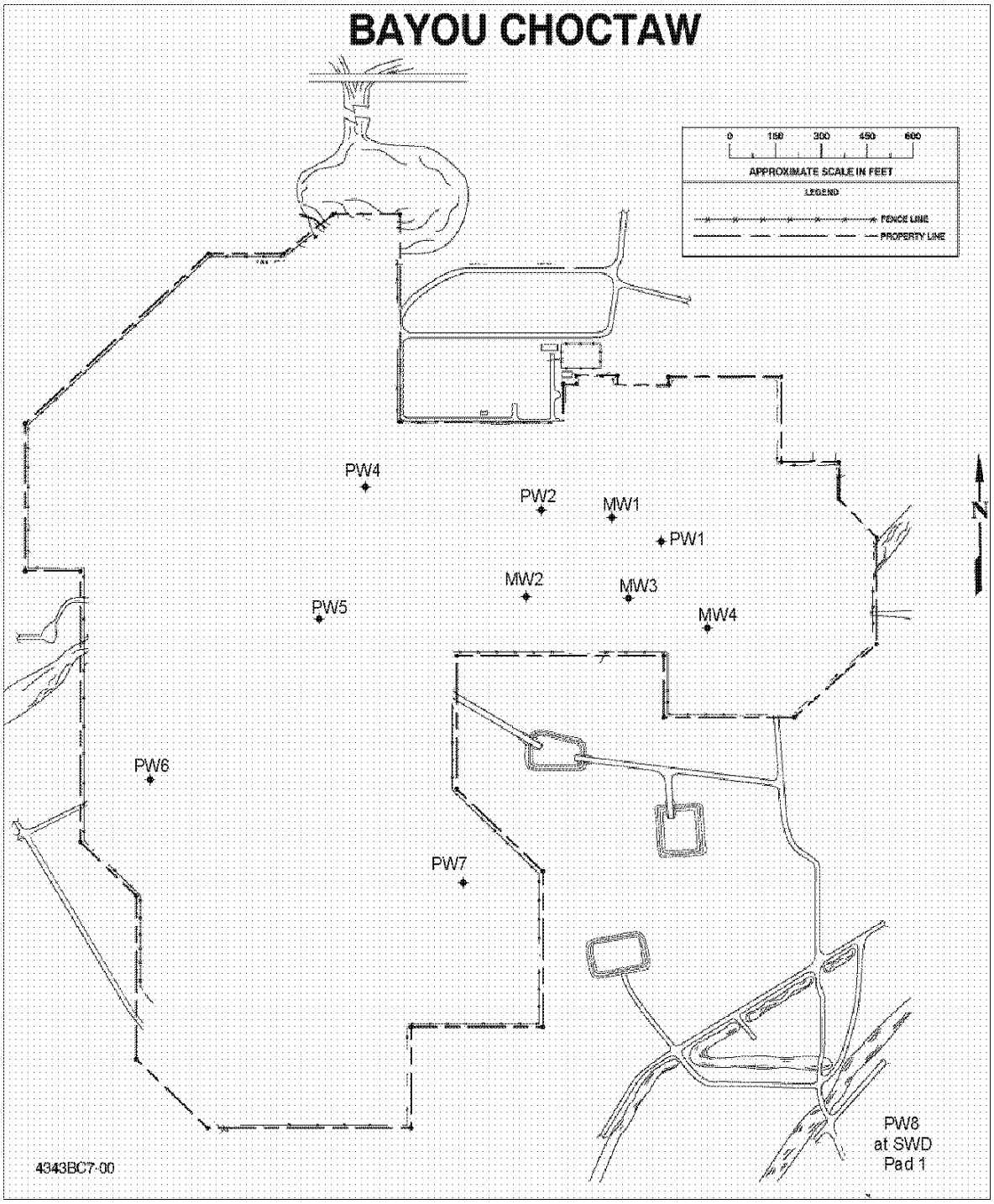


Figure C-1. Bayou Choctaw Ground Water Monitoring Stations

Bayou Choctaw 2019 Contour

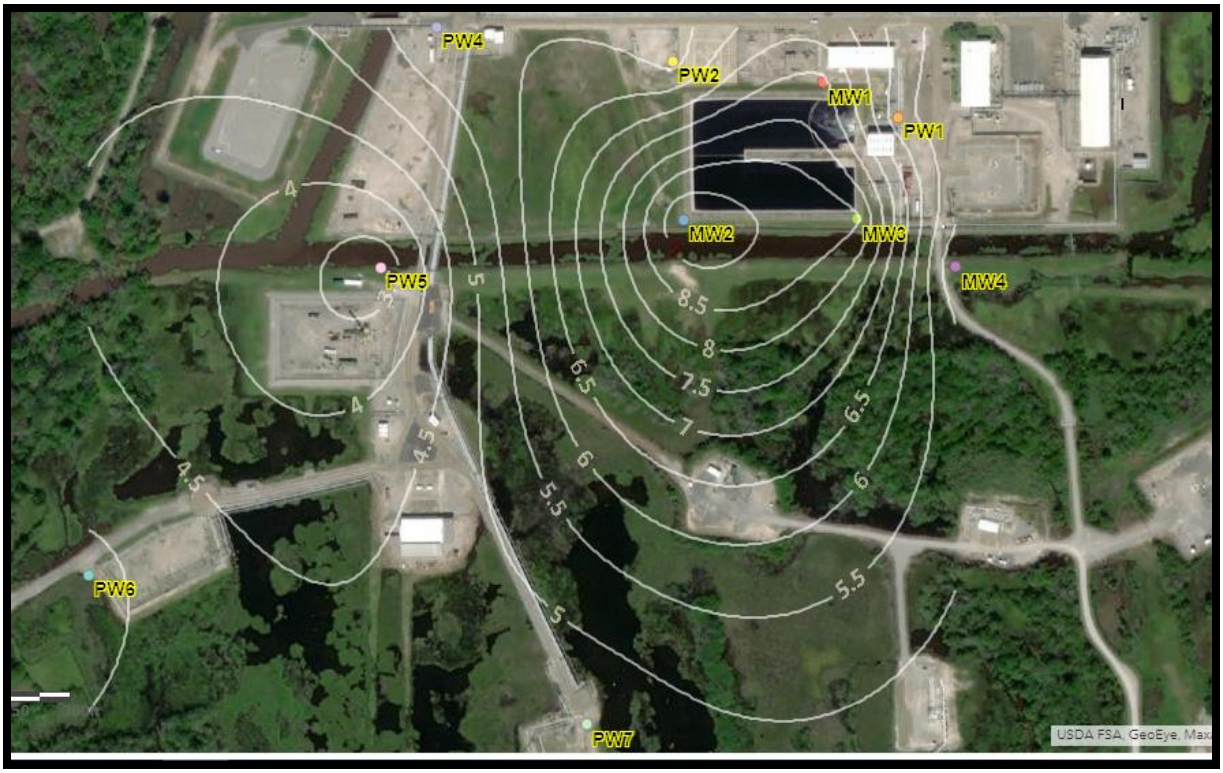
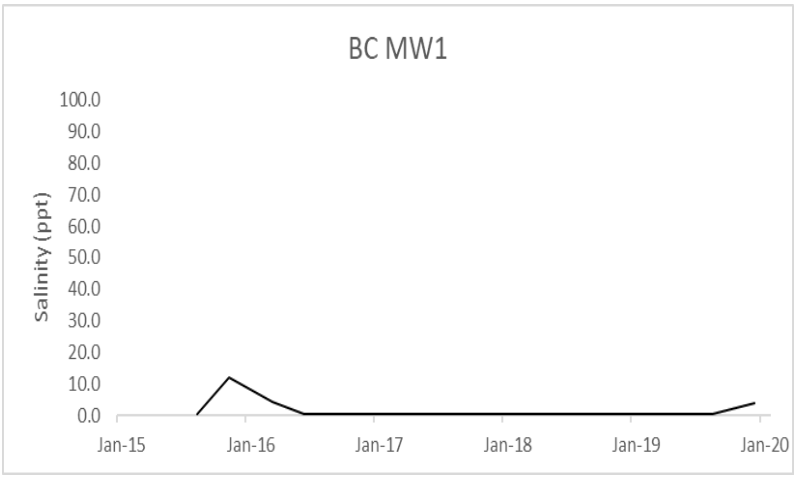


Figure C-2. Bayou Choctaw Ground Water Contoured Elevations August 2019

WELL ID	DATE	SALINITY (PPT)
MW1	Aug-15	0.5
MW1	Nov-15	12.0
MW1	Mar-16	4.4
MW1	Jun-16	0.5
MW1	Sep-16	0.5
MW1	Dec-16	0.5
MW1	Mar-17	0.5
MW1	Jun-17	0.5
MW1	Sep-17	0.5
MW1	Nov-17	0.5
MW1	Mar-18	0.5
MW1	Jun-18	0.5
MW1	Jul-18	0.5
MW1	Jan-19	0.5
MW1	Jun-19	0.5
MW1	Aug-19	0.5
MW1	Dec-19	3.9
	Average	**1.6**



MW2	Sep-14	0.5
MW2	Aug-15	0.5
MW2	Nov-15	11.0
MW2	Mar-16	0.5
MW2	Jun-16	0.5
MW2	Sep-16	0.5
MW2	Dec-16	0.5
MW2	Mar-17	0.5
MW2	Jun-17	0.5
MW2	Sep-17	0.5
MW2	Nov-17	0.5
MW2	Mar-18	0.5
MW2	Jun-18	0.5
MW2	Jul-18	0.5
MW2	Jan-19	0.5
MW2	Jun-19	0.5
MW2	Aug-19	0.5
MW2	Dec-19	3.9
	Average	**1.3**

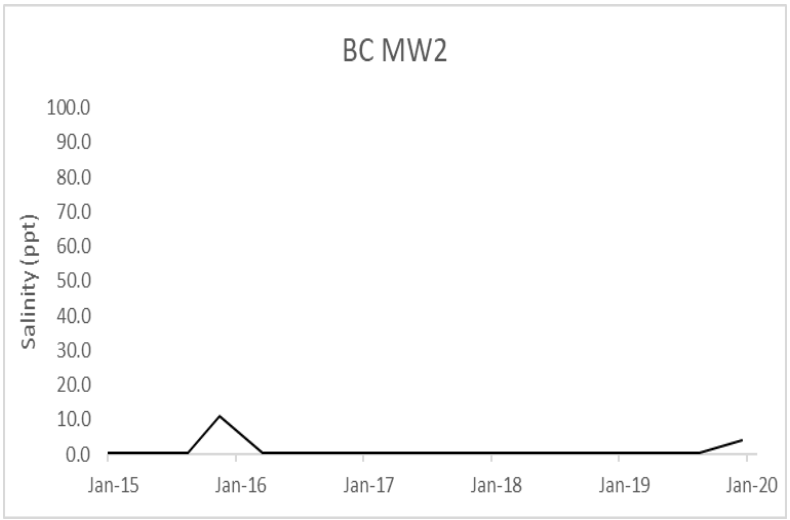
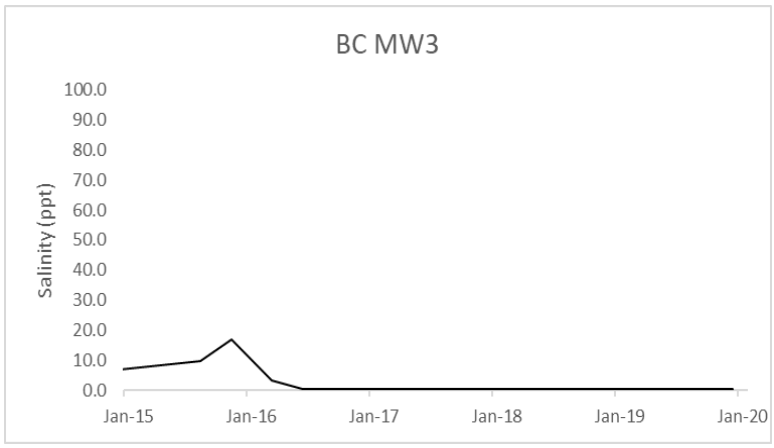


Figure C-3. Bayou Choctaw Ground Water Monitoring Well Salinities

MW3	Sep-14	6.0
MW3	Aug-15	10.0
MW3	Nov-15	17.0
MW3	Mar-16	3.4
MW3	Jun-16	0.5
MW3	Sep-16	0.5
MW3	Dec-16	0.5
MW3	Mar-17	0.5
MW3	Jun-17	0.5
MW3	Sep-17	0.5
MW3	Nov-17	0.5
MW3	Mar-18	0.5
MW3	Jun-18	0.5
MW3	Jul-18	0.5
MW3	Jan-19	0.5
MW3	Jun-19	0.5
MW3	Aug-19	0.5
MW3	Dec-19	0.5
	Average	**2.4**



MW4	Sep-14	6.0
MW4	Aug-15	20.0
MW4	Nov-15	28.0
MW4	Mar-16	15.4
MW4	Jun-16	0.5
MW4	Sep-16	0.5
MW4	Dec-16	0.5
MW4	Mar-17	0.5
MW4	Jun-17	0.5
MW4	Sep-17	0.5
MW4	Nov-17	0.5
MW4	Mar-18	0.5
MW4	Jun-18	0.5
MW4	Jul-18	0.5
MW4	Jan-19	0.5
MW4	Jun-19	0.5
MW4	Aug-19	0.5
MW4	Dec-19	3.9
	Average	**4.4**

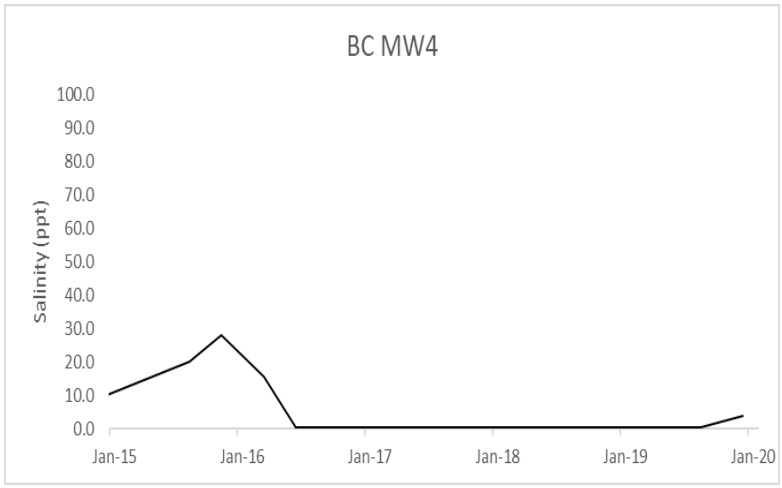
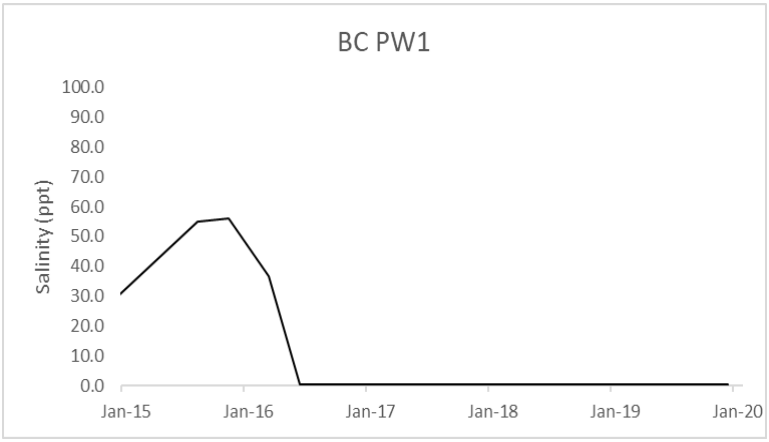


Figure C-3. Bayou Choctaw Ground Water Monitoring Well Salinities

PW1	Sep-14	20.0
PW1	Aug-15	55.0
PW1	Nov-15	56.0
PW1	Mar-16	36.6
PW1	Jun-16	0.5
PW1	Sep-16	0.5
PW1	Dec-16	0.5
PW1	Mar-17	0.5
PW1	Jun-17	0.5
PW1	Sep-17	0.5
PW1	Nov-17	0.5
PW1	Mar-18	0.5
PW1	Jun-18	0.5
PW1	Jul-18	0.5
PW1	Jan-19	0.5
PW1	Jun-19	0.5
PW1	Aug-19	0.5
PW1	Dec-19	0.5
	Average	**9.7**



PW2	Sep-14	34.0
PW2	Aug-15	55.0
PW2	Nov-15	56.0
PW2	Mar-16	4.0
PW2	Jun-16	0.5
PW2	Sep-16	0.5
PW2	Dec-16	0.5
PW2	Mar-17	0.5
PW2	Jun-17	0.5
PW2	Sep-17	0.5
PW2	Nov-17	0.5
PW2	Mar-18	0.5
PW2	Jun-18	0.5
PW2	Jul-18	0.5
PW2	Jan-19	0.5
PW2	Jun-19	0.5
PW2	Aug-19	0.5
PW2	Dec-19	0.5
	Average	**8.7**

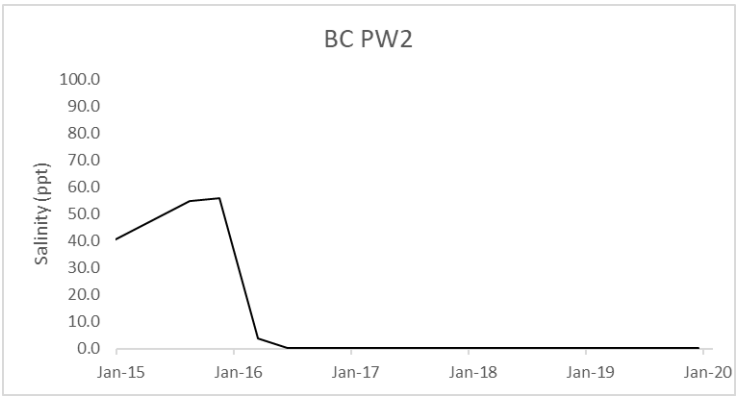
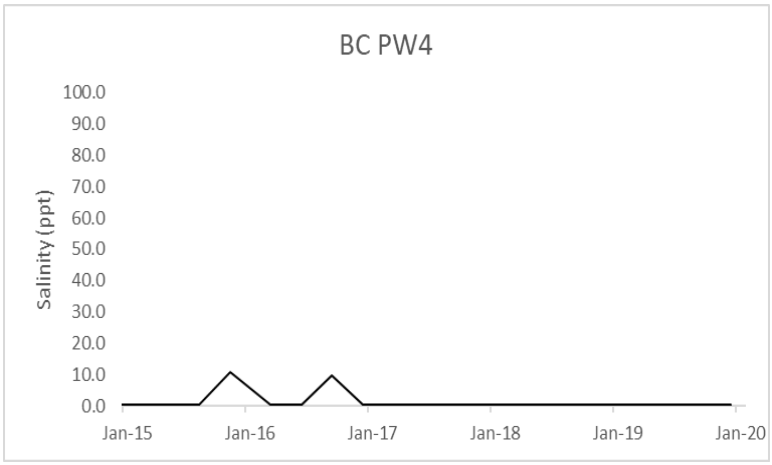


Figure C-3. Bayou Choctaw Ground Water Monitoring Well Salinities

		0.5
PW4	Sep-14	
PW4	Aug-15	0.5
PW4	Nov-15	11.0
PW4	Mar-16	0.5
PW4	Jun-16	0.5
PW4	Sep-16	10.0
PW4	Dec-16	0.5
PW4	Mar-17	0.5
PW4	Jun-17	0.5
PW4	Sep-17	0.5
PW4	Nov-17	0.5
PW4	Mar-18	0.5
PW4	Jun-18	0.5
PW4	Jul-18	0.5
PW4	Jan-19	0.5
PW4	Jun-19	0.5
PW4	Aug-19	0.5
PW4	Dec-19	0.5
	Average	**1.6**



PW5	Sep-14	20.0
PW5	Aug-15	20.0
PW5	Nov-15	35.0
PW5	Mar-16	16.6
PW5	Jun-16	0.5
PW5	Sep-16	10.0
PW5	Mar-17	0.5
PW5	Jun-17	0.5
PW5	Sep-17	0.5
PW5	Nov-17	0.5
PW5	Mar-18	0.5
PW5	Jun-18	0.5
PW5	Jul-18	0.5
PW5	Jan-19	0.5
PW5	Jun-19	0.5
PW5	Aug-19	0.5
PW5	Dec-19	3.4
	Average	**6.5**

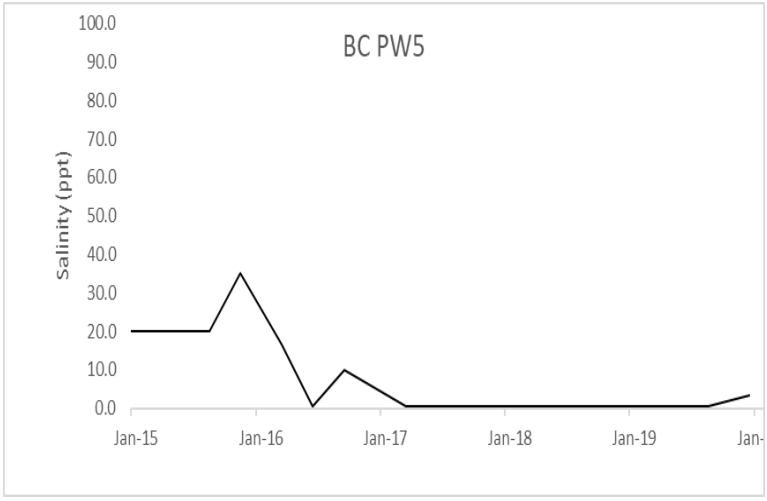
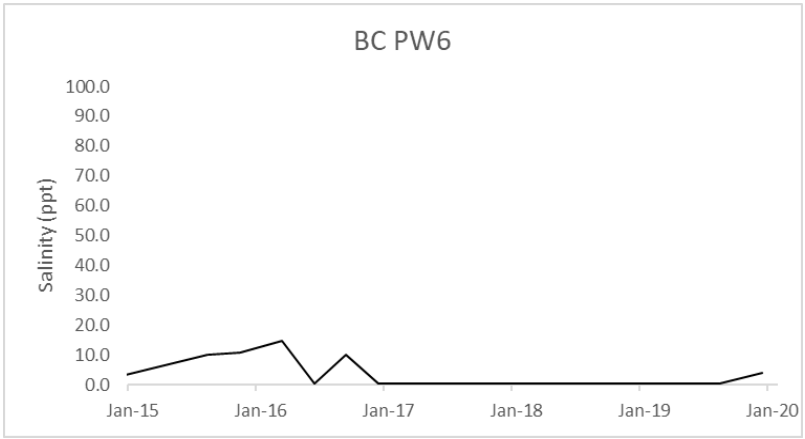


Figure C-3. Bayou Choctaw Ground Water Monitoring Well Salinities

PW6	Sep-14	0.5
PW6	Aug-15	10.0
PW6	Nov-15	11.0
PW6	Mar-16	14.8
PW6	Jun-16	0.5
PW6	Sep-16	10.0
PW6	Dec-16	0.5
PW6	Mar-17	0.5
PW6	Jun-17	0.5
PW6	Sep-17	0.5
PW6	Nov-17	0.5
PW6	Mar-18	0.5
PW6	Jun-18	0.5
PW6	Jul-18	0.5
PW6	Jan-19	0.5
PW6	Jun-19	0.5
PW6	Aug-19	0.5
PW6	Dec-19	4.0
	Average	**3.1**



PW7	Sep-14	31.0
PW7	Aug-15	65.0
PW7	Nov-15	47.0
PW7	Mar-16	0.5
PW7	Jun-16	0.5
PW7	Sep-16	0.5
PW7	Dec-16	0.5
PW7	Mar-17	0.5
PW7	Jun-17	0.5
PW7	Sep-17	0.5
PW7	Nov-17	0.5
PW7	Mar-18	0.5
PW7	Jun-18	0.5
PW7	Jul-18	0.5
PW7	Jan-19	0.5
PW7	Jun-19	0.5
PW7	Aug-19	0.5
PW7	Dec-19	4.2
	Average	**8.6**

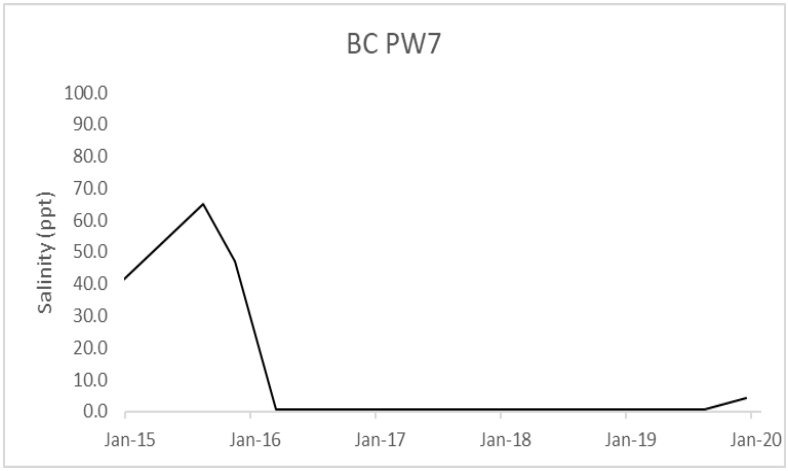


Figure C-3. Bayou Choctaw Ground Water Monitoring Well Salinities

PW8	Sep-14	15.0
PW8	Aug-15	25.0
PW8	Nov-15	30.0
PW8	Mar-16	5.7
PW8	Jun-16	0.5
PW8	Sep-16	0.5
PW8	Dec-16	0.5
PW8	Mar-17	0.5
PW8	Jun-17	0.5
PW8	Sep-17	0.5
PW8	Nov-17	0.5
PW8	Mar-18	0.5
PW8	Jun-18	0.5
PW8	Jul-18	0.5
PW8	Jan-19	0.5
PW8	Jun-19	0.5
PW8	Aug-19	0.5
PW8	Dec-19	0.5
	Average	**4.6**

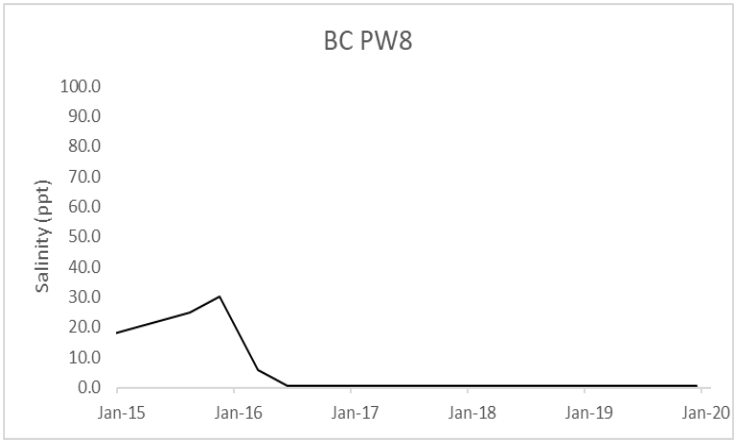


Figure C-3. Bayou Choctaw Ground Water Monitoring Well Salinities

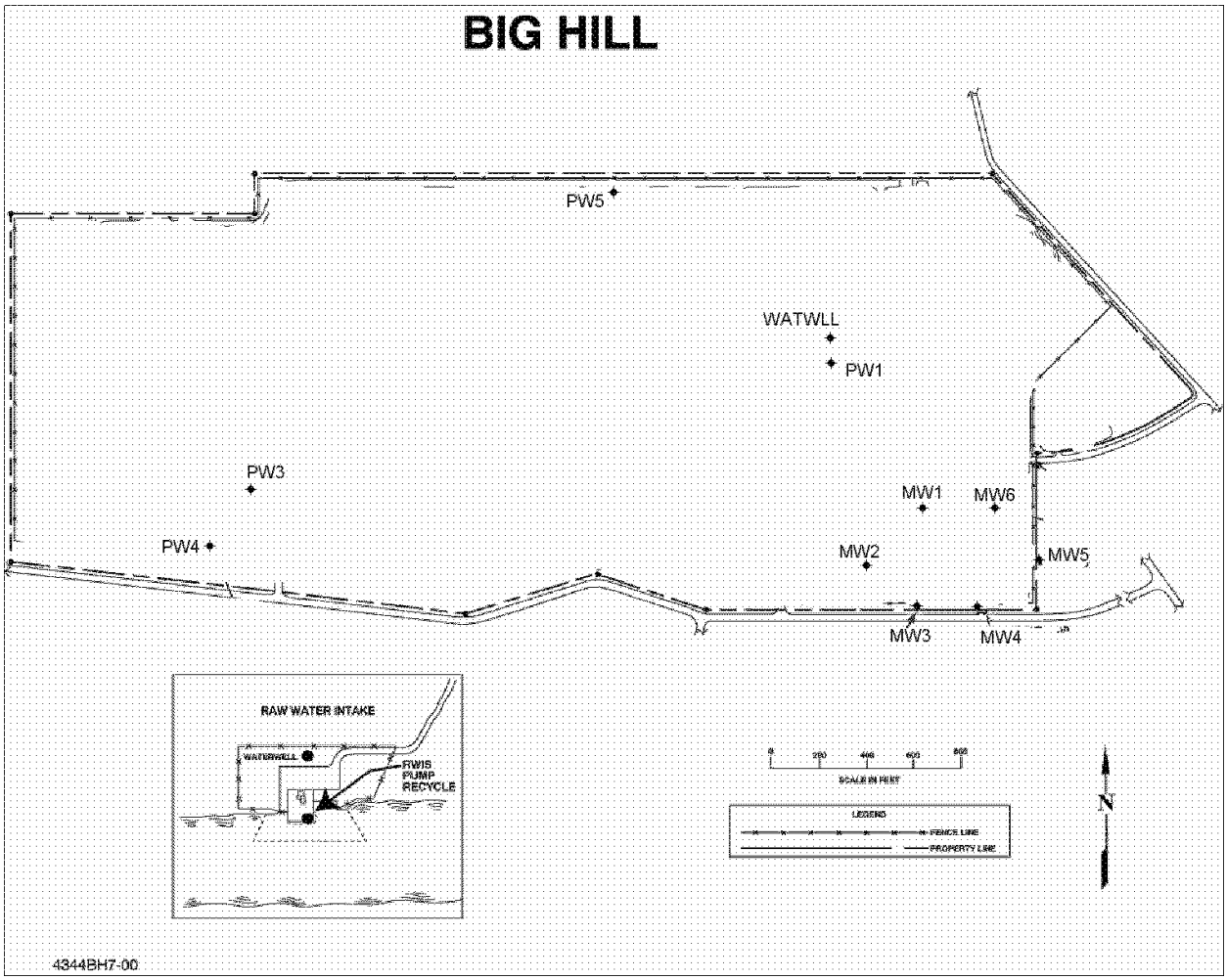


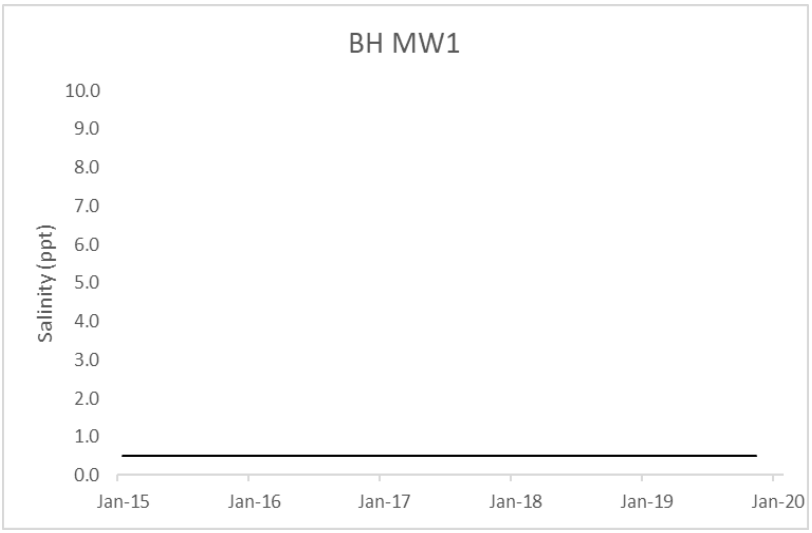
Figure C-4. Big Hill Ground Water Monitoring Stations

Big Hill 2019 Contour

Figure C-5. Big Hill Ground Water Contoured Elevations April 2019

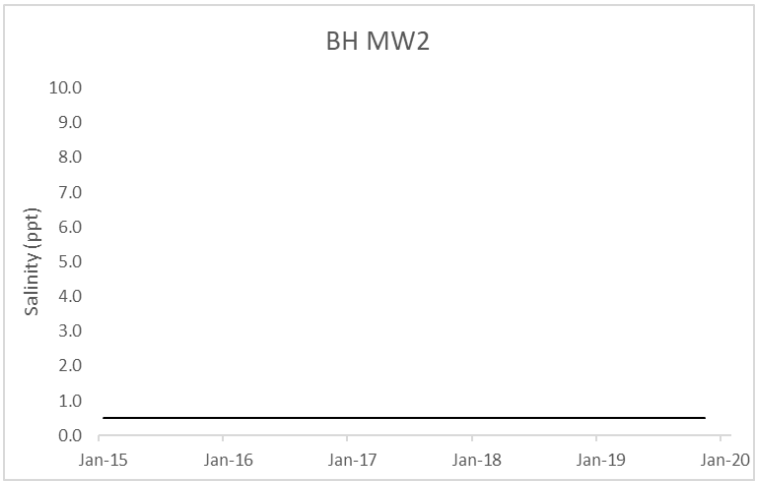
Figure C-6. Big Hill Ground Water Monitoring Well Salinities

MW1	Jan-15	0.5
MW1	Feb-15	0.5
MW1	Mar-15	0.5
MW1	Apr-15	0.5
MW1	May-15	0.5
MW1	Jun-15	0.5
MW1	Jul-15	0.5
MW1	Aug-15	0.5
MW1	Sep-15	0.5
MW1	Oct-15	0.5
MW1	Nov-15	0.5
MW1	Dec-15	0.5
MW1	Jan-16	0.5
MW1	Feb-16	0.5
MW1	Mar-16	0.5
MW1	Apr-16	0.5
MW1	May-16	0.5
MW1	Jun-16	0.5
MW1	Jul-16	0.5
MW1	Aug-16	0.5
MW1	Sep-16	0.5
MW1	Oct-16	0.5
MW1	Nov-16	0.5
MW1	Dec-16	0.5
MW1	Jan-17	0.5
MW1	Feb-17	0.5
MW1	Mar-17	0.5
MW1	Jun-17	0.5
MW1	Jul-17	0.5
MW1	Aug-17	0.5
MW1	Sep-17	0.5
MW1	Oct-17	0.5
MW1	Jan-18	0.5
MW1	Feb-18	0.5
MW1	Mar-18	0.5
MW1	Apr-18	0.5
MW1	May-18	0.5
MW1	Jun-18	0.5
MW1	Jul-18	0.5
MW1	Aug-18	0.5
MW1	Sep-18	0.5



MW1	Oct-18	0.5
MW1	Nov-18	0.5
MW1	Dec-18	0.5
MW1	Jan-19	0.5
MW1	Feb-19	0.5
MW1	Mar-19	0.5
MW1	Apr-19	0.5
MW1	May-19	0.5
MW1	Jun-19	0.5
MW1	Jul-19	0.5
MW1	Aug-19	0.5
MW1	Sep-19	0.5
MW1	Oct-19	0.5
MW1	Nov-19	0.5
	Average	**0.5**

MW2	Jan-15	0.5
MW2	Feb-15	0.5
MW2	Mar-15	0.5
MW2	Apr-15	0.5
MW2	May-15	0.5
MW2	Jun-15	0.5
MW2	Jul-15	0.5
MW2	Aug-15	0.5
MW2	Sep-15	0.5
MW2	Oct-15	0.5
MW2	Nov-15	0.5
MW2	Dec-15	0.5
MW2	Jan-16	0.5
MW2	Feb-16	0.5
MW2	Mar-16	0.5
MW2	Apr-16	0.5
MW2	May-16	0.5
MW2	Jun-16	0.5
MW2	Jul-16	0.5
MW2	Aug-16	0.5
MW2	Sep-16	0.5
MW2	Oct-16	0.5
MW2	Nov-16	0.5
MW2	Dec-16	0.5
MW2	Jan-17	0.5
MW2	Feb-17	0.5
MW2	Mar-17	0.5
MW2	Jun-17	0.5
MW2	Jul-17	0.5
MW2	Aug-17	0.5
MW2	Sep-17	0.5
MW2	Oct-17	0.5



MW2	Jan-18	0.5
MW2	Feb-18	0.5
MW2	Mar-18	0.5
MW2	Apr-18	0.5
MW2	May-18	0.5
MW2	Jun-18	0.5
MW2	Aug-18	0.5
MW2	Sep-18	0.5
MW2	Oct-18	0.5
MW2	Nov-18	0.5
MW2	Dec-18	0.5
MW2	Jan-19	0.5
MW2	Feb-19	0.5
MW2	Mar-19	0.5
MW2	Apr-19	0.5
MW2	May-19	0.5
MW2	Jun-19	0.5
MW2	Jul-19	0.5
MW2	Aug-19	0.5
MW2	Sep-19	0.5
MW2	Oct-19	0.5
MW2	Nov-19	0.5
	Average	**0.5**

Figure C-6. Big Hill Ground Water Monitoring Well Salinities

MW3	Jan-15	0.5
MW3	Feb-15	0.5
MW3	Mar-15	0.5
MW3	Apr-15	0.5
MW3	May-15	0.5
MW3	Jun-15	0.5
MW3	Jul-15	0.5
MW3	Aug-15	0.5
MW3	Sep-15	0.5
MW3	Oct-15	0.5
MW3	Nov-15	0.5
MW3	Dec-15	0.5
MW3	Jan-16	0.5
MW3	Feb-16	0.5
MW3	Mar-16	0.5
MW3	Dec-16	0.5
MW3	Jan-17	0.5
MW3	Feb-17	0.5
MW3	Mar-17	0.5
MW3	Jun-17	0.5
MW3	Jul-17	0.5
MW3	Aug-17	0.5
MW3	Sep-17	0.5
MW3	Oct-17	0.5
MW3	Jan-18	0.5
MW3	Feb-18	0.5
MW3	Mar-18	0.5
MW3	Apr-18	0.5
MW3	May-18	0.5
MW3	Jun-18	0.5
MW3	Jul-18	0.5
MW3	Aug-18	0.5
MW3	Sep-18	0.5
MW3	Oct-18	0.5
MW3	Nov-18	0.5
MW3	Dec-18	0.5
MW3	Jan-19	0.5
MW3	Feb-19	0.5
MW3	Mar-19	0.5
MW3	Apr-19	0.5
MW3	May-19	0.5
MW3	Jun-19	0.5
MW3	Jul-19	0.5
MW3	Aug-19	0.5
MW3	Sep-19	0.5
MW3	Oct-19	0.5
MW3	Nov-19	0.5
	Average	**0.5**

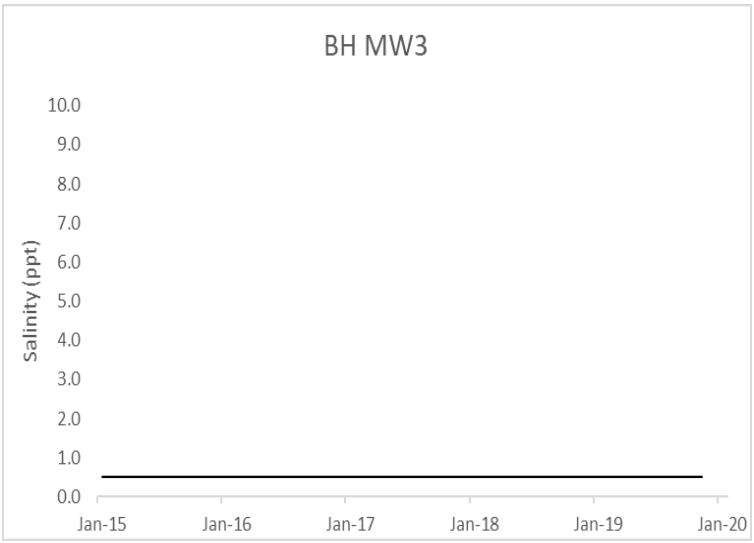
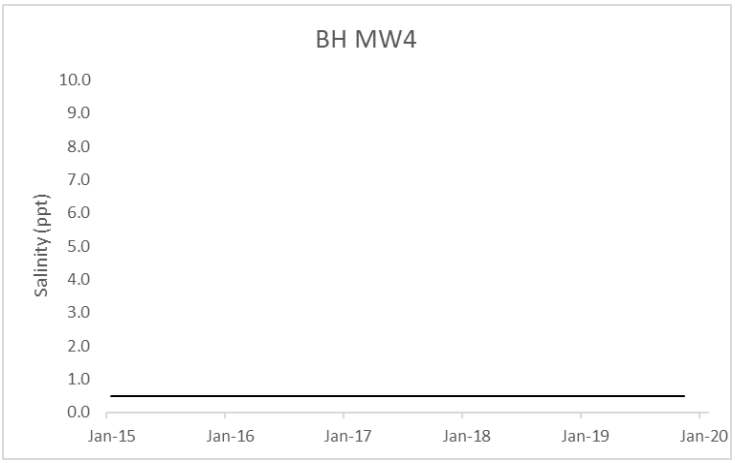


Figure C-6. Big Hill Ground Water Monitoring Well Salinities

MW4	Jan-15	0.5
MW4	Feb-15	0.5
MW4	Mar-15	0.5
MW4	Apr-15	0.5
MW4	May-15	0.5
MW4	Jun-15	0.5
MW4	Jul-15	0.5
MW4	Aug-15	0.5
MW4	Sep-15	0.5
MW4	Oct-15	0.5
MW4	Nov-15	0.5
MW4	Dec-15	0.5
MW4	Jan-16	0.5
MW4	Feb-16	0.5
MW4	Mar-16	0.5
MW4	Aug-18	0.5
MW4	May-16	0.5
MW4	Jun-16	0.5
MW4	Jul-16	0.5
MW4	Aug-16	0.5
MW4	Sep-16	0.5
MW4	Oct-16	0.5
MW4	Nov-16	0.5
MW4	Dec-16	0.5
MW4	Jan-17	0.5
MW4	Feb-17	0.5
MW4	Mar-17	0.5
MW4	Jun-17	0.5
MW4	Jul-17	0.5
MW4	Aug-17	0.5
MW4	Sep-17	0.5
MW4	Oct-17	0.5
MW4	Jan-18	0.5
MW4	Feb-18	0.5
MW4	Mar-18	0.5
MW4	Apr-18	0.5
MW4	May-18	0.5
MW4	Jun-18	0.5
MW4	Jul-18	0.5



MW4	Sep-18	0.5
MW4	Oct-18	0.5
MW4	Nov-18	0.5
MW4	Dec-18	0.5
MW4	Jan-19	0.5
MW4	Feb-19	0.5
MW4	Mar-19	0.5
MW4	Apr-19	0.5
MW4	May-19	0.5
MW4	Jun-19	0.5
MW4	Jul-19	0.5
MW4	Aug-19	0.5
MW4	Sep-19	0.5
MW4	Oct-19	0.5
MW4	Nov-19	0.5
	Average	**0.5**

Figure C-6. Big Hill Ground Water Monitoring Well Salinities

MW5	Jan-15	2.0
MW5	Feb-15	0.5
MW5	Mar-15	0.5
MW5	Apr-15	0.5
MW5	May-15	0.5
MW5	Jun-15	0.5
MW5	Jul-15	1.4
MW5	Aug-15	1.4
MW5	Sep-15	1.5
MW5	Oct-15	1.4
MW5	Nov-15	1.5
MW5	Dec-15	1.4
MW5	Jan-16	1.2
MW5	Feb-16	1.3
MW5	Mar-16	1.2
MW5	Apr-16	1.2
MW5	May-16	1.2
MW5	Jun-16	1.2
MW5	Jul-16	1.2
MW5	Aug-16	1.1
MW5	Sep-16	1.1
MW5	Oct-16	1.2
MW5	Nov-16	1.2
MW5	Dec-16	1.1
MW5	Jan-17	0.5
MW5	Feb-17	1.0
MW5	Mar-17	1.1
MW5	Jun-17	0.5
MW5	Jul-17	0.5
MW5	Aug-17	0.5
MW5	Sep-17	1.0
MW5	Oct-17	0.5
MW5	Jan-18	0.5
MW5	Feb-18	0.5
MW5	Mar-18	0.5
MW5	Apr-18	0.5
MW5	May-18	0.5
MW5	Jun-18	0.5
MW5	Jul-18	0.5
MW5	Aug-18	0.5
MW5	Sep-18	0.5
MW5	Oct-18	0.5
MW5	Nov-18	0.5
MW5	Dec-18	0.5
MW5	Jan-19	0.5
MW5	Feb-19	0.5
MW5	Mar-19	0.5
MW5	Apr-19	0.5
MW5	May-19	0.5
MW5	Jun-19	0.5
MW5	Jul-19	0.5
MW5	Aug-19	0.5
MW5	Sep-19	0.5
MW5	Oct-19	0.5
MW5	Nov-19	0.5
	Average	**0.8**

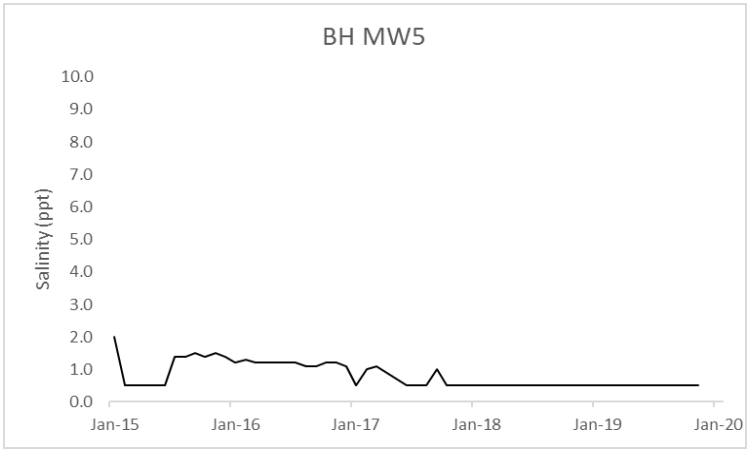


Figure C-6. Big Hill Ground Water Monitoring Well Salinities

MW6	Jan-15	0.5
MW6	Feb-15	0.5
MW6	Mar-15	0.5
MW6	Apr-15	0.5
MW6	May-15	0.5
MW6	Jun-15	0.5
MW6	Jul-15	0.5
MW6	Aug-15	0.5
MW6	Sep-15	0.5
MW6	Oct-15	0.5
MW6	Nov-15	0.5
MW6	Dec-15	0.5
MW6	Jan-16	0.5
MW6	Feb-16	0.5
MW6	Mar-16	0.5
MW6	Apr-16	0.5
MW6	May-16	0.5
MW6	Jun-16	0.5
MW6	Jul-16	0.5
MW6	Aug-16	0.5
MW6	Sep-16	0.5
MW6	Oct-16	0.5
MW6	Nov-16	0.5
MW6	Dec-16	0.5
MW6	Jan-17	0.5
MW6	Feb-17	0.5
MW6	Mar-17	0.5
MW6	Jun-17	0.5
MW6	Jul-17	0.5
MW6	Aug-17	0.5
MW6	Sep-17	0.5
MW6	Oct-17	0.5
MW6	Jan-18	0.5
MW6	Feb-18	0.5
MW6	Mar-18	0.5
MW6	Apr-18	0.5
MW6	May-18	0.5
MW6	Jun-18	0.5
MW6	Jul-18	0.5
MW6	Aug-18	0.5
MW6	Sep-18	0.5
MW6	Oct-18	0.5
MW6	Nov-18	0.5
MW6	Dec-18	0.5
MW6	Jan-19	0.5
MW6	Feb-19	0.5
MW6	Mar-19	0.5
MW6	Apr-19	0.5
MW6	May-19	0.5
MW6	Jun-19	0.5
MW6	Jul-19	0.5
MW6	Aug-19	0.5
MW6	Sep-19	0.5
MW6	Oct-19	0.5
MW6	Nov-19	0.5
	Average	**0.5**

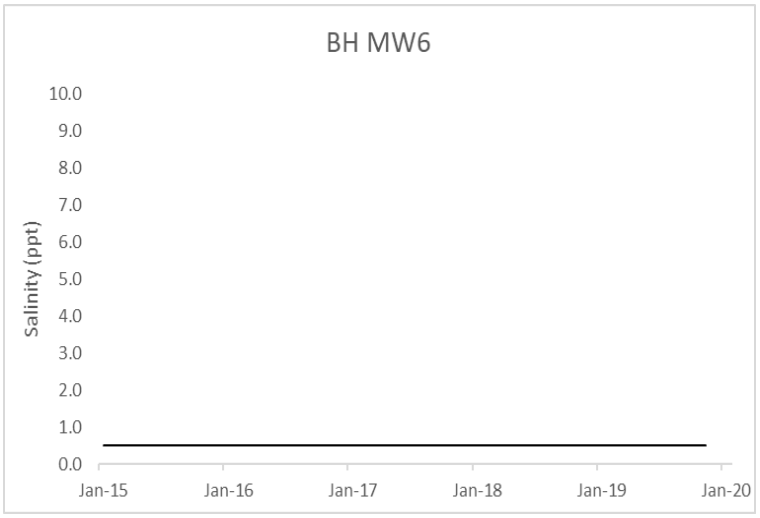
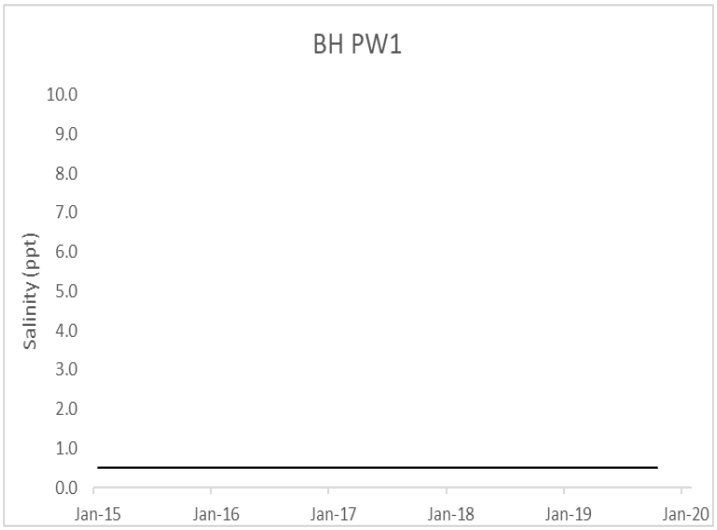
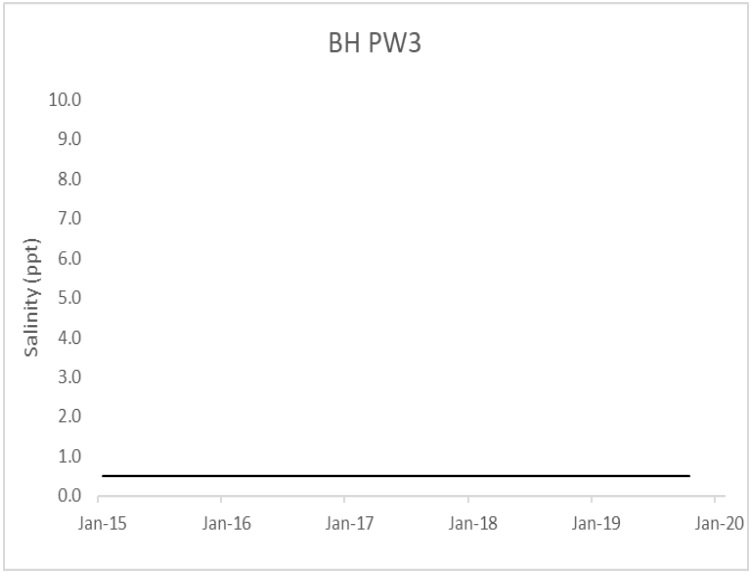


Figure C-6. Big Hill Ground Water Monitoring Well Salinities

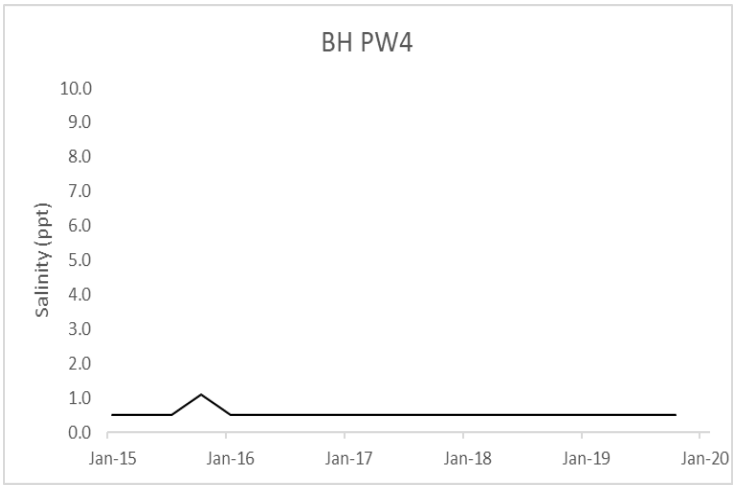
PW1	Jan-15	0.5
PW1	Apr-15	0.5
PW1	Jul-15	0.5
PW1	Oct-15	0.5
PW1	Jan-16	0.5
PW1	Apr-16	0.5
PW1	Jul-16	0.5
PW1	Oct-16	0.5
PW1	Jul-17	0.5
PW1	Oct-17	0.5
PW1	Jan-18	0.5
PW1	Apr-18	0.5
PW1	Jul-18	0.5
PW1	Oct-18	0.5
PW1	Jan-19	0.5
PW1	Apr-19	0.5
PW1	Jul-19	0.5
PW1	Oct-19	0.5
	Average	**0.5**



PW3	Jan-15	0.5
PW3	Apr-15	0.5
PW3	Jul-15	0.5
PW3	Oct-15	0.5
PW3	Jan-16	0.5
PW3	Apr-16	0.5
PW3	Jul-16	0.5
PW3	Oct-16	0.5
PW3	Jan-17	0.5
PW3	Jul-17	0.5
PW3	Oct-17	0.5
PW3	Jan-18	0.5
PW3	Apr-18	0.5
PW3	Jul-18	0.5
PW3	Oct-18	0.5
PW3	Jan-19	0.5
PW3	Apr-19	0.5
PW3	Oct-19	0.5
	Average	**0.5**



PW4	Jan-15	0.5
PW4	Apr-15	0.5
PW4	Jul-15	0.5
PW4	Oct-15	1.1
PW4	Jan-16	0.5
PW4	Apr-16	0.5
PW4	Jul-16	0.5
PW4	Oct-16	0.5
PW4	Jan-17	0.5
PW4	Jul-17	0.5
PW4	Oct-17	0.5
PW4	Jan-18	0.5
PW4	Apr-18	0.5
PW4	Jul-18	0.5
PW4	Oct-18	0.5
PW4	Jan-19	0.5
PW4	Apr-19	0.5
PW4	Jul-19	0.5
PW4	Oct-19	0.5
	Average	**0.5**



PW5	Jan-15	0.5
PW5	Apr-15	0.5
PW5	Jul-15	0.5
PW5	Oct-15	0.5
PW5	Jan-16	0.5
PW5	Apr-16	0.5
PW5	Jul-16	0.5
PW5	Oct-16	0.5
PW5	Jan-17	0.5
PW5	Jul-17	0.5
PW5	Oct-17	0.5
PW5	Jan-18	0.5
PW5	Apr-18	0.5
PW5	Jul-18	0.5
PW5	Oct-18	0.5
PW5	Jan-19	0.5
PW5	Apr-19	0.5
PW5	Jul-19	0.5
PW5	Oct-19	0.5
	Average	**0.5**

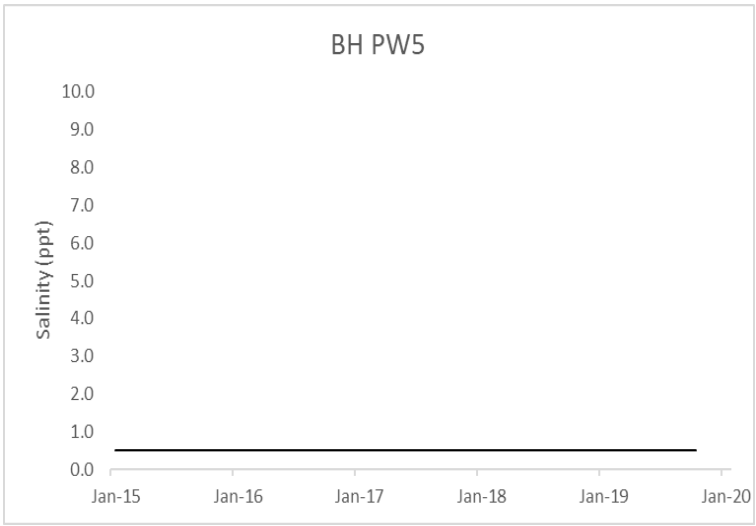


Figure C-6. Big Hill Ground Water Monitoring Well Salinities

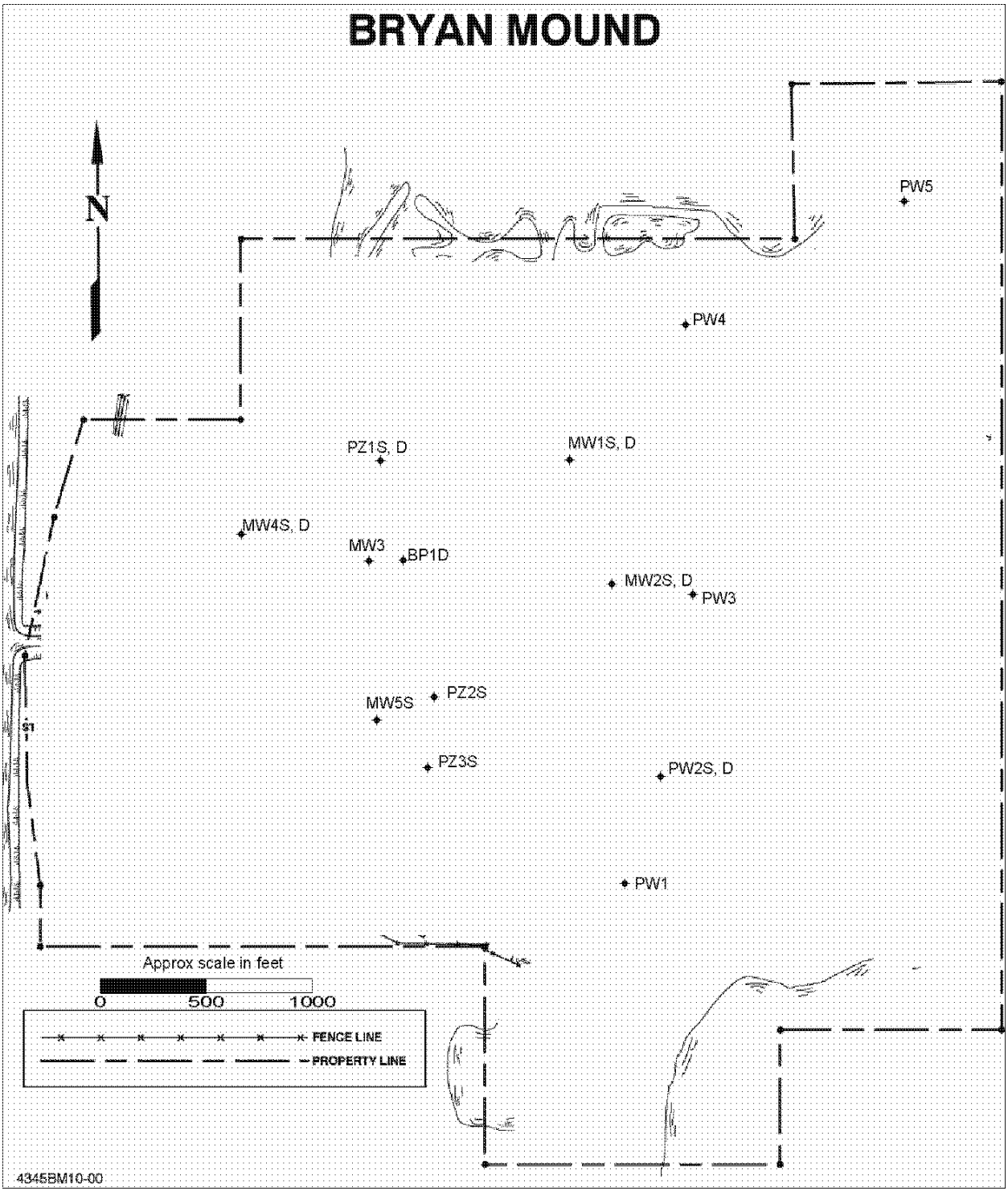


Figure C-7. Bryan Mound Ground Water Monitoring Stations, Deep and Shallow

Bryan Mound 2019 Contour-Shallow

Figure C-8. Bryan Mound Shallow Ground Water Zone Contoured Elevations September 2019

Bryan Mound 2019 Contour-Deep

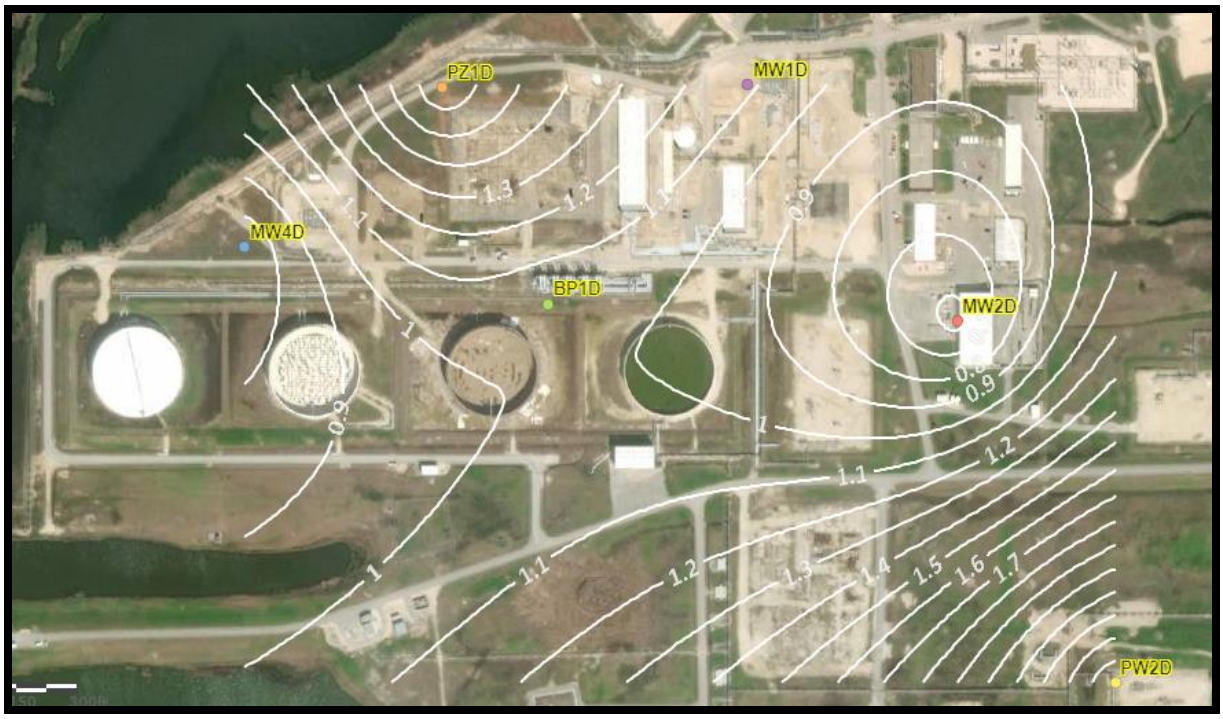
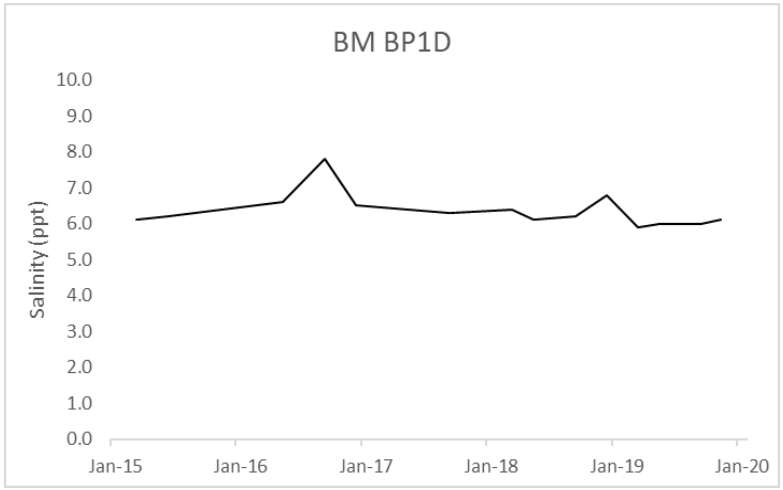


Figure C-9. Bryan Mound Deep Ground Water Zone Contoured Elevations September 2019

BP1D	Mar-15	6.1
BP1D	Jun-15	6.2
BP1D	May-16	6.6
BP1D	Sep-16	7.8
BP1D	Dec-16	6.5
BP1D	Sep-17	6.3
BP1D	Mar-18	6.4
BP1D	May-18	6.1
BP1D	Sep-18	6.2
BP1D	Dec-18	6.8
BP1D	Mar-19	5.9
BP1D	May-19	6.0
BP1D	Sep-19	6.0
BP1D	Nov-19	6.1
	Average	**6.4**



MW1D	Mar-15	44.0
MW1D	Jun-15	156.0
MW1D	Sep-15	180.0
MW1D	Mar-16	162.0
MW1D	May-16	170.0
MW1D	Sep-16	155.0
MW1D	Dec-16	161.0
MW1D	Jun-17	168.0
MW1D	Sep-17	169.0
MW1D	Oct-17	169.0
MW1D	Dec-17	174.0
MW1D	Mar-18	117.0
MW1D	May-18	170.0
MW1D	Sep-18	161.0
MW1D	Dec-18	169.0
MW1D	Mar-19	169.0
MW1D	May-19	168.0
MW1D	Sep-19	163.0
MW1D	Nov-19	168.0
	Average	**157.5**

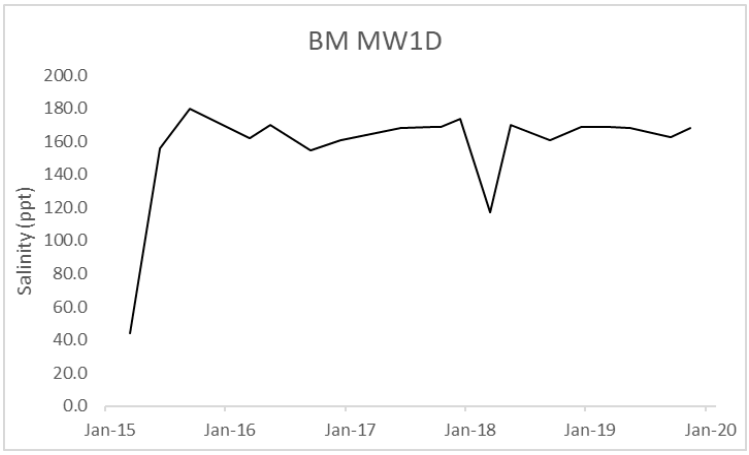
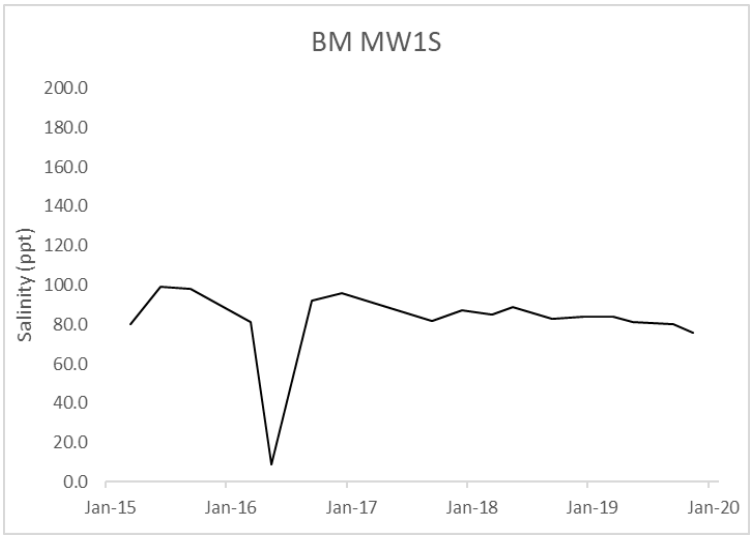


Figure C-10. Bryan Mound Water Monitoring Well Salinities

MW1S	Mar-15	80.0
MW1S	Jun-15	99.0
MW1S	Sep-15	98.0
MW1S	Mar-16	81.0
MW1S	May-16	9.0
MW1S	Sep-16	92.0
MW1S	Dec-16	96.0
MW1S	Sep-17	82.0
MW1S	Dec-17	87.0
MW1S	Mar-18	85.0
MW1S	May-18	89.0
MW1S	Sep-18	83.0
MW1S	Dec-18	84.0
MW1S	Mar-19	84.0
MW1S	May-19	81.0
MW1S	Sep-19	80.0
MW1S	Nov-19	76.0
	Average	**81.5**



MW2D	Mar-15	60.0
MW2D	Jun-15	58.0
MW2D	Sep-15	60.0
MW2D	Mar-16	56.6
MW2D	Sep-16	55.0
MW2D	Dec-16	56.0
MW2D	Jun-17	11.8
MW2D	Sep-17	54.0
MW2D	Dec-17	53.0
MW2D	Mar-18	60.0
MW2D	May-18	64.0
MW2D	Sep-18	62.0
MW2D	Dec-18	61.0
MW2D	Mar-19	61.0
MW2D	May-19	61.0
MW2D	Sep-19	60.0
MW2D	Nov-19	61.0
	Average	**56.1**

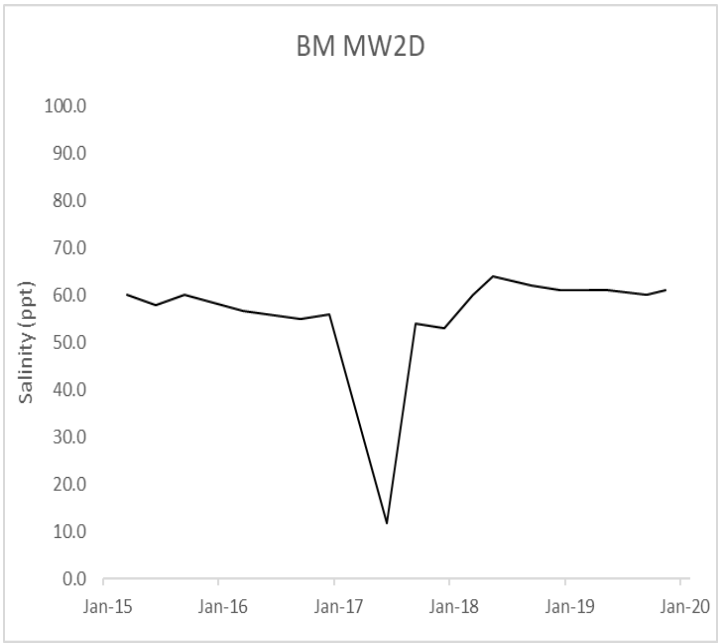
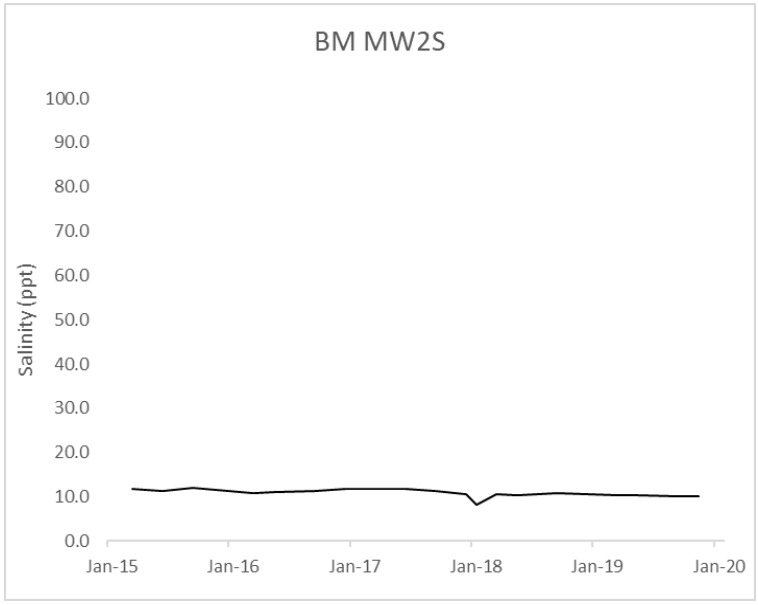


Figure C-10. Bryan Mound Water Monitoring Well Salinities

MW2S	Mar-15	11.8
MW2S	Jun-15	11.2
MW2S	Sep-15	12.1
MW2S	Mar-16	10.9
MW2S	May-16	11.1
MW2S	Sep-16	11.3
MW2S	Dec-16	11.8
MW2S	Jun-17	11.8
MW2S	Sep-17	11.4
MW2S	Dec-17	10.5
MW2S	Jan-18	8.2
MW2S	Mar-18	10.5
MW2S	May-18	10.4
MW2S	Sep-18	10.7
MW2S	Dec-18	10.5
MW2S	Mar-19	10.4
MW2S	May-19	10.3
MW2S	Sep-19	10.0
MW2S	Nov-19	10.0
	Average	**10.8**



MW3	Mar-15	6.7
MW3	Jun-15	7.3
MW3	Mar-16	6.8
MW3	May-16	7.8
MW3	Sep-16	9.8
MW3	Dec-16	7.3
MW3	Jun-17	7.1
MW3	Sep-17	7.2
MW3	Dec-17	7.1
MW3	Mar-18	6.9
MW3	May-18	6.8
MW3	Sep-18	7.4
MW3	Dec-18	7.2
MW4	Mar-19	6.9
MW5	May-19	6.8
MW3	Sep-19	6.6
MW4	Nov-19	9.5
	Average	**7.4**

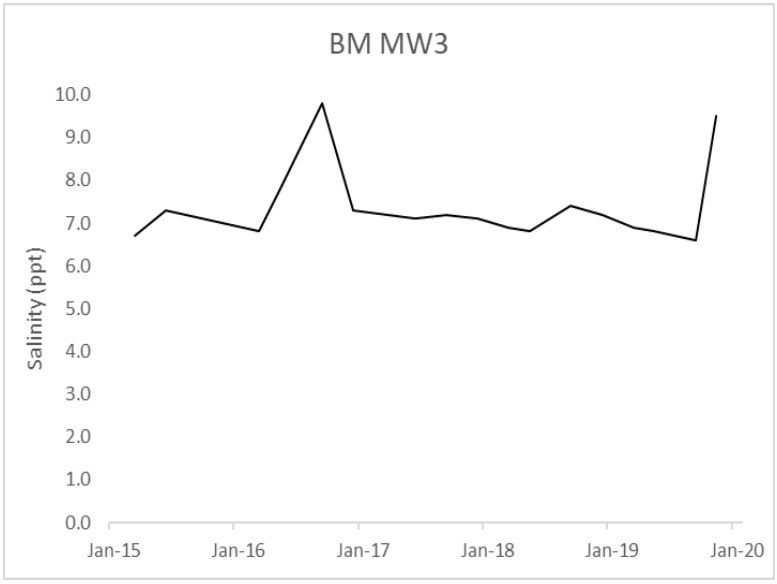
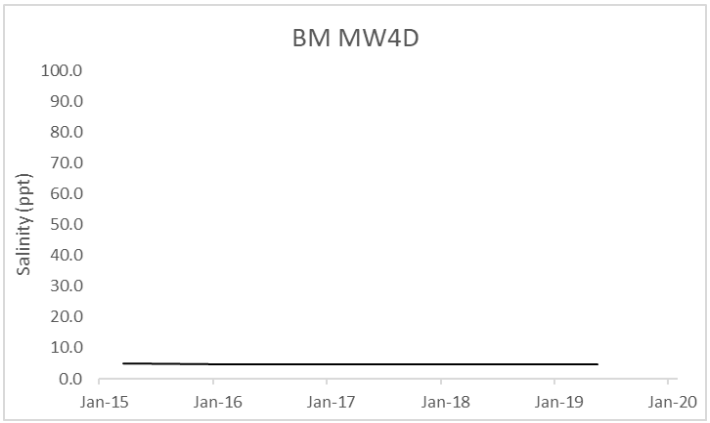


Figure C-10. Bryan Mound Water Monitoring Well Salinities

MW4D	Mar-15	4.9
MW4D	Mar-16	4.8
MW4D	Mar-18	4.6
MW4D	May-18	4.6
MW4D	Mar-19	4.7
MW4D	May-19	4.6
	Average	**4.7**



MW4S	Mar-15	9.6
MW4S	Mar-16	10.1
MW4S	Mar-18	9.6
MW4S	May-18	9.6
MW4S	Dec-18	9.5
MW4S	Mar-19	9.6
MW4S	May-19	9.7
	Average	**9.7**

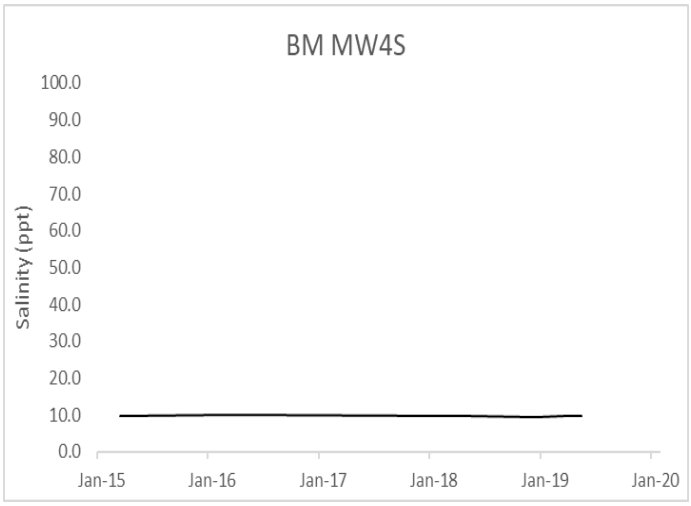
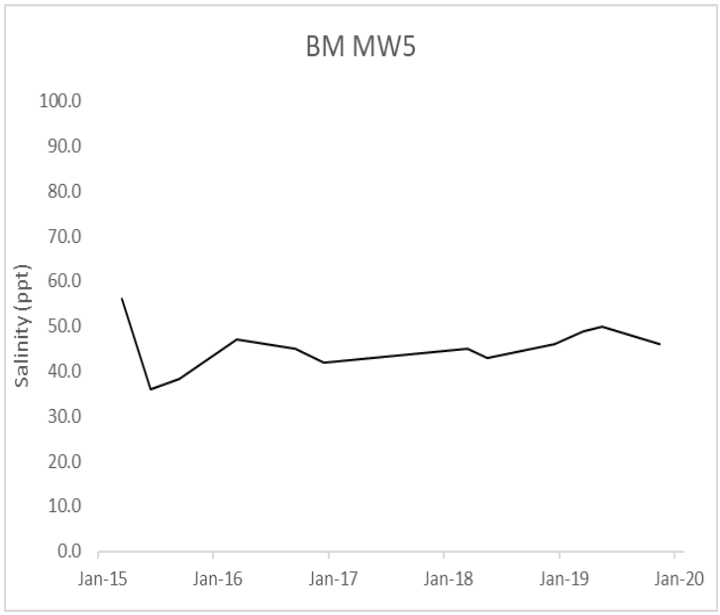
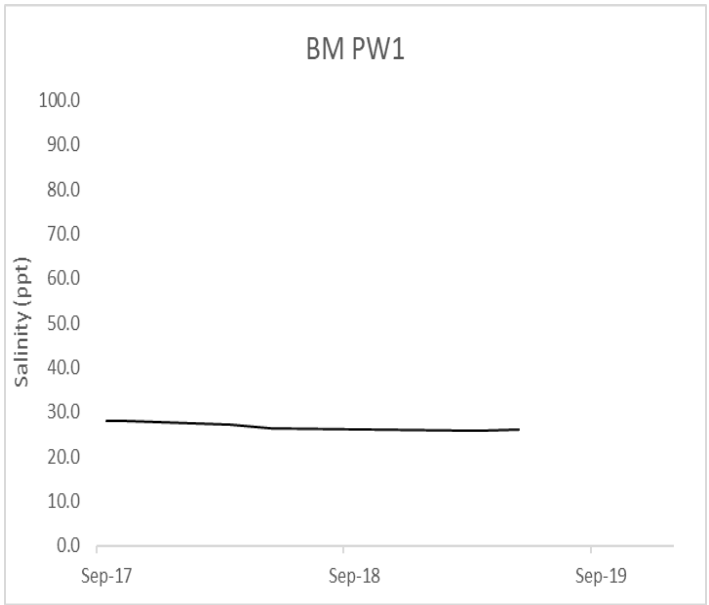


Figure C-10. Bryan Mound Water Monitoring Well Salinities

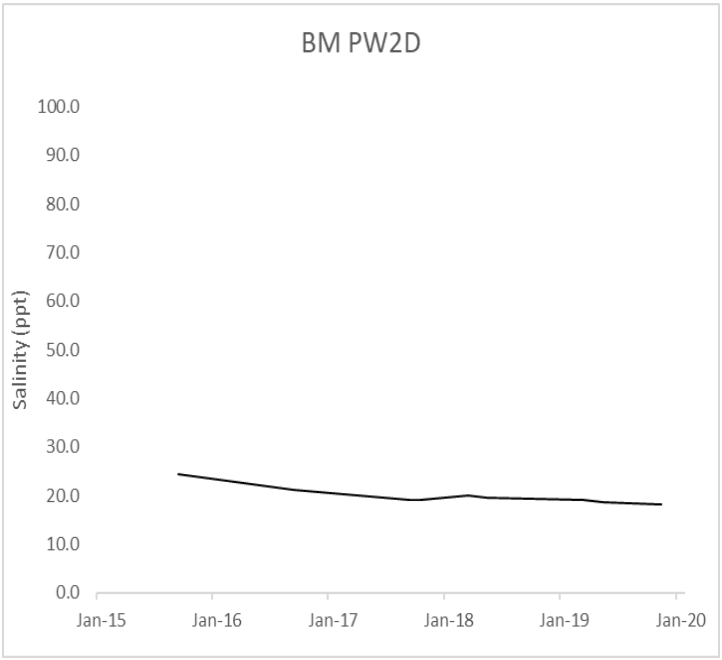
MW5	Mar-15	56.0
MW5	Jun-15	35.9
MW5	Sep-15	38.3
MW5	Mar-16	47.0
MW5	Sep-16	45.0
MW5	Dec-16	42.0
MW5	Mar-18	45.0
MW5	May-18	43.0
MW5	Dec-18	46.0
MW5	Mar-19	49.0
MW5	May-19	50.0
MW5	Nov-19	46.0
	Average	**45.3**



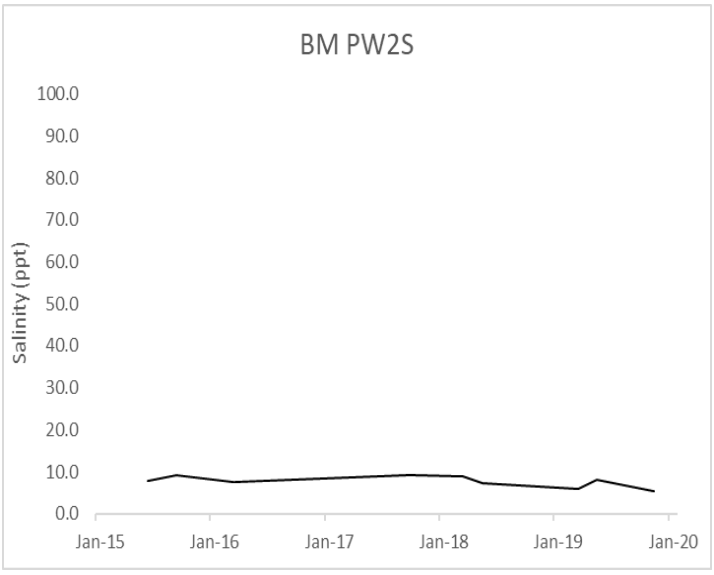
PW1	Sep-17	27.9
PW1	Oct-17	27.9
PW1	Mar-18	27.3
PW1	May-18	26.4
PW1	Mar-19	25.8
PW1	May-19	26.1
	Average	**26.9**



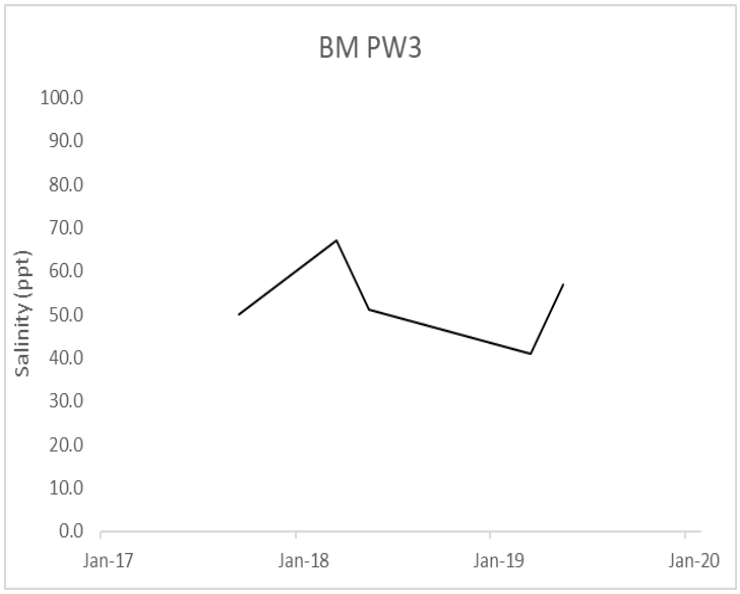
PW2D	Sep-15	24.4
PW2D	Sep-16	21.2
PW2D	Sep-17	19.2
PW2D	Oct-17	19.2
PW2D	Mar-18	20.1
PW2D	May-18	19.6
PW2D	Mar-19	19.2
PW2D	May-19	18.7
PW2D	Nov-19	18.2
	Average	**20.0**



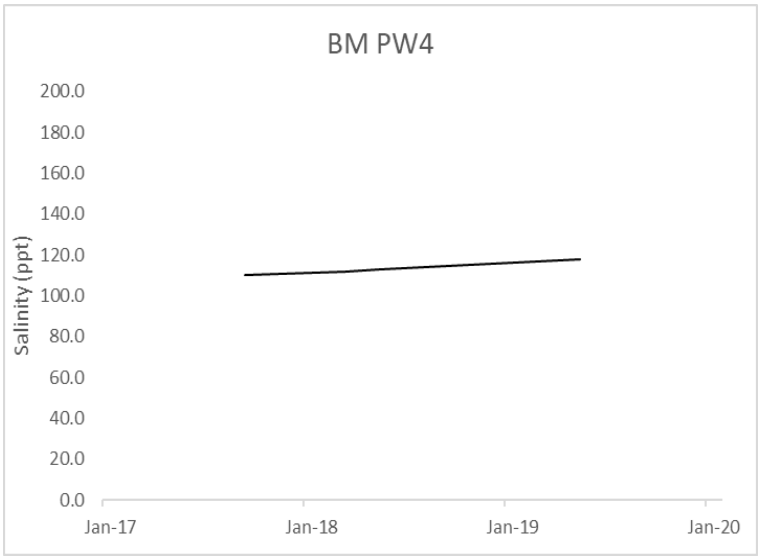
PW2S	Jun-15	7.7
PW2S	Sep-15	9.1
PW2S	Mar-16	7.5
PW2S	Sep-16	8.1
PW2S	Sep-17	9.3
PW2S	Oct-17	9.3
PW2S	Mar-18	8.9
PW2S	May-18	7.3
PW2S	Mar-19	5.8
PW2S	May-19	8.1
PW2S	Nov-19	5.4
	Average	**7.9**



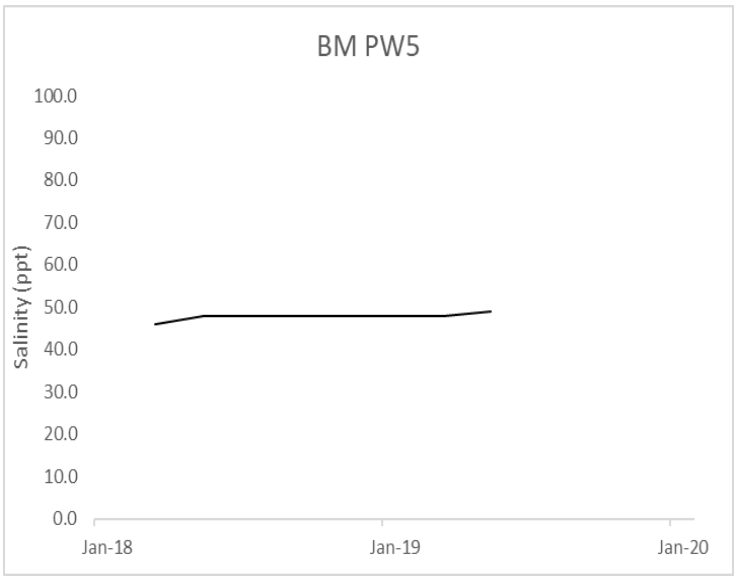
PW3	Sep-17	50.0
PW3	Mar-18	67.0
PW3	May-18	51.0
PW3	Mar-19	41.0
PW3	May-19	57.0
	Average	**53.2**



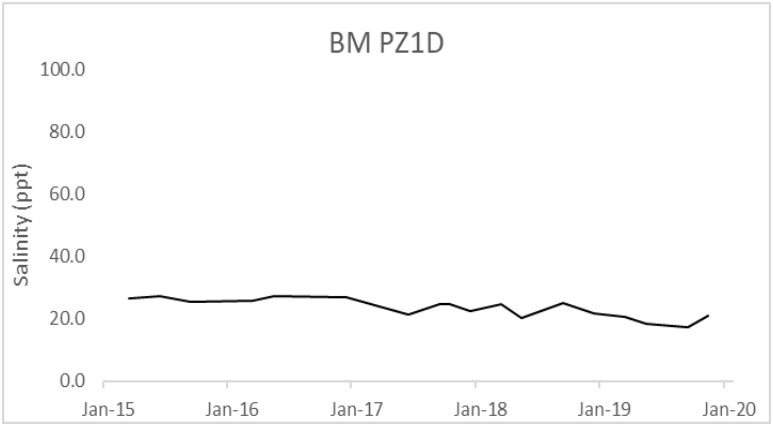
PW4	Sep-17	110.0
PW4	Mar-18	112.0
PW4	May-18	113.0
PW4	May-19	118.0
	Average	**113.3**



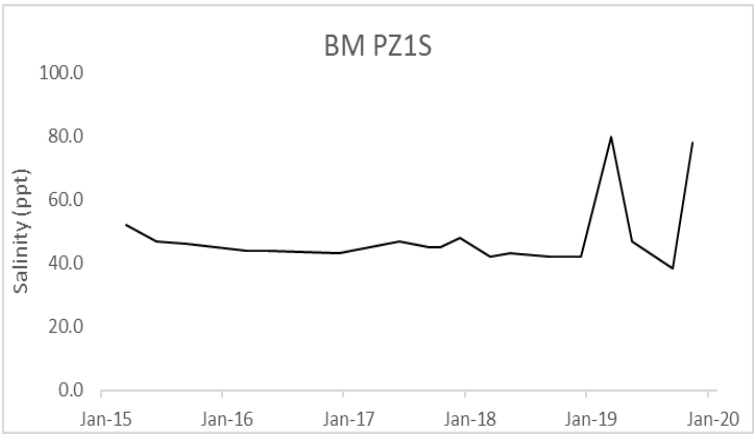
PW5	Mar-18	46.0
PW5	May-18	48.0
PW5	Mar-19	48.0
PW5	May-19	49.0
	Average	**47.0**



PZ1D	Mar-15	26.5
PZ1D	Jun-15	27.2
PZ1D	Sep-15	25.5
PZ1D	Mar-16	25.6
PZ1D	May-16	27.3
PZ1D	Dec-16	26.8
PZ1D	Jun-17	21.1
PZ1D	Sep-17	24.5
PZ1D	Oct-17	24.5
PZ1D	Dec-17	22.4
PZ1D	Mar-18	24.7
PZ1D	May-18	20.3
PZ1D	Sep-18	24.9
PZ1D	Dec-18	21.8
PZ1D	Mar-19	20.7
PZ1D	May-19	18.4
PZ1D	Sep-19	17.2
PZ1D	Nov-19	20.9
	Average	**23.4**



PZ1S	Mar-15	52.0
PZ1S	Jun-15	47.0
PZ1S	Sep-15	46.0
PZ1S	Mar-16	44.0
PZ1S	May-16	44.0
PZ1S	Dec-16	43.0
PZ1S	Jun-17	47.0
PZ1S	Sep-17	45.0
PZ1S	Oct-17	45.0
PZ1S	Dec-17	48.0
PZ1S	Mar-18	42.0
PZ1S	May-18	43.0
PZ1S	Sep-18	42.0
PZ1S	Dec-18	42.0
PZ1S	Mar-19	79.8
PZ1S	May-19	47.0
PZ1S	Sep-19	38.5
PZ1S	Nov-19	77.8
	Average	**48.5**



PZ3	Sep-17	22.3
PZ3	Oct-17	22.3
PZ3	Mar-18	23.1
PZ3	May-18	22.0
PZ3	Mar-19	22.3
PZ3	May-19	22.7
	Average	**22.5**

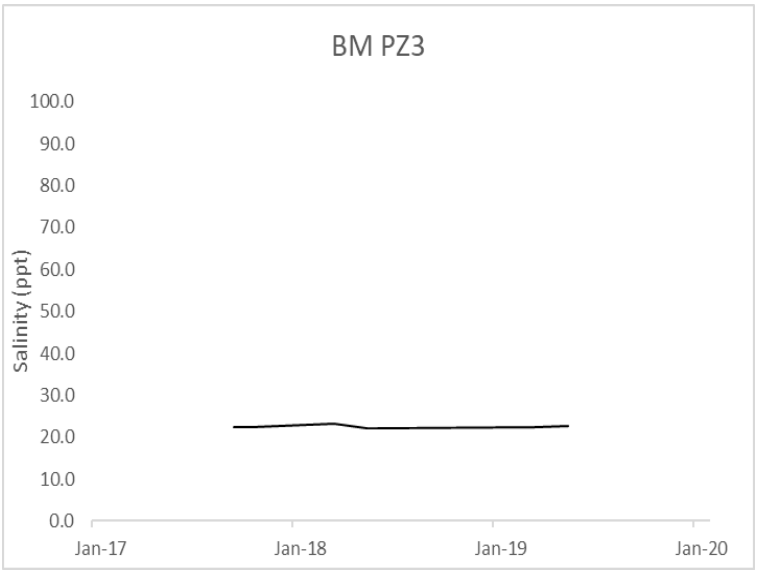


Figure C-10. Bryan Mound Water Monitoring Well Salinities

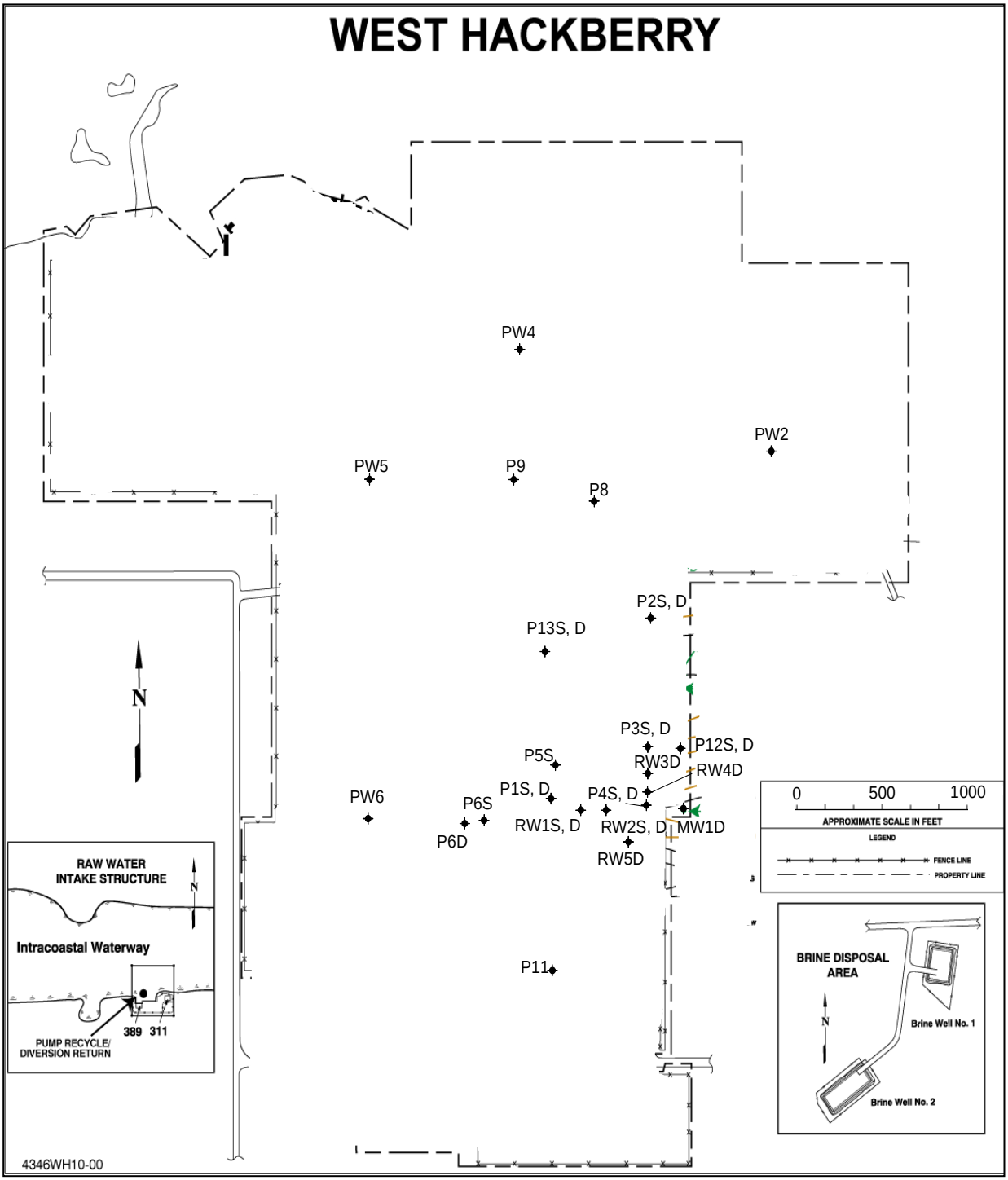


Figure C-11. West Hackberry Ground Water Monitoring Stations, Deep and Shallow

West Hackberry 2019 Contour-Shallow

Figure C-12. West Hackberry Shallow Ground Water Zone Contoured Elevations September 2019

West Hackberry 2019 Contour-Deep

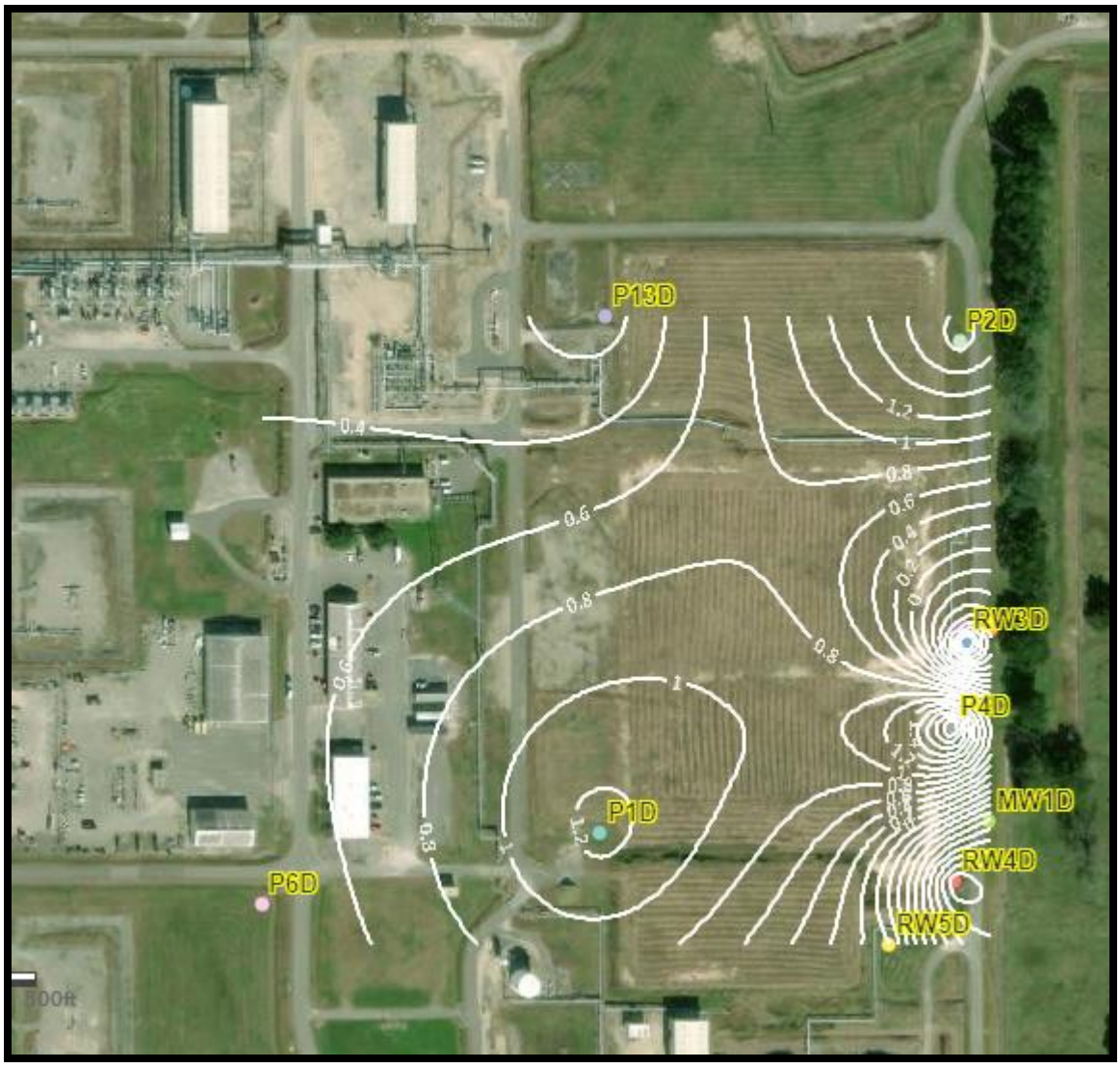
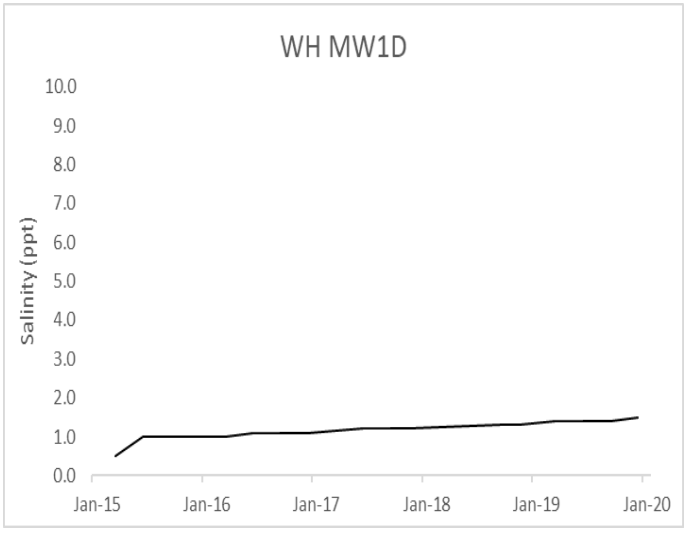


Figure C-13 West Hackberry Deep Ground Water Zone Contoured Elevations September 2019

MW1D	Mar-15	0.5
MW1D	Jun-15	1.0
MW1D	Sep-15	1.0
MW1D	Dec-15	1.0
MW1D	Mar-16	1.0
MW1D	Jun-16	1.1
MW1D	Sep-16	1.1
MW1D	Dec-16	1.1
MW1D	Jun-17	1.2
MW1D	Sep-17	1.2
MW1D	Nov-17	1.2
MW1D	Sep-18	1.3
MW1D	Nov-18	1.3
MW1D	Mar-19	1.4
MW1D	Jun-19	1.4
MW1D	Sep-19	1.4
MW1D	Dec-19	1.5
	Average	**1.2**



P11	Mar-15	1.1
P11	May-15	1.1
P11	Aug-15	1.0
P11	Dec-15	0.5
P11	Mar-16	1.2
P11	Jun-16	1.0
P11	Sep-16	1.0
P11	Nov-16	1.0
P11	Jun-17	1.0
P11	Sep-17	0.5
P11	Nov-17	0.5
P11	Sep-18	1.0
P11	Nov-18	1.0
P11	Mar-19	1.1
P11	Jun-19	1.1
P11	Sep-19	1.0
P11	Nov-19	0.5
	Average	**0.9**

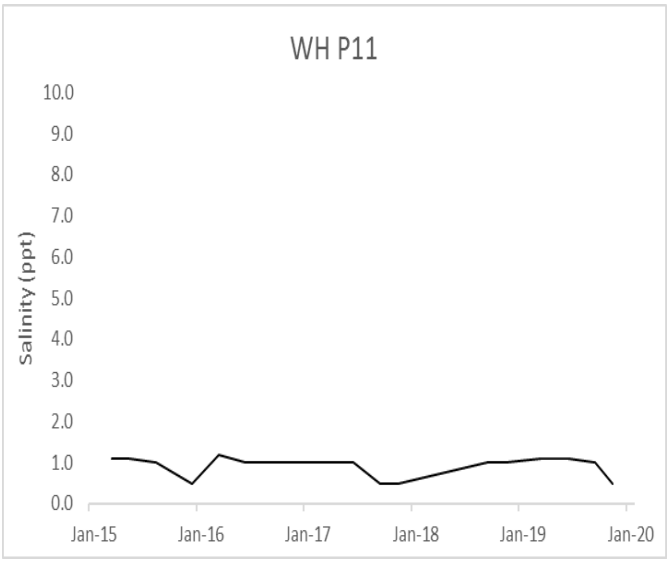
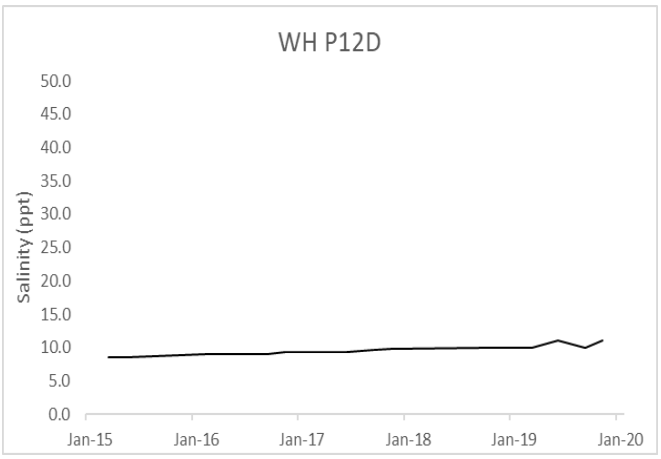


Figure C-14. West Hackberry Monitoring Well Salinities

P12D	Mar-15	8.5
P12D	May-15	8.5
P12D	Aug-15	8.7
P12D	Feb-16	9.0
P12D	Jun-16	9.0
P12D	Sep-16	9.0
P12D	Nov-16	9.3
P12D	Jun-17	9.4
P12D	Sep-17	9.7
P12D	Nov-17	9.8
P12D	Sep-18	10.0
P12D	Nov-18	10.0
P12D	Mar-19	10.0
P12D	Jun-19	11.0
P12D	Sep-19	10.0
P12D	Nov-19	11.0
	Average	**9.6**



P12S	Mar-15	14.0
P12S	May-15	14.0
P12S	Aug-15	14.0
P12S	Dec-15	13.0
P12S	Feb-16	13.0
P12S	Jun-16	12.0
P12S	Sep-16	8.8
P12S	Nov-16	12.0
P12S	Jun-17	11.0
P12S	Sep-17	11.0
P12S	Nov-17	12.0
P12S	Sep-18	11.0
P12S	Nov-18	12.0
P12S	Mar-19	11.0
P12S	Jun-19	11.0
P12S	Sep-19	9.8
P12S	Nov-19	9.7
	Average	**11.7**

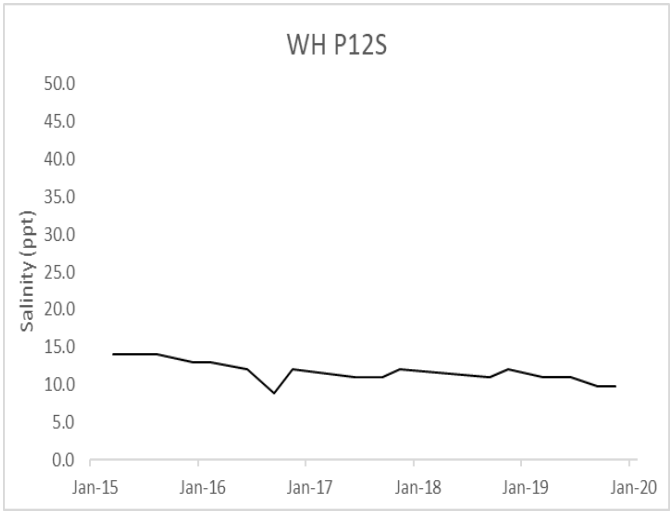
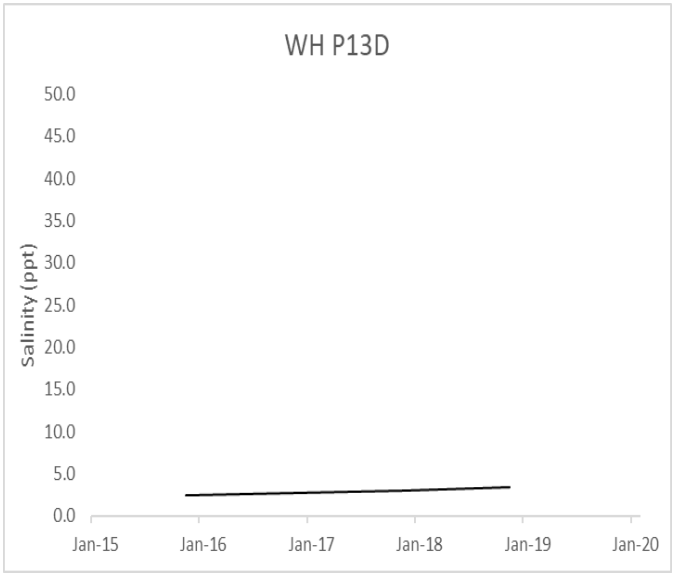


Figure C-14. West Hackberry Monitoring Well Salinities

P13D	Nov-15	2.5
P13D	Nov-16	2.8
P13D	Nov-17	3.0
P13D	Nov-18	3.4
P13D	Nov-19	3.7
	Average	**3.1**



P13S	Nov-15	0.5
P13S	Nov-16	0.5
P13S	Nov-17	0.5
P13S	Nov-18	0.5
P13S	Nov-19	0.5
	Average	**0.5**

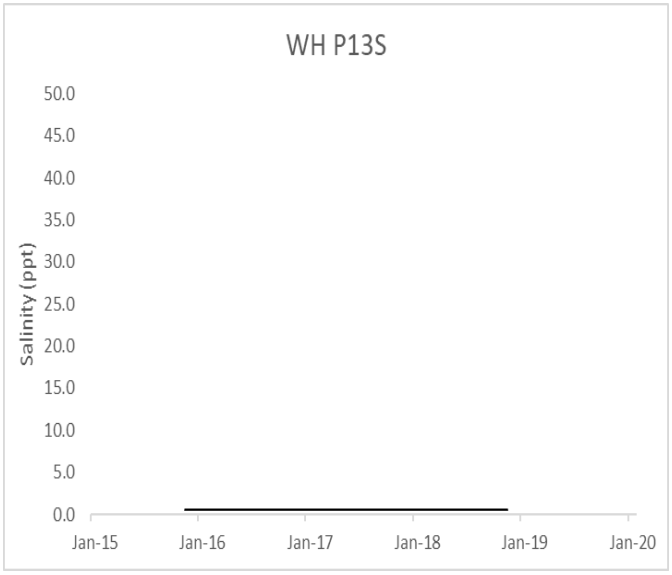
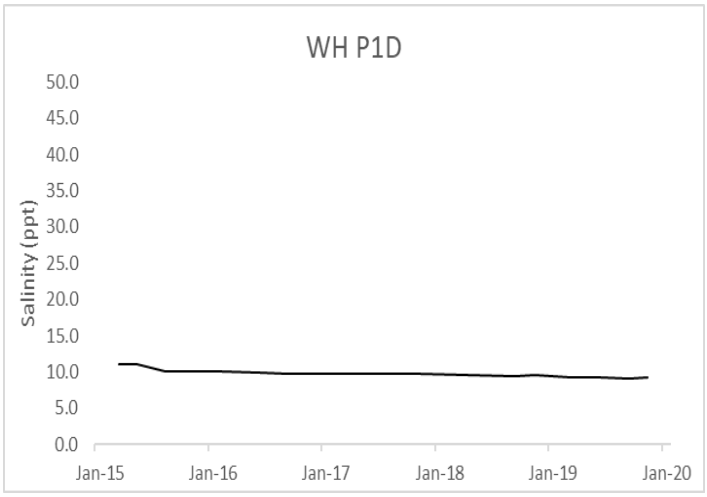


Figure C-14. West Hackberry Monitoring Well Salinities

P1D	Mar-15	11.0
P1D	May-15	11.0
P1D	Aug-15	10.0
P1D	Nov-15	10.0
P1D	Feb-16	10.0
P1D	Jun-16	9.9
P1D	Sep-16	9.7
P1D	Nov-16	9.8
P1D	Jun-17	9.7
P1D	Sep-17	9.7
P1D	Nov-17	9.7
P1D	Sep-18	9.4
P1D	Nov-18	9.5
P1D	Mar-19	9.3
P1D	Jun-19	9.3
P1D	Sep-19	9.1
P1D	Nov-19	9.2
	Average	**9.8**



P1S	Nov-15	1.9
P1S	Nov-16	1.9
P1S	Nov-17	1.0
P1S	Nov-18	0.5
P1S	Nov-19	0.5
	Average	**1.2**

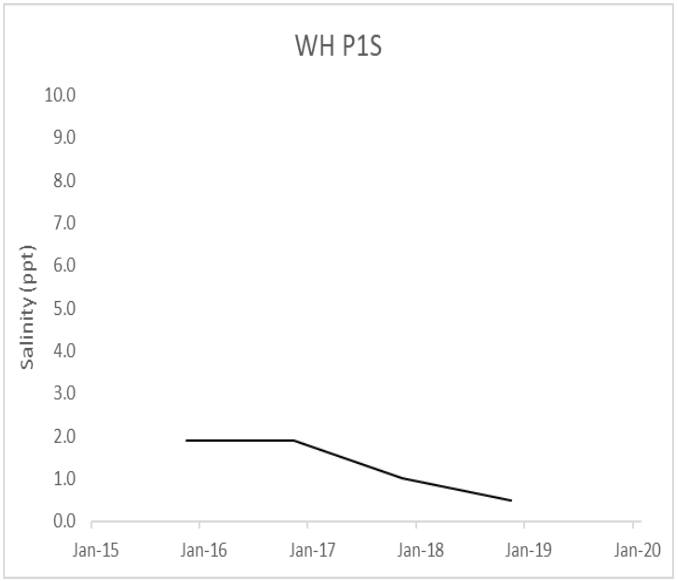
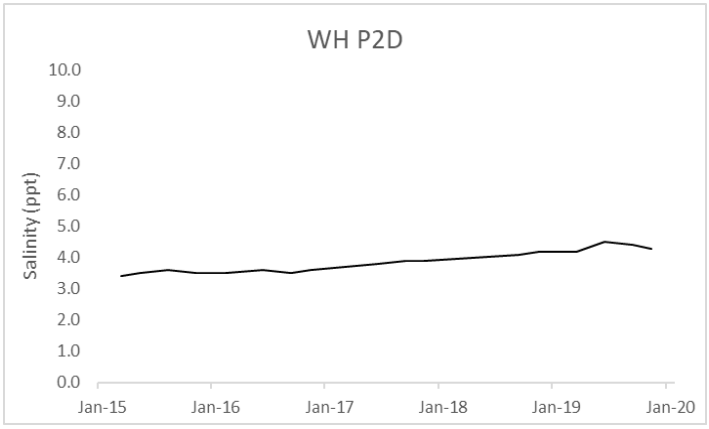


Figure C-14. West Hackberry Monitoring Well Salinities

P2D	Mar-15	3.4
P2D	May-15	3.5
P2D	Aug-15	3.6
P2D	Nov-15	3.5
P2D	Feb-16	3.5
P2D	Jun-16	3.6
P2D	Sep-16	3.5
P2D	Nov-16	3.6
P2D	Jun-17	3.8
P2D	Sep-17	3.9
P2D	Nov-17	3.9
P2D	Sep-18	4.1
P2D	Nov-18	4.2
P2D	Mar-19	4.2
P2D	Jun-19	4.5
P2D	Sep-19	4.4
P2D	Nov-19	4.3
	Average	**3.9**



P2S	Mar-15	2.3
P2S	May-15	2.1
P2S	Aug-15	2.1
P2S	Nov-15	4.3
P2S	Feb-16	1.8
P2S	Jun-16	2.5
P2S	Sep-16	2.3
P2S	Nov-16	2.1
P2S	Jun-17	2.0
P2S	Sep-17	2.6
P2S	Nov-17	2.1
P2S	Sep-18	2.8
P2S	Nov-18	2.6
P2S	Mar-19	2.2
P2S	Jun-19	2.1
P2S	Sep-19	2.1
P2S	Nov-19	2.7
	Average	**2.4**

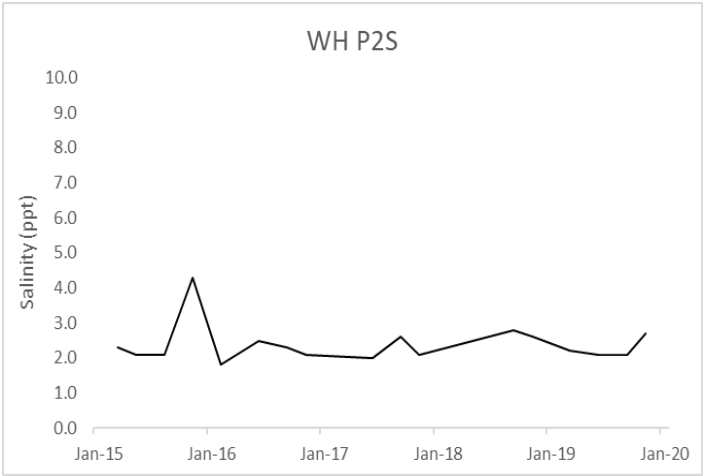
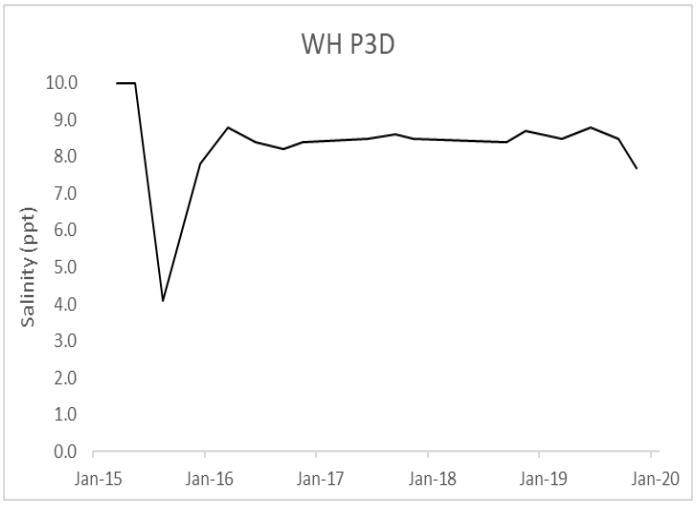


Figure C-14. West Hackberry Monitoring Well Salinities

P3D	Mar-15	10.0
P3D	May-15	10.0
P3D	Aug-15	4.1
P3D	Dec-15	7.8
P3D	Mar-16	8.8
P3D	Jun-16	8.4
P3D	Sep-16	8.2
P3D	Nov-16	8.4
P3D	Jun-17	8.5
P3D	Sep-17	8.6
P3D	Nov-17	8.5
P3D	Sep-18	8.4
P3D	Nov-18	8.7
P3D	Mar-19	8.5
P3D	Jun-19	8.8
P3D	Sep-19	8.5
P3D	Nov-19	7.7
	Average	**8.3**



P3S	Mar-15	32.0
P3S	May-15	36.0
P3S	Aug-15	32.0
P3S	Dec-15	31.0
P3S	Mar-16	31.0
P3S	Jun-16	30.0
P3S	Sep-16	28.0
P3S	Nov-16	30.0
P3S	Jun-17	28.0
P3S	Sep-17	27.0
P3S	Nov-17	26.0
P3S	Sep-18	25.0
P3S	Nov-18	26.0
P3S	Mar-19	23.0
P3S	Jun-19	24.0
P3S	Sep-19	25.0
P3S	Nov-19	22.0
	Average	**28.0**

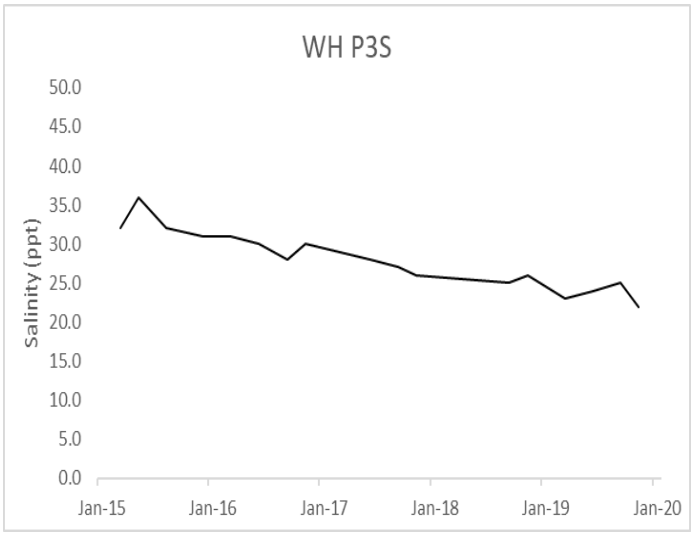
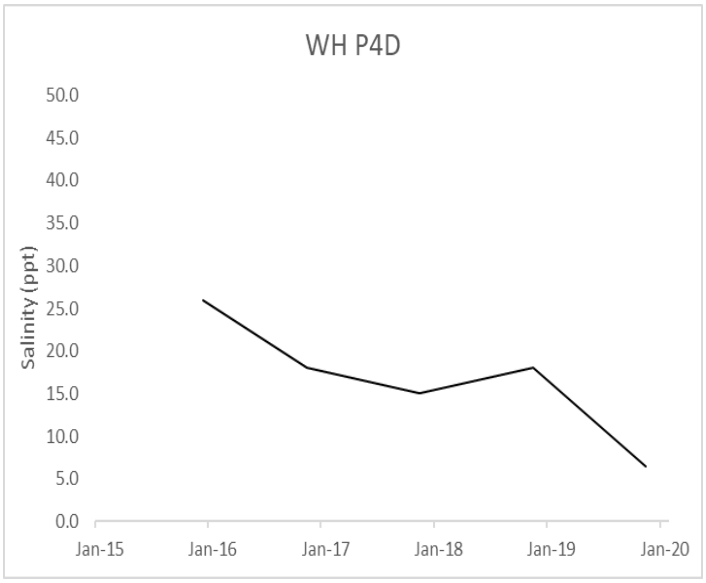


Figure C-14. West Hackberry Monitoring Well Salinities

P4D	Dec-15	26.0
P4D	Nov-16	18.0
P4D	Nov-17	15.0
P4D	Nov-18	18.0
P4D	Nov-19	6.4
	Average	**16.7**



P4S	Mar-15	30.0
P4S	May-15	24.0
P4S	Aug-15	29.0
P4S	Dec-15	26.0
P4S	Mar-16	24.0
P4S	Jun-16	21.0
P4S	Sep-16	24.0
P4S	Nov-16	28.0
P4S	Jun-17	23.0
P4S	Sep-17	20.0
P4S	Nov-17	24.0
P4S	Sep-18	21.0
P4S	Nov-18	14.0
P4S	Mar-19	14.0
P4S	Jun-19	15.0
P4S	Sep-19	17.0
P4S	Nov-19	17.0
	Average	**21.8**

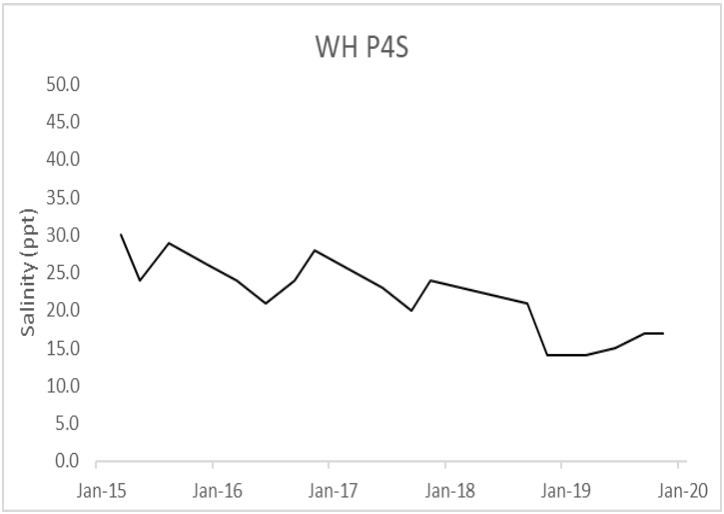
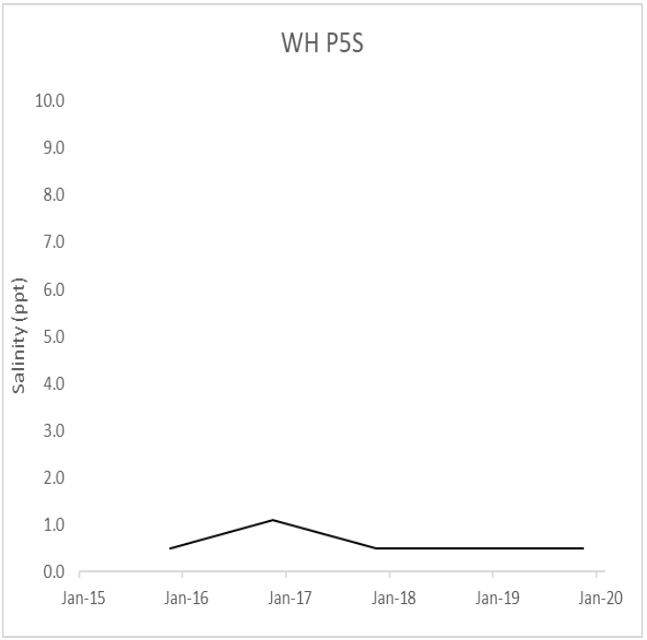


Figure C-14. West Hackberry Monitoring Well Salinities

P5S	Nov-15	0.5
P5S	Nov-16	1.1
P5S	Nov-17	0.5
P5S	Nov-18	0.5
P5S	Nov-19	0.5
	Average	**0.6**



P6D	Mar-15	1.6
P6D	May-15	2.0
P6D	Aug-15	2.0
P6D	Dec-15	1.6
P6D	Mar-16	1.6
P6D	Jun-16	1.9
P6D	Sep-16	1.8
P6D	Dec-16	1.6
P6D	Jun-17	1.3
P6D	Sep-17	1.2
P6D	Nov-17	1.1
P6D	Sep-18	1.2
P6D	Nov-18	1.3
P6D	Mar-19	1.6
P6D	Jun-19	1.8
P6D	Sep-19	1.7
P6D	Dec-19	1.4
	Average	**1.6**

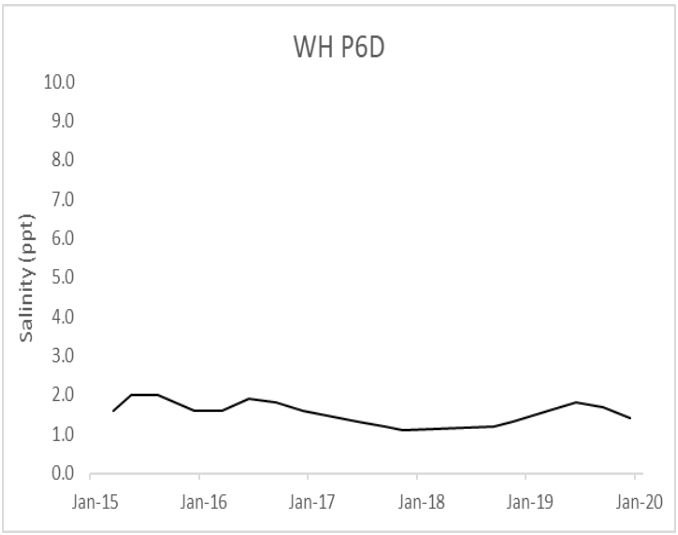
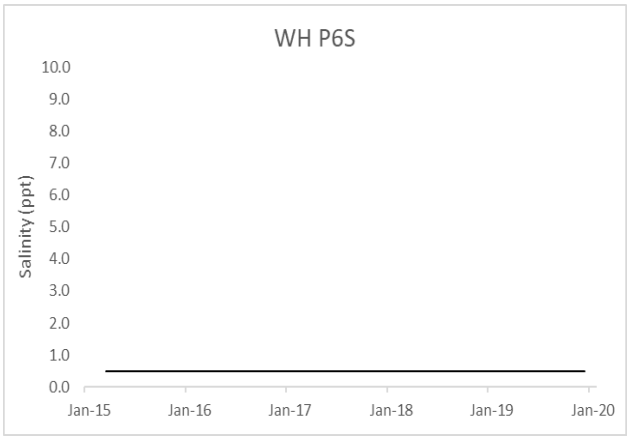


Figure C-14. West Hackberry Monitoring Well Salinities

P6S	Mar-15	0.5
P6S	May-15	0.5
P6S	Aug-15	0.5
P6S	Dec-15	0.5
P6S	Mar-16	0.5
P6S	Jun-16	0.5
P6S	Sep-16	0.5
P6S	Dec-16	0.5
P6S	Jun-17	0.5
P6S	Sep-17	0.5
P6S	Nov-17	0.5
P6S	Sep-18	0.5
P6S	Nov-18	0.5
P6S	Mar-19	0.5
P6S	Jun-19	0.5
P6S	Sep-19	0.5
P6S	Dec-19	0.5
	Average	**0.5**



P8	Dec-15	0.5
P8	Dec-16	0.5
P8	Nov-17	0.5
P8	Nov-18	0.5
P8	Dec-19	0.5
	Average	**0.5**

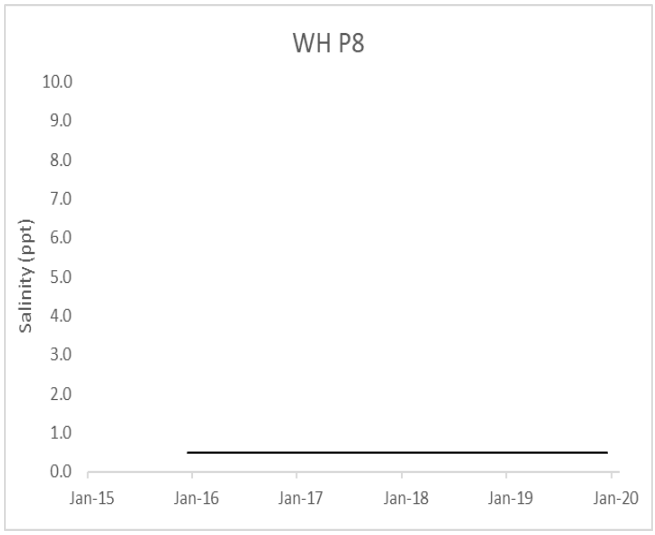
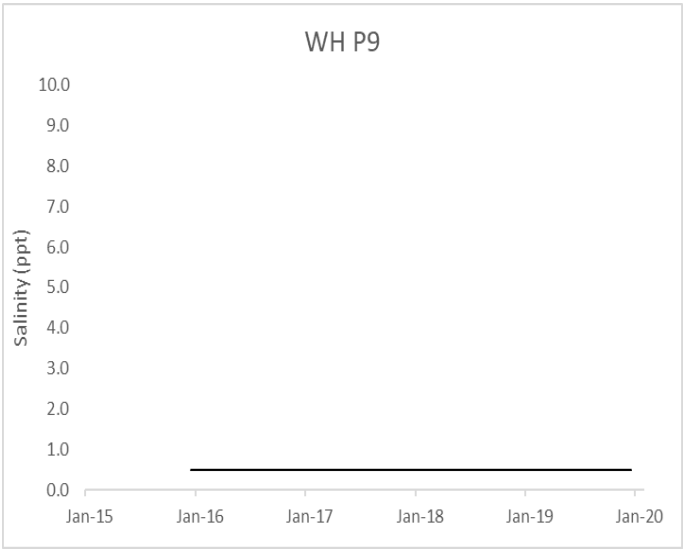


Figure C-14. West Hackberry Monitoring Well Salinities

P9	Dec-15	0.5
P9	Dec-16	0.5
P9	Nov-17	0.5
P9	Nov-18	0.5
P9	Dec-19	0.5
	Average	0.5



PW2	Mar-15	8.7
PW2	Jun-15	8.8
PW2	Aug-15	8.9
PW2	Nov-15	8.9
PW2	Mar-16	9.7
PW2	Jun-16	9.7
PW2	Sep-16	9.7
PW2	Dec-16	9.7
PW2	Jun-17	9.5
PW2	Sep-17	9.4
PW2	Nov-17	9.4
PW2	Sep-18	8.8
PW2	Nov-18	8.7
PW2	Mar-19	8.6
PW2	Jun-19	8.5
PW2	Sep-19	8.0
PW2	Dec-19	8.0
	Average	**9.0**

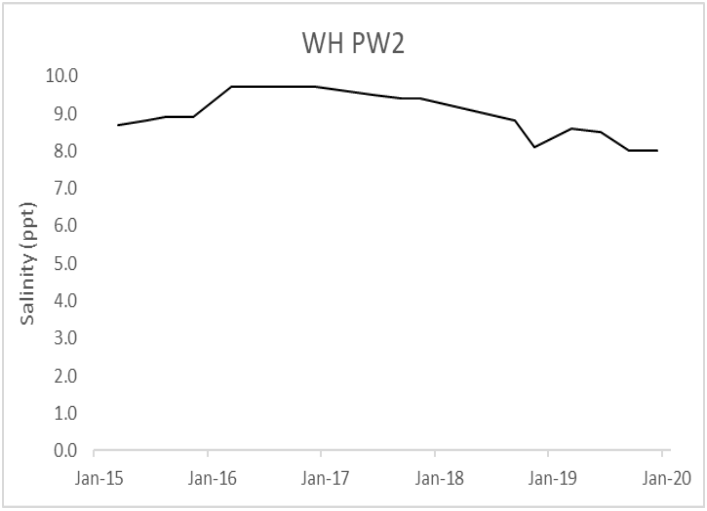
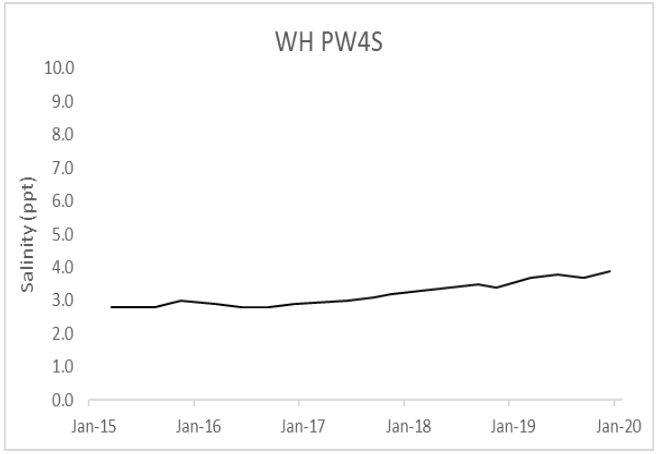


Figure C-14. West Hackberry Monitoring Well Salinities

PW4S	Mar-15	2.8
PW4S	Jun-15	2.8
PW4S	Aug-15	2.8
PW4S	Nov-15	3.0
PW4S	Mar-16	2.9
PW4S	Jun-16	2.8
PW4S	Sep-16	2.8
PW4S	Dec-16	2.9
PW4S	Jun-17	3.0
PW4S	Sep-17	3.1
PW4S	Nov-17	3.2
PW4S	Sep-18	3.5
PW4S	Nov-18	3.4
PW4S	Mar-19	3.7
PW4S	Jun-19	3.8
PW4S	Sep-19	3.7
PW4S	Dec-19	3.9
	Average	**3.2**



PW5	Mar-15	0.5
PW5	Jun-15	0.5
PW5	Aug-15	0.5
PW5	Nov-15	0.5
PW5	Mar-16	0.5
PW5	Jun-16	0.5
PW5	Sep-16	0.5
PW5	Dec-16	0.5
PW5	Jun-17	0.5
PW5	Sep-17	0.5
PW5	Nov-17	0.5
PW5	Sep-18	0.5
PW5	Nov-18	0.5
PW5	Mar-19	0.5
PW5	Jun-19	0.5
PW5	Sep-19	0.5
PW5	Dec-19	0.5
	Average	**0.5**

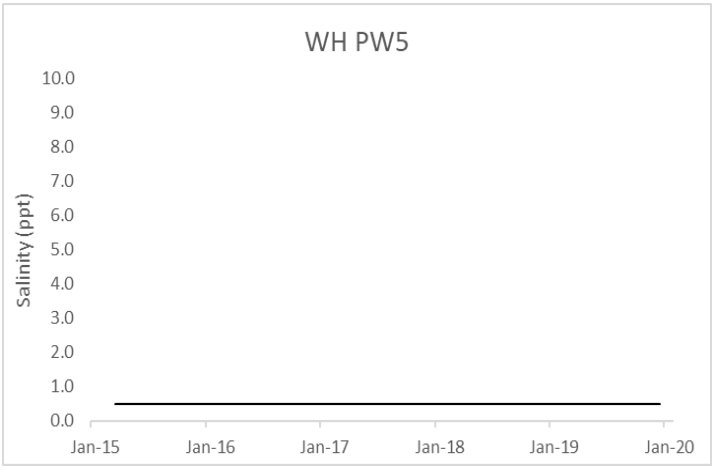
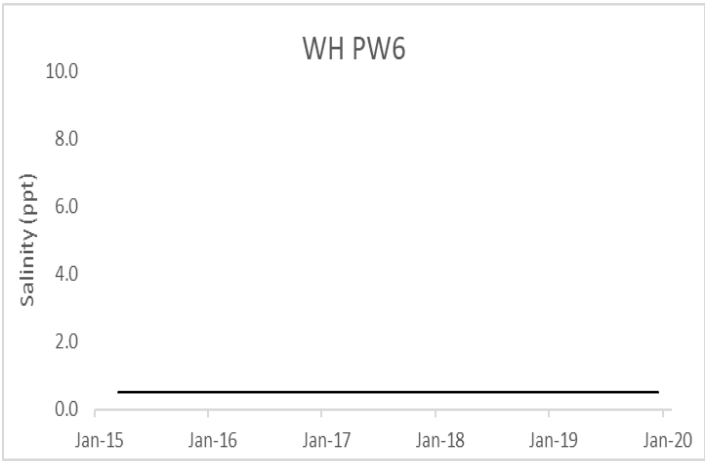


Figure C-14. West Hackberry Monitoring Well Salinities

PW6	Mar-15	0.5
PW6	Jun-15	0.5
PW6	Aug-15	0.5
PW6	Nov-15	0.5
PW6	Mar-16	0.5
PW6	Jun-16	0.5
PW6	Sep-16	0.5
PW6	Dec-16	0.5
PW6	Jun-17	0.5
PW6	Sep-17	0.5
PW6	Nov-17	0.5
PW6	Sep-18	0.5
PW6	Nov-18	0.5
PW6	Mar-19	0.5
PW6	Jun-19	0.5
PW6	Sep-19	0.5
PW6	Dec-19	0.5
	Average	**0.5**



RW2S	Mar-15	0.5
RW2S	May-15	0.5
RW2S	Aug-15	0.5
RW2S	Nov-15	0.5
RW2S	Feb-16	0.5
RW2S	Jun-16	0.5
RW2S	Sep-16	0.5
RW2S	Nov-16	0.5
RW2S	Jun-17	0.5
RW2S	Sep-17	0.5
RW2S	Nov-17	0.5
RW2S	Sep-18	0.5
RW2S	Nov-18	0.5
RW2S	Mar-19	0.5
RW2S	Jun-19	0.5
RW2S	Sep-19	1.0
RW2S	Nov-19	0.5
	Average	**0.5**

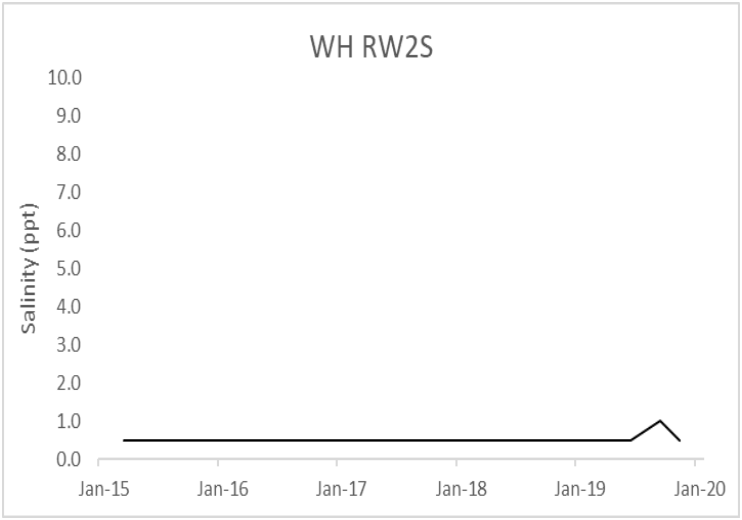
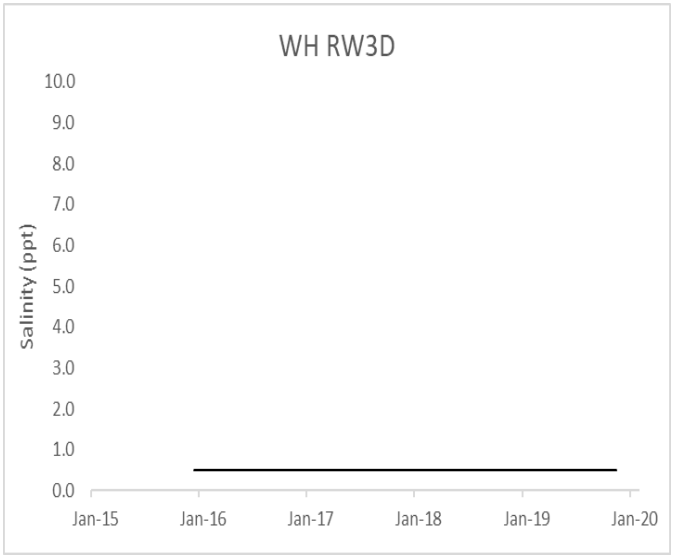


Figure C-14. West Hackberry Monitoring Well Salinities

RW3D	Dec-15	0.5
RW3D	Nov-16	0.5
RW3D	Nov-17	0.5
RW3D	Nov-18	0.5
RW3D	Nov-19	0.5
	Average	**0.5**



RW4D	Mar-15	5.0
RW4D	May-15	2.0
RW4D	Aug-15	2.1
RW4D	Dec-15	1.0
RW4D	Mar-16	2.2
RW4D	Jun-16	2.3
RW4D	Sep-16	2.4
RW4D	Nov-16	2.5
RW4D	Jun-17	2.9
RW4D	Sep-17	3.1
RW4D	Nov-17	3.0
RW4D	Sep-18	3.5
RW4D	Nov-18	3.6
RW4D	Mar-19	3.4
RW4D	Jun-19	3.5
RW4D	Sep-19	3.5
RW4D	Nov-19	3.6
	Average	**2.9**

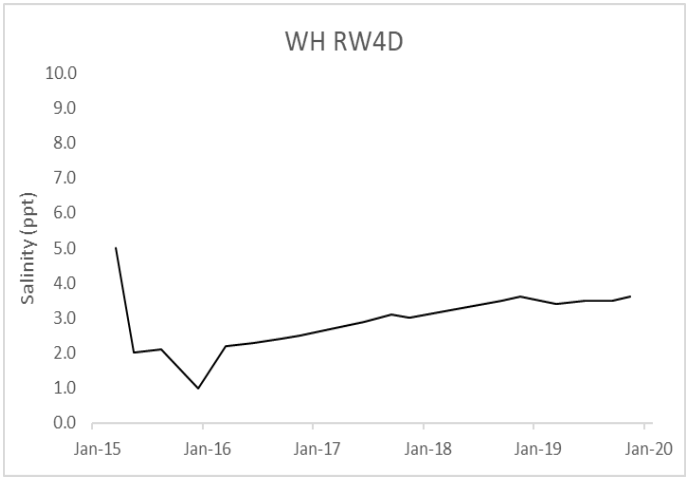


Figure C-14. West Hackberry Monitoring Well Salinities

RW5D	Mar-15	23.0
RW5D	May-15	19.0
RW5D	Aug-15	7.7
RW5D	Dec-15	13.0
RW5D	Mar-16	19.0
RW5D	Jun-16	16.0
RW5D	Sep-16	14.0
RW5D	Nov-16	11.0
RW5D	Jun-17	15.0
RW5D	Sep-17	14.0
RW5D	Nov-17	11.0
RW5D	Sep-18	9.9
RW5D	Nov-18	12.0
RW5D	Mar-19	12.0
RW5D	Jun-19	8.0
RW5D	Sep-19	7.8
RW5D	Nov-19	8.5
	Average	**13.0**

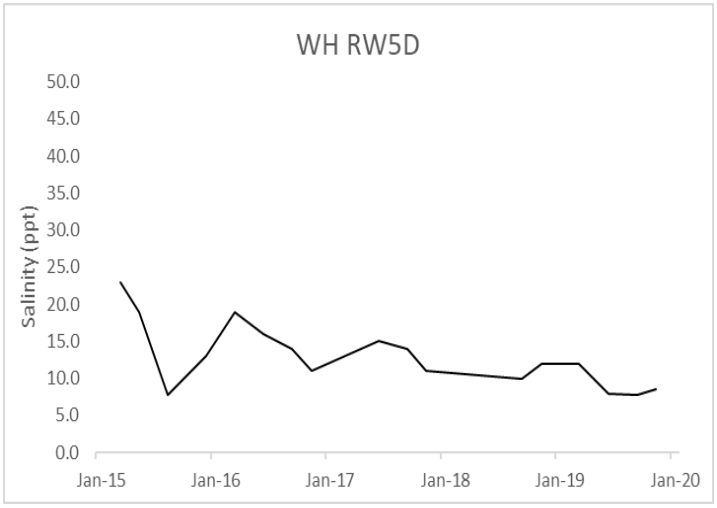
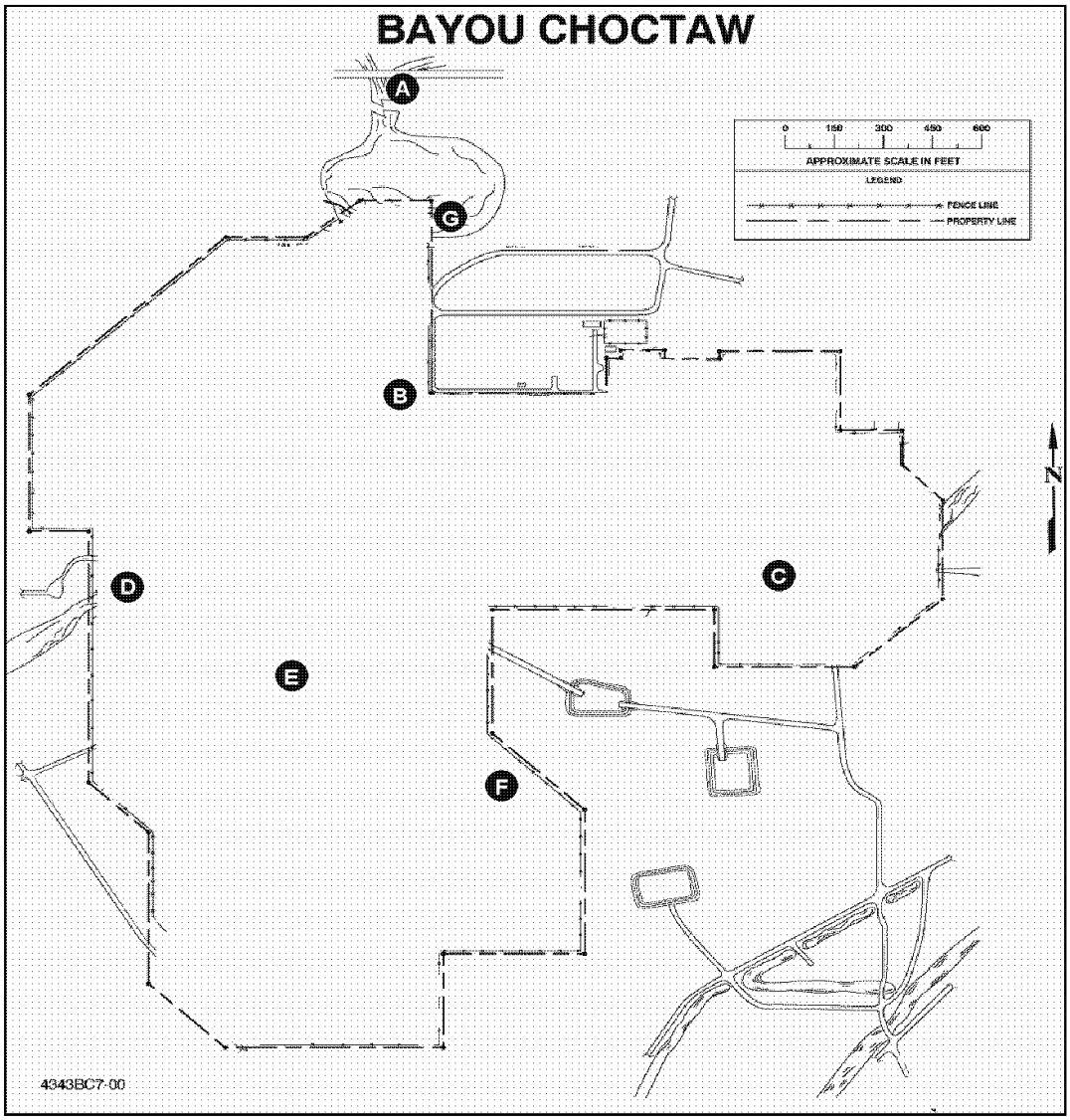


Figure C-14. West Hackberry Monitoring Well Salinities

Appendix D

SURFACE WATER QUALITY SURVEILLANCE MONITORING DURING 2019



Water Quality Monitoring Stations

A Canal north of Cavern Lake at perimeter road bridge
B Ditch running under the road to warehouse on West side of the road in area of heat exchangers.
C East-West Canal at Intersection of road to brine disposal wells
D East-West Canal
E Wetland Area
F Wetland Area
G Near Raw Water Intake

Figure D-1 Bayou Choctaw Environmental Monitoring Stations

Table D-1 2019 Data Summary for Bayou Choctaw Monitoring Stations

Station	Statistical Parameters	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
A	Sample Size	12	12	12	12	12	12
	Number of BDL	0	3	NV	10	NV	0
	Maximum	9.5	2.5	8.7	0.5	27.7	18.9
	Minimum	2.2	0.0	7.1	0.5	2.7	5.8
	Mean	5.6	2.3	7.5	0.5	17.8	10.9
	Median	6.5	2.5	7.4	0.5	19.1	10.6
	Standard Deviation	2.4	0.7	NV	0.0	7.9	4.1
	Coefficient of Variation	42.9	30.4	NV	0.0	44.4	37.6
B	Sample Size	11	11	11	11	11	11
	Number of BDL	0	3	NV	10	NV	0
	Maximum	14.0	2.5	8.6	0.5	22.0	11.7
	Minimum	3.9	0.0	7.1	0.5	2.7	0.5
	Mean	7.3	2.3	7.8	0.5	15.6	6.5
	Median	6.3	2.5	7.7	0.5	17.0	5.9
	Standard Deviation	3.0	0.8	NV	0.0	6.7	4.1
	Coefficient of Variation	41.1	34.8	NV	0.0	42.9	63.1
C	Sample Size	12	12	12	12	12	12
	Number of BDL	0	3	NV	9	NV	0
	Maximum	9.5	2.5	8.0	0.5	22.9	24.2
	Minimum	3.2	0.0	6.9	0.5	2.7	0.5
	Mean	6.3	2.3	7.3	0.5	15.7	9.7
	Median	5.7	2.5	7.2	0.5	17.4	10.4
	Standard Deviation	2.0	0.7	NV	0.0	6.3	6.6
	Coefficient of Variation	31.7	30.4	NV	0.0	40.1	68.0
D	Sample Size	12	12	12	12	12	12
	Number of BDL	0	3	NV	11	NV	0
	Maximum	9.7	2.5	8.0	0.5	22.3	13.7
	Minimum	2.1	0.0	7.0	0.5	2.7	0.5
	Mean	7.0	2.3	7.5	0.5	15.9	7.4
	Median	7.4	2.5	7.5	0.5	17.9	8.2
	Standard Deviation	2.1	0.7	NV	0.0	6.4	4.9
	Coefficient of Variation	30.0	30.4	NV	0.0	40.3	66.2
E	Sample Size	12	12	12	12	12	12
	Number of BDL	0	3	NV	9	NV	0
	Maximum	10.2	2.5	7.7	0.5	22.4	14.2
	Minimum	3.5	0.0	7.0	0.5	2.7	0.5
	Mean	6.8	2.3	7.3	0.5	16.2	7.9
	Median	6.7	2.5	7.3	0.5	17.7	9.3
	Standard Deviation	2.1	0.7	NV	0.0	6.7	4.8
	Coefficient of Variation	30.9	30.4	NV	0.0	41.4	60.8

Note: BDL = Number of samples that were below the detectable limit.
NV = Not a valid number or statistically meaningful.

Table D-1 2019 Data Summary for Bayou Choctaw Monitoring Stations (continued)

Station	Statistical Parameters	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
F	Sample Size	11	11	11	11	11	11
	Number of BDL	0	3	NV	9	NV	0
	Maximum	11.1	2.5	8.0	0.5	22.4	14.5
	Minimum	3.7	0.0	7.0	0.5	2.7	0.5
	Mean	7.1	2.3	7.4	0.5	15.5	8.6
	Median	6.8	2.5	7.4	0.5	17.9	9.5
	Standard Deviation	2.2	0.8	NV	0.0	6.6	4.5
	Coefficient of Variation	31.0	34.8	NV	0.0	42.6	52.3
G	Sample Size	12	12	12	12	12	12
	Number of BDL	0	3	NV	11	NV	0
	Maximum	9.2	2.5	7.8	0.5	22.6	13.2
	Minimum	2.6	0.0	7.1	0.5	2.7	0.5
	Mean	6.2	2.3	7.4	0.5	15.3	9.6
	Median	6.3	2.5	7.4	0.5	16.7	10.0
	Standard Deviation	2.2	0.7	NV	0.0	6.2	3.7
	Coefficient of Variation	35.5	30.4	NV	0.0	40.5	38.5

Note: BDL = Number of samples that were below the detectable limit.
NV = Not a valid number or statistically meaningful.

Table D-2 5-Year Trending Data for Bayou Choctaw Monitoring Stations

Station	Year	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
A	2015	4.7	2.5	7.4	0.5	23.2	21.1
	2016	5.5	2.5	7.6	0.8	21.7	26.4
	2017	7.5	2.5	7.6	0.5	21.2	24.2
	2018	4.0	2.5	7.5	0.5	22.9	26.3
	2019	5.6	2.3	7.5	0.5	17.8	10.9
B	2015	4.7	2.5	7.4	0.5	21.2	37.7
	2016	5.5	2.5	7.6	0.8	21.1	51.2
	2017	7.6	2.5	7.5	0.5	21.2	39.2
	2018	4.0	2.5	7.7	0.5	21.8	38.0
	2019	7.3	2.3	7.8	0.5	15.6	6.5
C	2015	4.0	2.5	7.3	0.5	22.7	22.6
	2016	4.9	2.5	7.6	0.9	21.8	29.4
	2017	8.3	2.5	7.4	0.5	20.9	22.6
	2018	3.7	2.5	7.6	0.7	23.3	23.1
	2019	6.3	2.3	7.3	0.5	15.7	9.7
D	2015	4.4	2.5	7.3	0.5	23.1	22.0
	2016	4.8	2.5	7.6	0.8	22.1	28.1
	2017	7.7	2.5	7.5	0.5	21.6	21.1
	2018	3.6	2.5	7.8	0.5	23.4	24.6
	2019	7.0	2.3	7.5	0.5	15.9	7.4
E	2015	3.4	2.5	7.2	0.5	22.7	23.9
	2016	4.7	2.5	7.4	0.9	20.9	30.4
	2017	8.6	2.5	7.5	0.5	21.1	24.6
	2018	3.5	2.5	7.8	0.6	23.3	20.6
	2019	6.8	2.3	7.3	0.5	16.2	7.9
F	2015	3.9	2.5	7.3	0.5	22.2	25.0
	2016	6.1	2.5	7.4	0.9	20.8	30.3
	2017	8.3	2.5	7.6	0.5	21.0	21.1
	2018	4.4	2.5	7.8	0.6	22.6	23.0
	2019	7.1	2.3	7.4	0.5	15.5	8.6
G	2015	4.3	2.5	7.5	0.5	22.5	22.4
	2016	5.5	2.5	7.5	0.9	21.6	26.9
	2017	7.6	2.5	7.7	0.5	22.1	24.4
	2018	4.7	2.5	7.7	0.5	23.1	25.1
	2019	6.2	2.3	7.4	0.5	15.3	9.6

Figure D-2 5-Year Trending Data for Bayou Choctaw Environmental Monitoring Stations

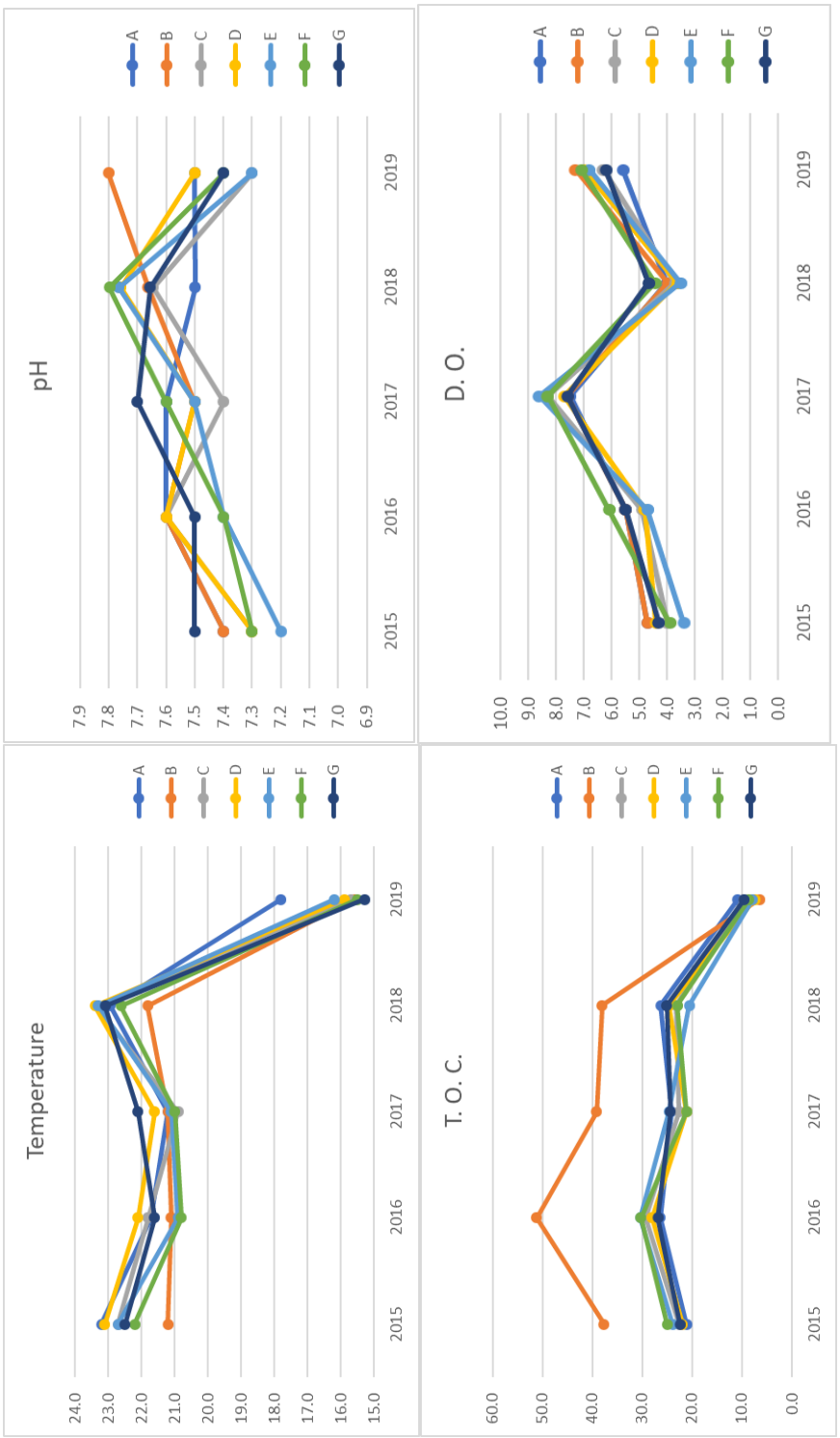
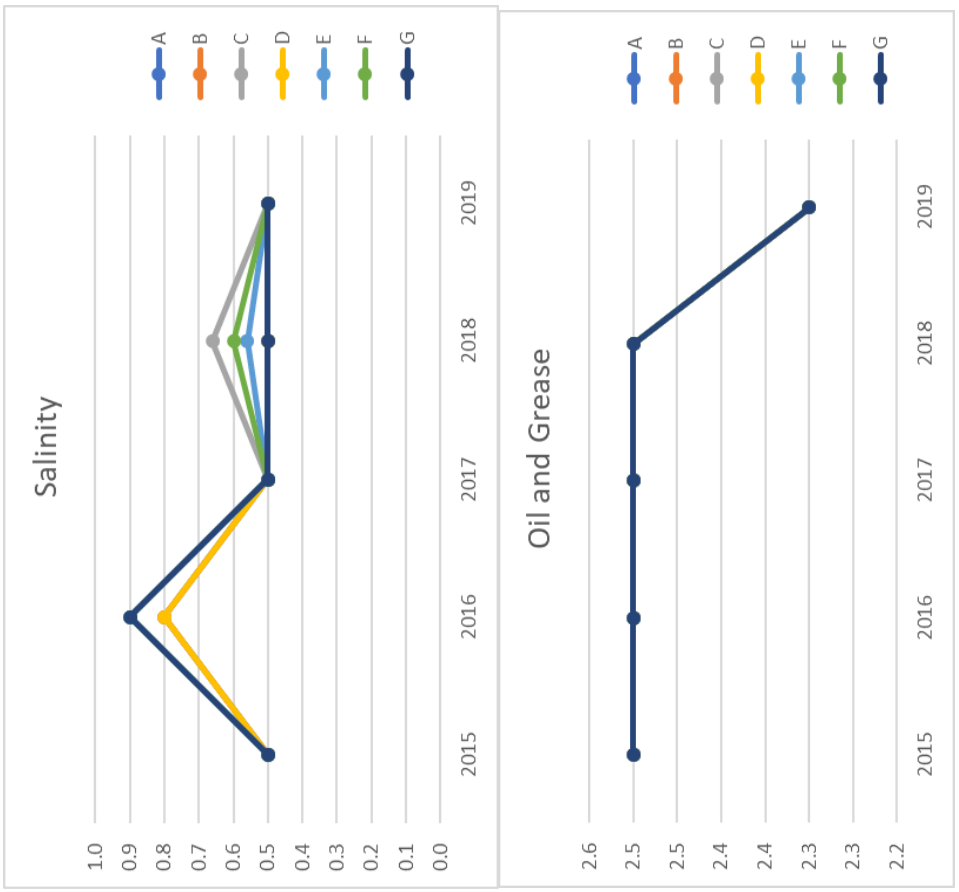
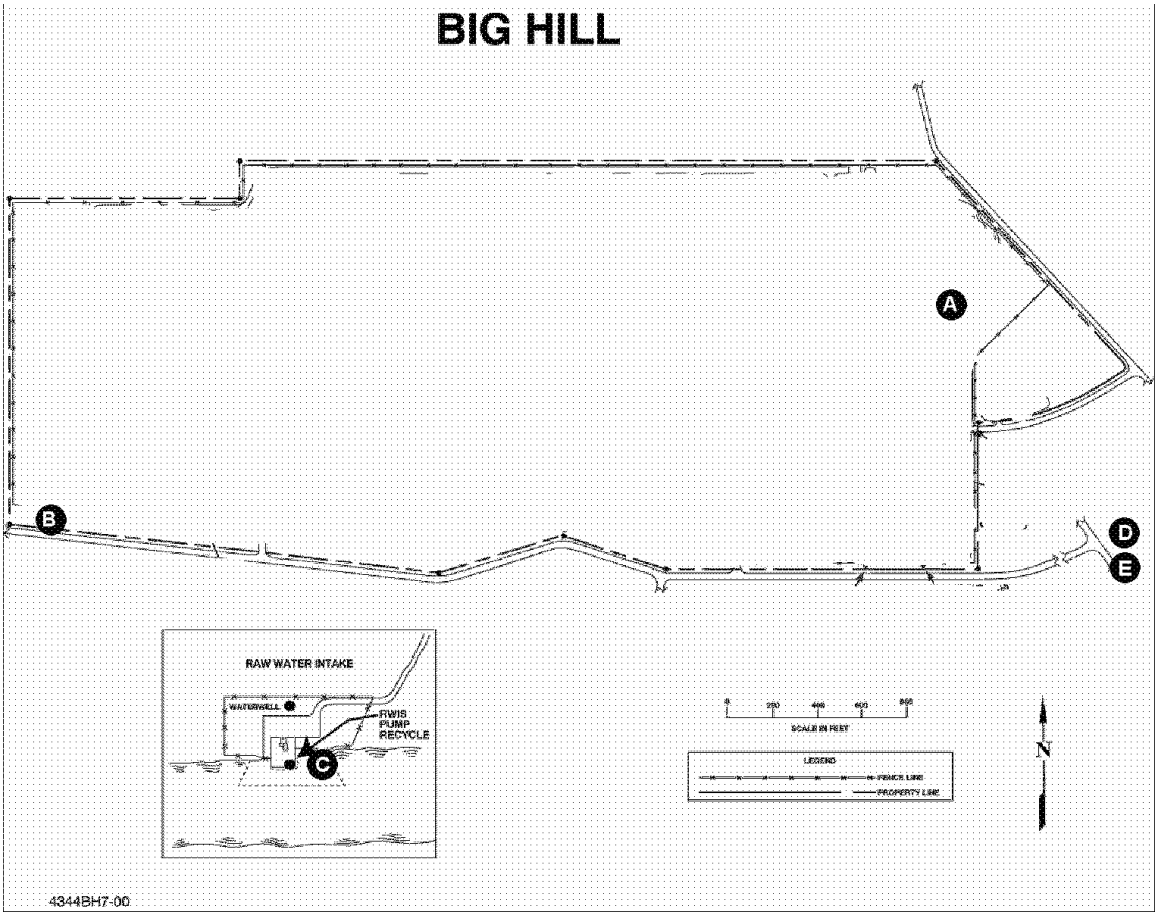


Figure D-2 5- Year Trending Data for Bayou Choctaw Environmental Monitoring Stations(continued)





Water Quality Monitoring Stations

A Pond receiving effluent from site sewage treatment plant (STP)
B Wilbur Road ditch – southwest of site
C RWIS at Intracoastal Waterway
D Pipkin Reservoir – (1.8 Miles from map location)
E Gator Hole – (3.1 Miles from map location)

Figure D-3 Big Hill Environmental Monitoring Stations

Table D-3 2019 Data Summary for Big Hill Monitoring Stations

Station	Statistical Parameters	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
B	Sample Size	11	3	11	11	11	11
	Number of BDL	0	4	NV	1	NV	0
	Maximum	12.3	2.5	7.8	3.1	30.0	15.8
	Minimum	1.7	2.5	6.4	0.5	15.0	7.9
	Mean	5.7	2.5	7.1	1.0	22.8	11.1
	Median	3.5	2.5	7.2	0.5	23.0	10.8
	Standard Deviation	4.2	0.0	NV	0.8	5.6	2.4
	Coefficient of Variation	73.7	0.0	NV	80.0	24.6	21.6
Station	**Statistical Parameters**	**Dissolved Oxygen (mg/L)**	**Oil & Grease (mg/L)**	**pH (s.u.)**	**Salinity (ppt)**	**Temperature (°C)**	**Total Organic Carbon (mg/L)**
C	Sample Size	11	3	11	11	11	11
	Number of BDL	0	4	NV	1	NV	0
	Maximum	12.3	2.5	7.9	18.5	31.0	17.8
	Minimum	3.4	2.5	6.9	0.5	14.0	7.0
	Mean	6.5	2.5	7.3	4.6	23.0	10.1
	Median	4.9	2.5	7.4	3.9	21.0	8.7
	Standard Deviation	2.9	0.0	NV	4.9	6.6	3.3
	Coefficient of Variation	44.6	0.0	NV	106.5	28.7	32.7
Station	**Statistical Parameters**	**Dissolved Oxygen (mg/L)**	**Oil & Grease (mg/L)**	**pH (s.u.)**	**Salinity (ppt)**	**Temperature (°C)**	**Total Organic Carbon (mg/L)**
D	Sample Size	11	4	11	11	11	11
	Number of BDL	0	4	NV	11	NV	0
	Maximum	21.6	2.5	7.8	13.8	31.0	18.3
	Minimum	0.5	2.5	6.6	0.5	13.0	0.5
	Mean	7.1	2.5	7.2	1.7	23.6	11.7
	Median	5.2	2.5	7.4	0.5	25.0	11.8
	Standard Deviation	6.5	0.0	NV	4.0	5.9	4.8
	Coefficient of Variation	91.5	0.0	NV	235.3	25.0	41.0
Station	**Statistical Parameters**	**Dissolved Oxygen (mg/L)**	**Oil & Grease (mg/L)**	**pH (s.u.)**	**Salinity (ppt)**	**Temperature (°C)**	**Total Organic Carbon (mg/L)**
E	Sample Size	11	3	11	11	11	11
	Number of BDL	0	4	NV	8	NV	0
	Maximum	12.0	2.5	8.1	3.2	30.0	16.2
	Minimum	1.2	2.5	6.4	0.5	14.0	8.4
	Mean	4.9	2.5	6.9	1.0	22.5	11.7
	Median	2.8	2.5	6.7	0.5	22.0	11.7
	Standard Deviation	4.2	0.0	NV	0.9	6.2	2.5
	Coefficient of Variation	85.7	0.0	NV	90.0	27.6	21.4

Note: BDL = Number of samples that were below the detectable limit.
NV = Not a valid number or statistically meaningful.

Table D-4 5- Year Trending Data for Big Hill Monitoring Stations

Station	Year	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
A	2015	N/A	N/A	N/A	N/A	N/A	N/A
	2016	N/A	N/A	N/A	N/A	N/A	N/A
	2017	N/A	N/A	N/A	N/A	N/A	N/A
	2018	N/A	N/A	N/A	N/A	N/A	N/A
	2019	N/A	N/A	N/A	N/A	N/A	N/A
B	2015	5.2	2.5	7.2	0.7	22.3	13.5
	2016	4.3	2.5	7.0	1.1	23.8	13.5
	2017	4.3	2.5	7.1	0.9	23.5	11.3
	2018	7.3	2.5	7.4	1.3	22.5	14.2
	2019	5.7	2.5	7.1	1.0	22.8	11.1
C	2015	6.4	2.5	7.4	5.2	23.2	9.8
	2016	6.0	2.5	7.3	4.4	24.1	8.5
	2017	5.2	2.5	7.3	7.0	24.3	7.8
	2018	9.4	2.5	7.5	6.2	23.1	8.5
	2019	6.5	2.5	7.3	4.6	23.0	10.1
D	2015	5.3	2.5	7.1	0.8	22.8	15.6
	2016	6.3	2.5	7.1	0.5	24.3	14.0
	2017	5.2	2.5	7.1	0.5	23.9	10.4
	2018	7.0	2.5	7.3	1.6	22.7	11.5
	2019	7.1	2.5	7.2	1.7	23.6	11.7
E	2015	4.4	2.5	6.6	0.7	22.3	17.3
	2016	5.2	2.5	6.7	1.0	24.0	13.7
	2017	3.0	2.5	6.7	2.0	23.8	12.5
	2018	7.9	2.5	7.0	1.0	22.3	15.0
	2019	4.9	2.5	6.9	1	22.5	11.7

Figure D-4 5- Year Trending Data for Big Hill Environmental Monitoring Stations

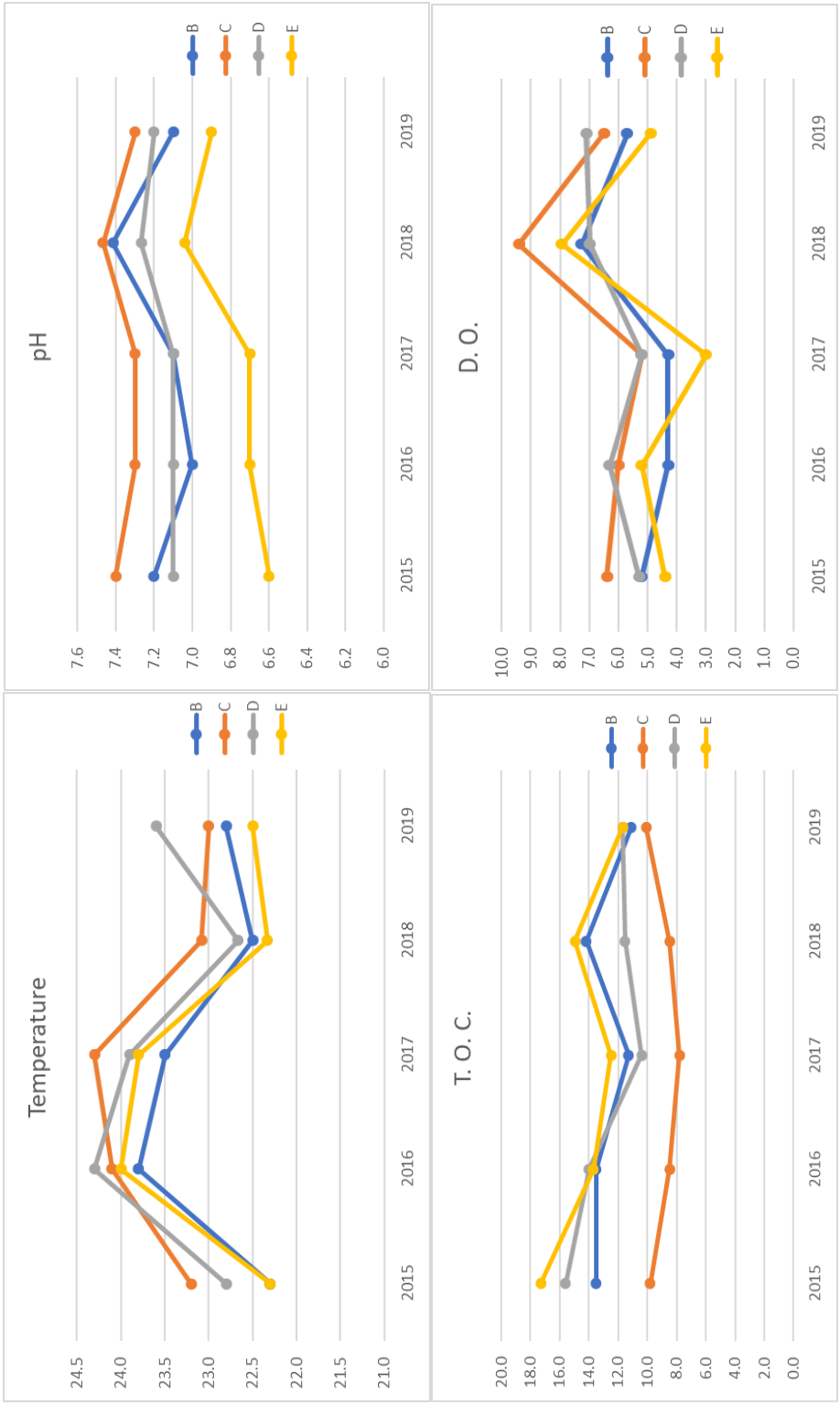
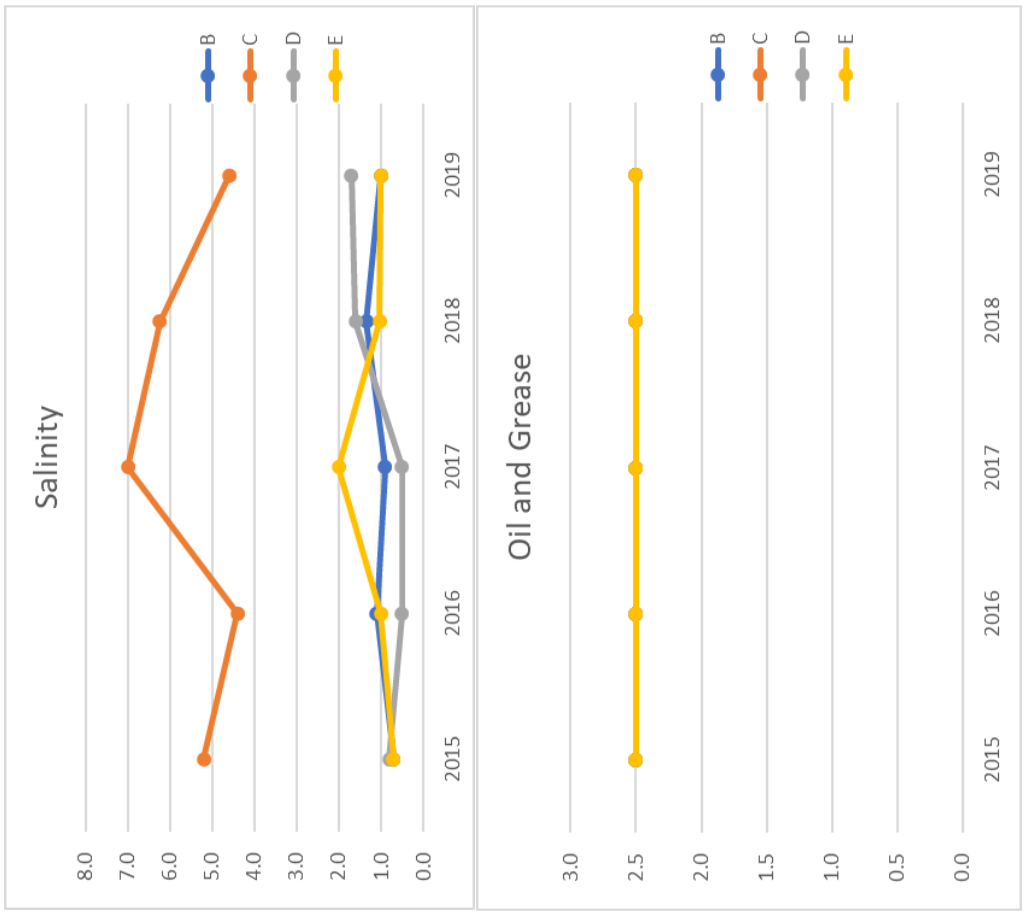
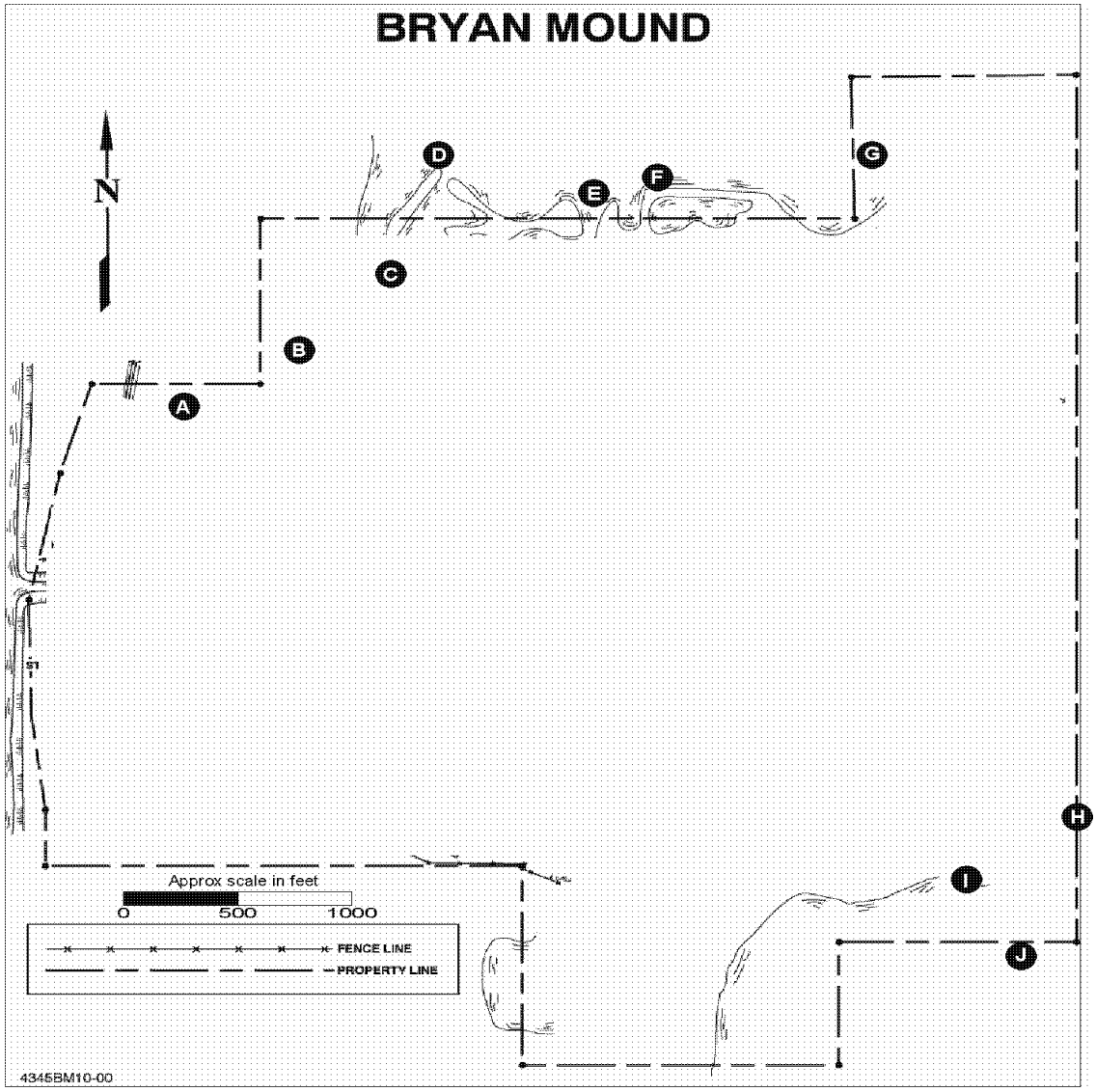


Figure D-4 5- Year Trending Data for Big Hill Environmental Monitoring Stations(continued)





Water Quality Monitoring Stations

A Blue Lake
B Blue Lake
C Blue Lake
D Blue Lake – Control Point 1
E Blue Lake
F Blue Lake
G Blue Lake
H Mud Lake
I Mud Lake
J Mud Lake – Control Point 2

Figure D-5 Bryan Mound Environmental Monitoring Stations

Table D-5 2019 Data Summary for Bryan Mound Monitoring Stations

Station	Statistical Parameters	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
A	Sample Size	9	4	9	9	9	9
	Number of BDL	0	3	NV	1	NV	0
	Maximum	18.8	2.5	7.8	25.3	29.8	49.7
	Minimum	3.3	2.5	6.1	0.3	19.2	25.8
	Mean	11.5	2.5	7.1	7.5	25.4	36.1
	Median	12.6	2.5	7.2	2.6	25.3	32.3
	Standard Deviation	5.6	0.0	NV	9.2	3.1	9.0
	Coefficient of Variation	48.7	0.0	NV	122.7	12.2	24.9
B	Sample Size	10	4	9	10	10	10
	Number of BDL	0	4	NV	1	NV	0
	Maximum	18.3	2.5	8.0	8.4	29.8	48.9
	Minimum	3.6	2.5	6.8	0.3	19.2	24.0
	Mean	11.7	2.5	7.4	3.3	24.8	35.9
	Median	13.0	2.5	7.3	2.6	25.2	34.8
	Standard Deviation	5.4	0.0	NV	2.8	3.5	8.2
	Coefficient of Variation	46.2	0.0	NV	84.8	14.1	22.8
C	Sample Size	9	5	10	10	9	10
	Number of BDL	0	4	NV	1	NV	0
	Maximum	18.1	2.5	8.0	8.4	29.8	50.0
	Minimum	3.1	2.5	6.3	0.3	19.2	24.5
	Mean	11.4	2.5	7.2	3.3	24.8	36.3
	Median	13.3	2.5	7.2	2.5	25.3	35.0
	Standard Deviation	5.7	0.0	NV	2.8	3.7	8.3
	Coefficient of Variation	50.0	0.0	NV	84.8	14.9	22.9
D	Sample Size	10	5	10	10	10	10
	Number of BDL	0	4	NV	1	NV	0
	Maximum	19.0	2.5	7.8	8.4	29.8	48.5
	Minimum	3.0	2.5	6.5	0.4	19.3	24.5
	Mean	11.5	2.5	7.2	3.3	24.9	35.7
	Median	12.6	2.5	7.2	2.5	25.1	34.8
	Standard Deviation	5.5	0.0	NV	2.8	3.5	8.3
	Coefficient of Variation	47.8	0.0	NV	84.8	14.1	23.2
E	Sample Size	10	5	10	10	10	10
	Number of BDL	0	4	NV	0	NV	0
	Maximum	18.4	2.5	7.9	8.4	29.9	49.9
	Minimum	4.0	2.5	6.1	0.3	19.2	24.3
	Mean	11.7	2.5	7.1	3.4	24.8	35.7
	Median	13.2	2.5	7.3	2.6	25.2	33.6
	Standard Deviation	5.2	0.0	NV	2.8	3.5	8.2
	Coefficient of Variation	44.4	0.0	NV	82.4	14.1	23.0

Note: BDL = Number of samples that were below the detectable limit.
NV = Not a valid number or statistically meaningful.

Table D-5 2019 Data Summary for Bryan Mound Monitoring Stations (continued)

Station	Statistical Parameters	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
F	Sample Size	10	5	10	9	9	9
	Number of BDL	0	4	NV	1	NV	0
	Maximum	18.6	2.5	7.9	8.3	29.9	45.6
	Minimum	3.4	2.5	6.6	0.4	19.3	24.1
	Mean	11.6	2.5	7.3	3.5	24.7	32.4
	Median	12.6	2.5	7.5	2.7	25.1	31.2
	Standard Deviation	5.3	0.0	NV	2.8	3.7	7.0
	Coefficient of Variation	45.7	0.0	NV	80.0	15.0	21.6
G	Sample Size	10	5	10	10	10	10
	Number of BDL	0	4	NV	1	NV	0
	Maximum	18.6	2.5	7.7	11.3	29.8	48.2
	Minimum	3.5	2.5	6.8	0.4	19.3	21.8
	Mean	11.7	2.5	7.3	4.2	24.8	34.0
	Median	13.1	2.5	7.2	2.6	25.2	32.7
	Standard Deviation	5.5	0.0	NV	3.7	3.5	8.8
	Coefficient of Variation	47.0	0.0	NV	88.1	14.1	25.9
H	Sample Size	11	5	11	10	10	11
	Number of BDL	0	4	NV	1	NV	0
	Maximum	17.8	2.5	7.9	25.3	30.1	37.8
	Minimum	2.2	2.5	6.4	0.6	4.8	16.7
	Mean	10.4	2.5	7.3	10.0	22.3	28.5
	Median	8.6	2.5	7.5	6.2	24.6	29.2
	Standard Deviation	5.7	0.0	NV	10.4	7.9	6.8
	Coefficient of Variation	54.8	0.0	NV	104.0	35.4	23.9
I	Sample Size	11	5	11	11	10	10
	Number of BDL	0	4	NV	1	NV	0
	Maximum	17.9	2.5	7.7	29.3	30.1	39.4
	Minimum	3.0	2.5	6.7	0.6	16.2	20.3
	Mean	10.5	2.5	7.3	11.4	24.4	29.1
	Median	8.8	2.5	7.3	10.7	25.4	29.1
	Standard Deviation	5.5	0.0	NV	11.1	4.9	5.8
	Coefficient of Variation	52.4	0.0	NV	97.4	20.1	19.9
J	Sample Size	11	5	11	11	10	11
	Number of BDL	0	4	NV	1	NV	0
	Maximum	17.4	2.5	7.6	25.3	30.1	40.0
	Minimum	2.4	2.5	6.1	0.5	16.3	15.0
	Mean	10.2	2.5	7.1	11.0	24.4	27.6
	Median	8.6	2.5	7.3	10.7	25.3	28.6
	Standard Deviation	5.5	0.0	NV	10.5	4.9	6.9
	Coefficient of Variation	53.9	0.0	NV	95.5	20.1	25.0

Note: BDL = Number of samples that were below the detectable limit.
NV = Not a valid number or statistically meaningful.

Table D-6 5-Year Trending Data for Bryan Mound Monitoring Stations

Station	Year	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
A	2015	6	2.5	7.1	5.3	23.3	22.3
	2016	7.3	4	7.3	2.5	22.3	24.1
	2017	11.1	2.5	7.7	1.7	22.4	24.1
	2018	12.24	2.50	7.55	4.38	24.73	25.85
	2019	11.50	2.50	7.10	7.50	25.40	36.10
B	2015	5.9	2.5	7.1	5.3	23.3	21.7
	2016	7.4	2.5	7.4	2.5	22.3	22.8
	2017	11.8	2.5	7.6	1.7	22.4	25.6
	2018	12.2	2.5	7.6	4.4	24.8	24.8
	2019	11.7	2.5	7.4	3.3	24.8	35.9
C	2015	5.9	2.5	7.2	5.3	23.3	21.6
	2016	7.4	2.5	7.4	2.5	22.3	23.7
	2017	11.2	2.5	7.7	1.7	22.4	24.8
	2018	12.5	2.5	7.9	4.4	24.8	27.6
	2019	11.4	2.5	7.2	3.3	24.8	36.3
D	2015	5.8	2.5	7.2	5.3	23.2	21.6
	2016	7.1	2.5	7.4	2.5	22.3	21.8
	2017	11.4	2.5	7.4	1.7	22.5	24.6
	2018	12.4	2.5	7.9	4.4	24.8	23.7
	2019	11.5	2.5	7.2	3.3	24.9	35.7
E	2015	5.9	2.5	7.2	7.9	23.3	18.9
	2016	7.3	2.5	7.5	2.5	22.3	21.4
	2017	11.6	2.5	7.5	1.7	22.5	23.6
	2018	12.0	2.5	7.6	4.4	24.8	24.7
	2019	11.7	2.5	7.1	3.4	24.8	35.7
F	2015	5.7	2.5	7.1	5.2	23.5	20.4
	2016	7.4	2.5	7.4	2.5	22.3	21.5
	2017	11.2	2.5	7.7	1.7	22.5	23
	2018	12.2	2.5	7.5	4.4	24.8	22.9
	2019	11.6	2.5	7.3	3.5	24.7	32.4

Table D-6 5-Year Trending Data for Bryan Mound Monitoring Stations (continued)

G	2015	5.8	2.5	7.2	5.2	23.5	20.8
	2016	7.8	2.5	7.4	2.5	22.3	21
	2017	11.5	2.5	7.6	5.3	22.4	22.8
	2018	12.5	2.5	7.7	4.4	24.8	22.5
	2019	11.7	2.5	7.3	4.2	24.8	34.0
H	2015	5.7	2.5	7.3	5.9	22.4	16.4
	2016	11.2	2.5	7.1	5.3	22.6	23.8
	2017	10.1	2.5	7.1	12.1	25.1	21.4
	2018	5.3	2.5	7.2	14.2	24.1	21.0
	2019	10.4	2.5	7.3	10.0	22.3	28.5
I	2015	5.6	2.5	7.3	5.6	22.5	16.2
	2016	11.3	2.5	7.1	5.3	22.6	23.6
	2017	10.4	2.5	7.5	13.4	24.8	18.6
	2018	5.3	2.5	7.2	12.4	24.1	19.4
	2019	10.5	2.5	7.3	11.4	24.4	29.1
J	2015	5.9	2.5	7.3	6	22.5	16
	2016	11	2.5	7	5.3	21.3	23.1
	2017	10.6	2.5	7.4	13.4	24.8	17.8
	2018	5.3	2.5	7.1	11.5	24.1	19.5
	2019	10.2	2.5	7.1	11.0	24.4	27.6

Figure D-6 5- Year Trending Data for Bryan Mound Environmental Monitoring Stations

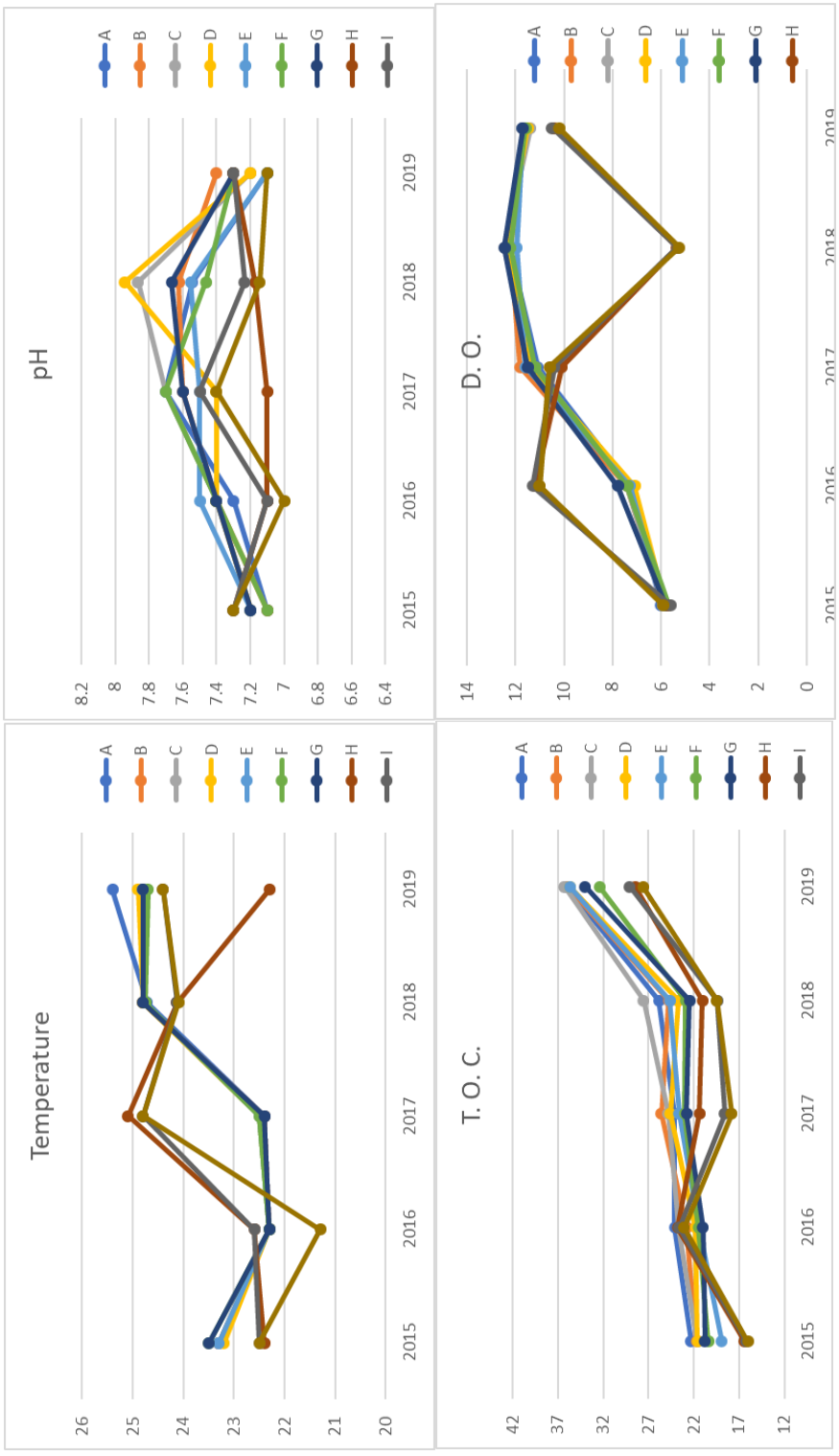
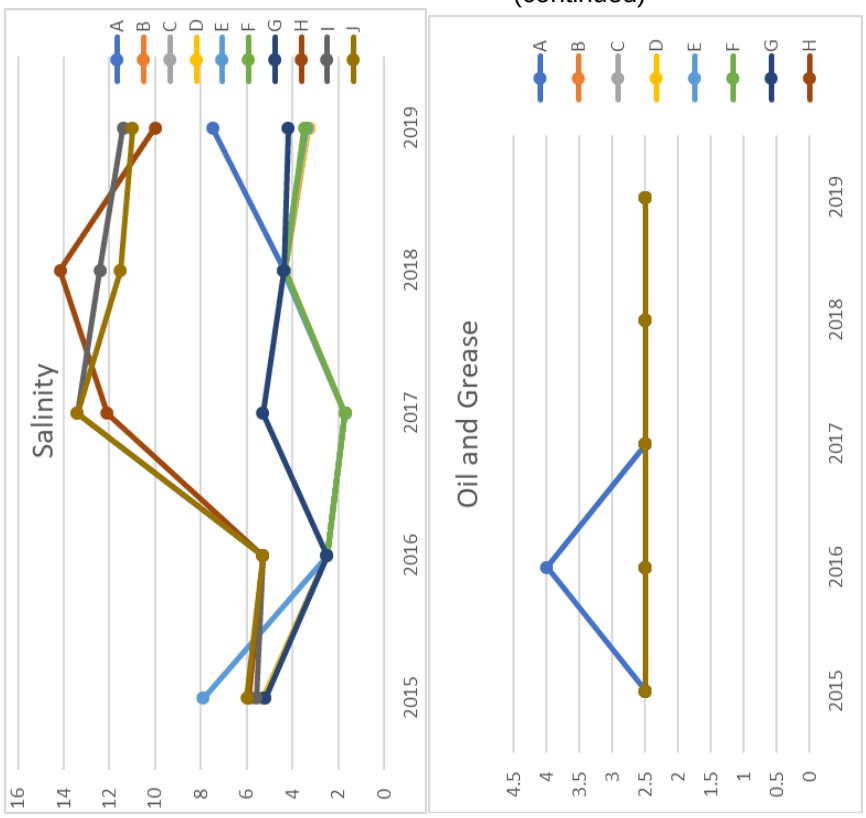
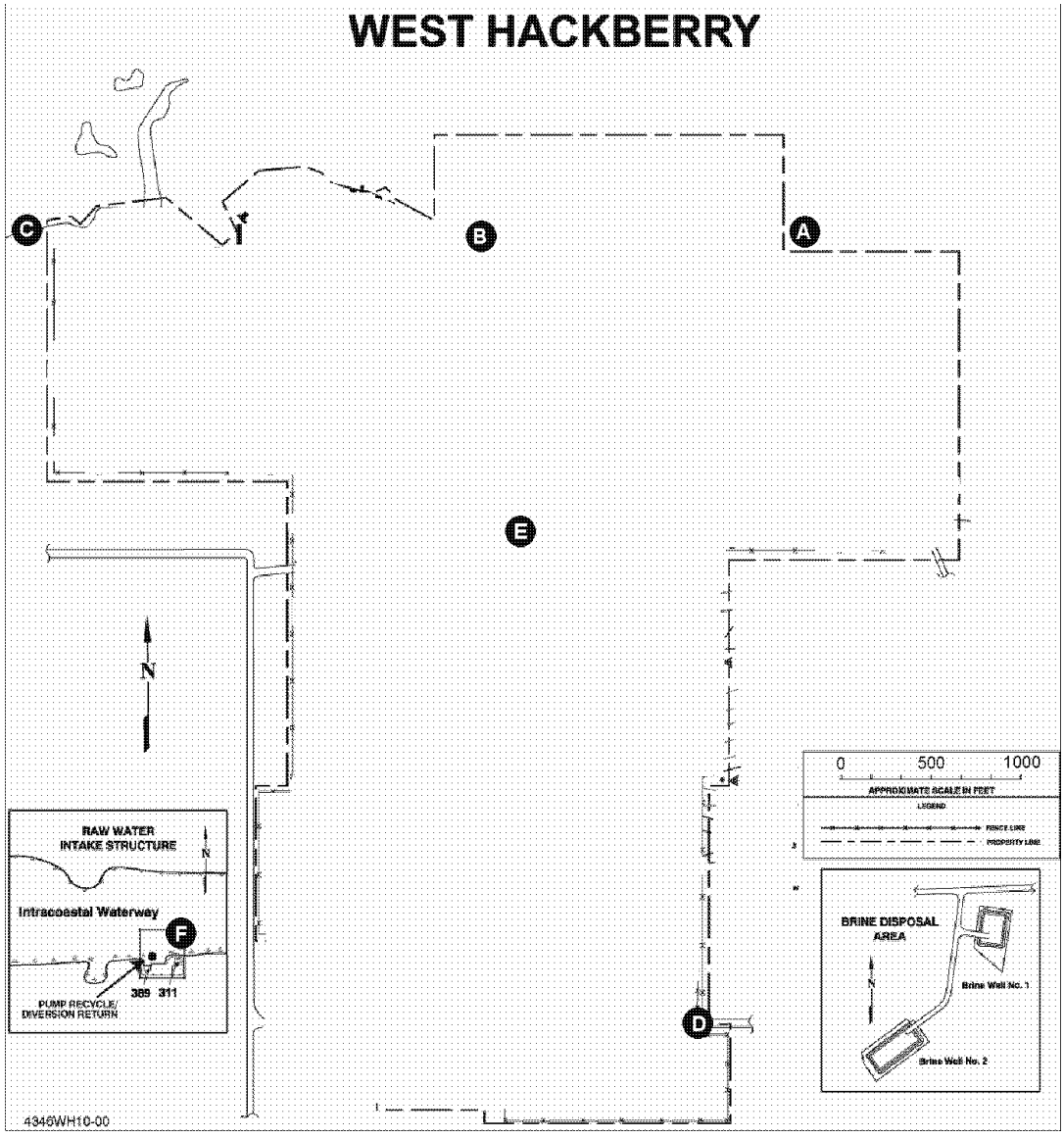


Figure D-6 5-Year Trending Data for Bryan Mound Environmental Monitoring Stations (continued)





Water Quality Monitoring Stations

A Black Lake
B Black Lake
C Black Lake
D Southeast drainage ditch
E High-pressure pump pad
F Raw water intake structure (Intracoastal Waterway)

Figure D-7 West Hackberry Environmental Monitoring Stations

Table D-7 2019 Data Summary for West Hackberry Monitoring Stations

Station	Statistical Parameters	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
A	Sample Size	7	3	7	7	7	7
	Number of BDL	0	3	NV	0	NV	0
	Maximum	10.4	2.5	8.1	11.0	31.0	8.2
	Minimum	5.6	2.5	7.6	1.5	12.0	6.0
	Mean	7.3	2.5	7.8	5.0	24.3	6.8
	Median	6.8	2.5	7.8	5.0	26.0	6.5
	Standard Deviation	1.7	0.0	NV	3.2	6.4	0.8
	Coefficient of Variation	23.3	0.0	NV	64.0	26.3	11.8
Station	**Statistical Parameters**	**Dissolved Oxygen (mg/L)**	**Oil & Grease (mg/L)**	**pH (s.u.)**	**Salinity (ppt)**	**Temperature (°C)**	**Total Organic Carbon (mg/L)**
B	Sample Size	7	3	7	7	7	7
	Number of BDL	0	4	NV	0	NV	0
	Maximum	10.6	2.5	8.1	11.0	31.0	7.5
	Minimum	5.5	2.5	7.5	1.6	12.0	6.0
	Mean	7.2	2.5	7.7	5.0	24.4	6.7
	Median	6.5	2.5	7.7	4.4	27.0	6.5
	Standard Deviation	1.8	0.0	NV	3.1	6.5	0.6
	Coefficient of Variation	25.0	0.0	NV	62.0	26.6	9.0
Station	**Statistical Parameters**	**Dissolved Oxygen (mg/L)**	**Oil & Grease (mg/L)**	**pH (s.u.)**	**Salinity (ppt)**	**Temperature (°C)**	**Total Organic Carbon (mg/L)**
C	Sample Size	7	3	7	7	7	7
	Number of BDL	0	4	NV	0	NV	0
	Maximum	10.9	2.5	8.0	11.0	31.0	7.9
	Minimum	5.8	2.5	7.4	1.7	12.0	5.8
	Mean	7.4	2.5	7.8	4.9	24.6	7.0
	Median	6.5	2.5	7.8	4.1	27.0	7.2
	Standard Deviation	1.9	0.0	NV	3.1	6.6	0.8
	Coefficient of Variation	25.7	0.0	NV	63.3	26.8	11.4
Station	**Statistical Parameters**	**Dissolved Oxygen (mg/L)**	**Oil & Grease (mg/L)**	**pH (s.u.)**	**Salinity (ppt)**	**Temperature (°C)**	**Total Organic Carbon (mg/L)**
D	Sample Size	10	4	10	10	10	10
	Number of BDL	0	4	NV	12	NV	0
	Maximum	11.0	2.5	8.2	1.0	30.0	7.6
	Minimum	4.5	2.5	7.6	0.5	14.0	3.6
	Mean	8.3	2.5	7.9	0.6	22.5	5.1
	Median	8.9	2.5	7.9	0.5	24.5	4.6
	Standard Deviation	2.2	0.0	NV	0.2	5.8	1.4
	Coefficient of Variation	26.5	0.0	NV	33.3	25.8	27.5

Note: BDL = Number of samples that were below the detectable limit.
NV = Not a valid number or statistically meaningful.

Table D-7 2019 Data Summary for West Hackberry Monitoring Stations (continued)

Station	Statistical Parameters	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
E	Sample Size	10	4	10	10	10	10
	Number of BDL	0	4	NV	10	NV	0
	Maximum	10.3	2.5	8.1	0.5	30.0	4.8
	Minimum	4.3	2.5	6.9	0.5	14.0	2.0
	Mean	7.7	2.5	7.8	0.5	22.9	3.1
	Median	8.3	2.5	7.9	0.5	25.0	3.0
	Standard Deviation	1.9	0.0	NV	0.0	5.8	0.8
	Coefficient of Variation	24.7	0.0	NV	0.0	25.3	25.8
Station	**Statistical Parameters**	**Dissolved Oxygen (mg/L)**	**Oil & Grease (mg/L)**	**pH (s.u.)**	**Salinity (ppt)**	**Temperature (°C)**	**Total Organic Carbon (mg/L)**
F	Sample Size	7	3	7	7	7	7
	Number of BDL	0	3	NV	6	NV	0
	Maximum	10.2	2.5	7.8	11.0	31.0	8.8
	Minimum	3.4	2.5	6.4	0.5	13.0	6.9
	Mean	6.1	2.5	7.0	2.1	25.0	7.6
	Median	5.4	2.5	7.0	0.5	28.0	7.2
	Standard Deviation	2.4	0.0	NV	3.9	6.6	0.8
	Coefficient of Variation	39.3	0.0	NV	185.7	26.4	10.5

Note: BDL = Number of samples that were below the detectable limit.
NV = Not a valid number or statistically meaningful.

Table D-8 5-Year Trending Data for West Hackberry Monitoring Stations

Station	Year	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
A	2015	8.0	2.5	7.7	7.8	22.4	7.8
	2016	8.4	2.5	7.9	5.9	23.4	7.5
	2017	8.1	2.5	7.8	7.4	21.8	7.0
	2018	7.6	2.5	7.7	8.0	23.3	6.7
	2019	7.3	2.5	7.8	5.0	24.3	6.8
B	2015	8.2	2.5	7.7	7.6	22.3	7.7
	2016	8.4	2.5	7.9	5.7	23.3	7.6
	2017	8.1	2.5	7.8	7.3	21.9	7.1
	2018	7.6	2.5	7.7	8.0	23.3	6.7
	2019	7.2	2.5	7.7	5.0	24.4	6.7
C	2015	8.1	2.5	7.7	7.5	22.3	7.9
	2016	8.6	2.5	7.9	5.6	23.8	7.6
	2017	8.3	2.5	7.9	6.8	22.1	7.2
	2018	7.6	2.5	7.7	8.1	23.2	6.7
	2019	7.4	2.5	7.8	4.9	24.6	7.0
D	2015	7.6	2.5	7.6	0.5	21.7	6.0
	2016	8.1	2.5	7.7	0.5	23.5	6.1
	2017	7.8	2.5	7.9	0.7	22.3	5.8
	2018	7.3	2.5	7.0	0.5	20.7	5.7
	2019	8.3	2.5	7.9	0.6	22.5	5.1
E	2015	7.1	2.5	7.8	0.5	22.5	4.1
	2016	8.1	2.5	7.9	0.5	23.0	4.1
	2017	8.0	2.5	7.9	0.7	22.5	3.9
	2018	7.4	2.5	7.7	0.6	22.8	3.3
	2019	7.7	2.5	7.8	0.5	22.9	3.1
F	2015	7.4	2.5	7.0	3.4	22.5	7.8
	2016	7.5	2.5	7.2	3.0	23.3	8.2
	2017	7.3	2.5	7.5	4.8	22.8	7.8
	2018	7.1	3.3	7.1	2.6	23.2	7.5
	2019	6.1	2.5	7	2.1	25	7.6

Figure D-8 5-Year Trending Data for West Hackberry Monitoring Stations

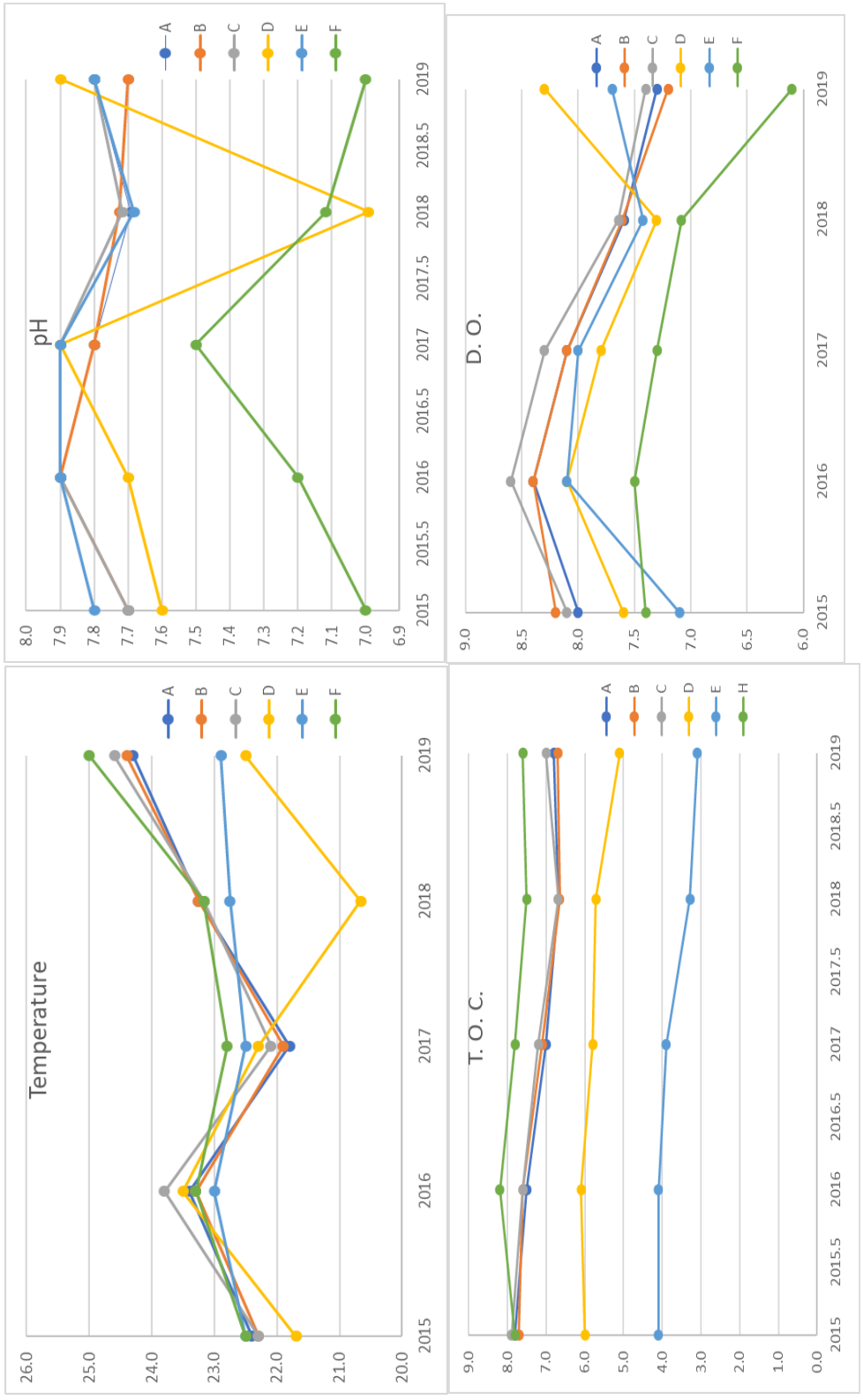
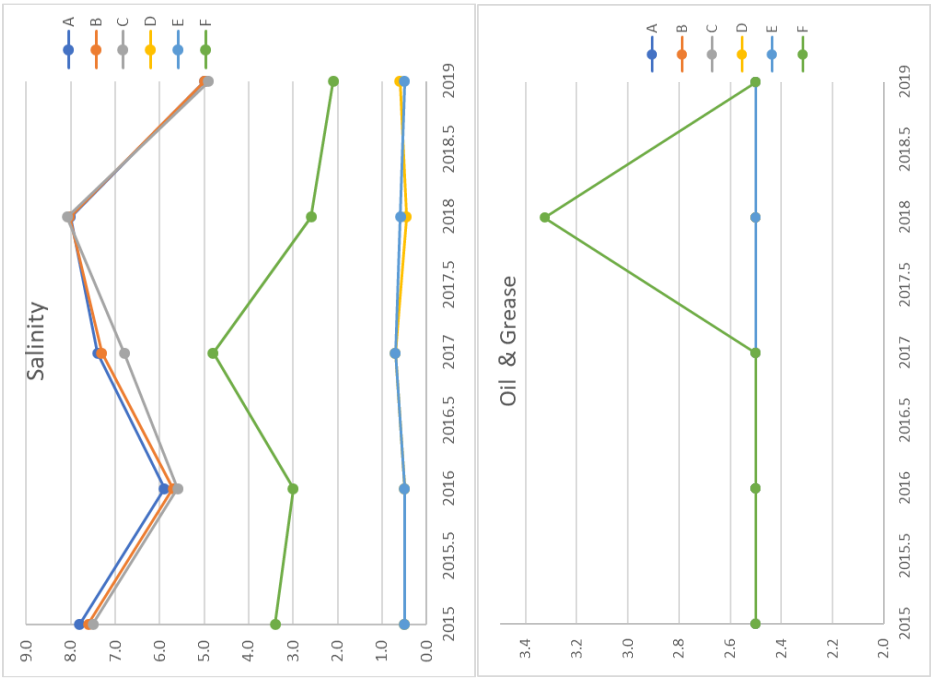


Figure D-8 5-Year Trending Data for West Hackberry Monitoring Stations (continued)



End of Appendix

Appendix E

QUALITY ASSURANCE AUDITS

DURING 2019

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/31/2019** **AUDITOR: Paul Veillon**

	CRITERIA	DOCUMENT NO.	ACC	
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI7000.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Click here to enter text.
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **NGMS,** vendor lab, date the minimum	ASI7000.12 version 2.0 section 3.1.5 Sample Labeling	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/31/2019** **AUDITOR: Paul Veillon**

	retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.1	☒	Click here to enter text.
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.2	☒	Click here to enter text.
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI7000.133 version 3.0, Section 3.1	☒	Click here to enter text.
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI7000.133 version 3.0, Section 3.1	☒	Click here to enter text.
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI7000.133 version 3.0, Section 3.2 & 3.2.1	☐	n/a
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI7000.133 version 3.0, Section 3.3	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/31/2019** **AUDITOR: Paul Veillon**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI7000.133 version 3.0, Section 3.4	☒	Click here to enter text.
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI7000.133 version 3.0, Section 3.6	☒	Click here to enter text.
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI7000.133 version 3.0, Section 3.7	☒	Click here to enter text.
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI7000.133 version 3.0, Section 6.2	☐	**No Log Book Found**
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/31/2019** **AUDITOR: Paul Veillon**

13.	Are erroneous entries crossed through once, initialed and dated in a manner that permits the incorrect entry to remain legible?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.
14.	Is a chemical inventory(listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
15.	Does the chemical inventory list the quantities, container type and location?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory MSDS file, and is the copy updated on a quarterly basis within the MSDS file?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
17.	Is there evidence of weekly inspections and monthly inventories and documentation been completed	MSI7000.133 version 3.0, Section 7.3.2.1	☒	Click here to enter text.
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears as well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the corrosive liquid and the gloves tested for leaks prior to use.	MSI7000.133 version 3.0, Section 10.2.1	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/31/2019** **AUDITOR: Paul Veillon**

	• Rubberized laboratory apron or a chemical and fire-resistant laboratory coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and MSDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents? • Limit chemicals stored at the lab bench or other work areas to those amounts	MSI7000.133 version 3.0, Appendix A	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/31/2019** **AUDITOR: Paul Veillon**

	necessary for daily operation. The container size shall be the minimum convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/23/2019** **AUDITOR: Beecher Adams**

	CRITERIA	DOCUMENT NO.	ACC	
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI7000.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Click here to enter text.
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **NGMS,** vendor lab, date the minimum	ASI7000.12 version 2.0 section 3.1.5 Sample Labeling	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/23/2019** **AUDITOR: Beecher Adams**

	retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.1	☒	Click here to enter text.
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.2	☒	Click here to enter text.
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI7000.133 version 3.0, Section 3.1	☒	Click here to enter text.
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI7000.133 version 3.0, Section 3.1	☒	Click here to enter text.
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI7000.133 version 3.0, Section 3.2 & 3.2.1	☐	n/a - macro volumes (>5.0 ml) and measurements are only intended to be approximate, about, or non-critical
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI7000.133 version 3.0, Section 3.3	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/23/2019** **AUDITOR: Beecher Adams**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI7000.133 version 3.0, Section 3.4	☒	Initial certification with hydrometer
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI7000.133 version 3.0, Section 3.6	☒	Standard #92323 / digital units included in annual M&TE PM
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI7000.133 version 3.0, Section 3.7	☒	Click here to enter text.
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI7000.133 version 3.0, Section 6.2	☒	Click here to enter text.
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/23/2019** **AUDITOR: Beecher Adams**

13.	Are <u>erroneous entries</u> crossed through once, initialed and dated in a manner that permits the incorrect entry to remain legible?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.
14.	Is a chemical inventory(listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
15.	Does the chemical inventory list the quantities, container type and location?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory MSDS file, and is the copy updated on a quarterly basis within the MSDS file?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
17.	Is there evidence of weekly inspections and monthly inventories and documentation been completed	MSI7000.133 version 3.0, Section 7.3.2.1	☒	Form HW003E-Weekly Inspection & Form HW005E-Monthly Inventory are entered into ESS data base
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears as well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the corrosive liquid and the gloves tested for leaks prior to use.	MSI7000.133 version 3.0, Section 10.2.1	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/23/2019** **AUDITOR: Beecher Adams**

	• Rubberized laboratory apron or a chemical and fire-resistant laboratory coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and MSDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents? • Limit chemicals stored at the lab bench or other work areas to those amounts	MSI7000.133 version 3.0, Appendix A	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/23/2019** **AUDITOR: Beecher Adams**

	necessary for daily operation. The container size shall be the minimum convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01/17/2019** **AUDITOR: Angela Coale**

	CRITERIA	DOCUMENT NO.	ACC	
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI7000.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Click here to enter text.
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **NGMS,** vendor lab, date the minimum	ASI7000.12 version 2.0 section 3.1.5 Sample Labeling	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01/17/2019** **AUDITOR: Angela Coale**

	retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.1	☒	Click here to enter text.
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.2	☒	Click here to enter text.
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI7000.133 version 3.0, Section 3.1	☒	Last use 1/9/2019
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI7000.133 version 3.0, Section 3.1	☒	Click here to enter text.
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI7000.133 version 3.0, Section 3.2 & 3.2.1	☒	Last calibrated 12/4/2018
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI7000.133 version 3.0, Section 3.3	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01/17/2019** **AUDITOR: Angela Coale**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI7000.133 version 3.0, Section 3.4	☒	No hydrometers in the lab
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI7000.133 version 3.0, Section 3.6	☒	Click here to enter text.
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI7000.133 version 3.0, Section 3.7	☒	Click here to enter text.
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI7000.133 version 3.0, Section 6.2	☒	Click here to enter text.
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01/17/2019** **AUDITOR: Angela Coale**

13.	Are <u>erroneous entries</u> crossed through once, initialed and dated in a manner that permits the incorrect entry to remain legible?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.
14.	Is a chemical inventory(listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI7000.133 version 3.0, Section 7.3.1	☒	**4th quarter 10/2018**
15.	Does the chemical inventory list the quantities, container type and location?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory MSDS file, and is the copy updated on a quarterly basis within the MSDS file?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
17.	Is there evidence of weekly inspections and monthly inventories and documentation(form number HW004E, Rev. 1.1, Effective Date: 11/01/2011) been completed	MSI7000.133 version 3.0, Section 7.3.2.1	☐	No longer use Form #HW004E; yes there is evidence of inventories
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears as well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the	MSI7000.133 version 3.0, Section 10.2.1	☐	Lab coats

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01/17/2019** **AUDITOR: Angela Coale**

	corrosive liquid and the gloves tested for leaks prior to use. • Rubberized laboratory apron or a chemical and fire-resistant laboratory coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and MSDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents?	MSI7000.133 version 3.0, Appendix A	☒	No food/ eyes wash clean and shower location good

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01/17/2019** **AUDITOR: Angela Coale**

	• Limit chemicals stored at the lab bench or other work areas to those amounts necessary for daily operation. The container size shall be the minimum convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01-29-19** **AUDITOR: Jake Norwood**

	CRITERIA	DOCUMENT NO.	ACC	0
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI7000.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Click here to enter text.
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **NGMS,** vendor lab, date the minimum	ASI7000.12 version 2.0 section 3.1.5 Sample Labeling	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01-29-19** **AUDITOR: Jake Norwood**

	retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.1	☒	Click here to enter text.
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.2	☒	Click here to enter text.
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI7000.133 version 3.0, Section 3.1	☒	Click here to enter text.
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI7000.133 version 3.0, Section 3.1	☒	Click here to enter text.
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI7000.133 version 3.0, Section 3.2 & 3.2.1	☐	n/a
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI7000.133 version 3.0, Section 3.3	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01-29-19** **AUDITOR: Jake Norwood**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI7000.133 version 3.0, Section 3.4	☐	n/a
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI7000.133 version 3.0, Section 3.6	☒	Click here to enter text.
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI7000.133 version 3.0, Section 3.7	☒	Click here to enter text.
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI7000.133 version 3.0, Section 6.2	☒	Click here to enter text.
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01-29-19** **AUDITOR: Jake Norwood**

13.	Are <u>erroneous entries</u> crossed through once, initialed and dated in a manner that permits the incorrect entry to remain legible?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.
14.	Is a chemical inventory(listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
15.	Does the chemical inventory list the quantities, container type and location?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory MSDS file, and is the copy updated on a quarterly basis within the MSDS file?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
17.	Is there evidence of weekly inspections and monthly inventories and documentation been completed	MSI7000.133 version 3.0, Section 7.3.2.1	☐	N'a
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears as well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the corrosive liquid and the gloves tested for leaks prior to use.	MSI7000.133 version 3.0, Section 10.2.1	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01-29-19** **AUDITOR: Jake Norwood**

	• Rubberized laboratory apron or a chemical and fire-resistant laboratory coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and MSDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents? • Limit chemicals stored at the lab bench or other work areas to those amounts	MSI7000.133 version 3.0, Appendix A	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01-29-19** **AUDITOR: Jake Norwood**

	necessary for daily operation. The container size shall be the minimum convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 31, 2019** **AUDITOR: Paul Veillon**

	CRITERIA	DOCUMENT NO.	ACC	
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI7000.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Click here to enter text.
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **NGMS,** vendor lab, date the minimum	ASI7000.12 version 2.0 section 3.1.5 Sample Labeling	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 31, 2019** **AUDITOR: Paul Veillon**

	retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.1	☒	Click here to enter text.
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.2	☒	Click here to enter text.
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI7000.133 version 3.0, Section 3.1	☒	Click here to enter text.
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI7000.133 version 3.0, Section 3.1	☒	Click here to enter text.
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI7000.133 version 3.0, Section 3.2 & 3.2.1	☐	n/a
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI7000.133 version 3.0, Section 3.3	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 31, 2019** **AUDITOR: Paul Veillon**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI7000.133 version 3.0, Section 3.4	☒	Click here to enter text.
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI7000.133 version 3.0, Section 3.6	☒	Click here to enter text.
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI7000.133 version 3.0, Section 3.7	☒	Click here to enter text.
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI7000.133 version 3.0, Section 6.2	☐	**No Log Book, now kept in Share Point**
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 31, 2019** **AUDITOR: Paul Veillon**

13.	Are <u>erroneous entries</u> crossed through once, initialed and dated in a manner that permits the incorrect entry to remain legible?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.
14.	Is a chemical inventory(listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
15.	Does the chemical inventory list the quantities, container type and location?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory SDS file, and is the copy updated on a quarterly basis within the SDS file?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
17.	Is there evidence of weekly inspections and monthly inventories and documentation been completed	MSI7000.133 version 3.0, Section 7.3.2.1	☒	Click here to enter text.
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears as well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the corrosive liquid and the gloves tested for leaks prior to use.	MSI7000.133 version 3.0, Section 10.2.1	☒	New rubberized apron on order

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 31, 2019** **AUDITOR: Paul Veillon**

	• Rubberized laboratory apron or a chemical and fire-resistant laboratory coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and SDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents? • Limit chemicals stored at the lab bench or other work areas to those amounts necessary for daily operation. The	MSI7000.133 version 3.0, Appendix A	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 31, 2019** **AUDITOR: Paul Veillon**

	container size shall be the minimum convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 23, 2019** **AUDITOR: Alex Lewis**

	CRITERIA	DOCUMENT NO.	ACC	
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI7000.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Click here to enter text.
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **NGMS,** vendor lab, date the minimum	ASI7000.12 version 2.0 section 3.1.5 Sample Labeling	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 23, 2019** **AUDITOR: Alex Lewis**

	retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.1	☒	Click here to enter text.
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.2	☒	Click here to enter text.
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI7000.133 version 3.0, Section 3.1	☒	Click here to enter text.
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI7000.133 version 3.0, Section 3.1	☒	Click here to enter text.
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI7000.133 version 3.0, Section 3.2 & 3.2.1	☒	
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI7000.133 version 3.0, Section 3.3	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 23, 2019** **AUDITOR: Alex Lewis**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI7000.133 version 3.0, Section 3.4	☒	Click here to enter text.
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI7000.133 version 3.0, Section 3.6	☒	Click here to enter text.
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI7000.133 version 3.0, Section 3.7	☒	Click here to enter text.
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI7000.133 version 3.0, Section 6.2	☒	
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 23, 2019** **AUDITOR: Alex Lewis**

13.	Are <u>erroneous entries</u> crossed through once, initialed and dated in a manner that permits the incorrect entry to remain legible?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.
14.	Is a chemical inventory(listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
15.	Does the chemical inventory list the quantities, container type and location?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory SDS file, and is the copy updated on a quarterly basis within the SDS file?	M SI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
17.	Is there evidence of weekly inspections and monthly inventories and documentation been completed	MSI7000.133 version 3.0, Section 7.3.2.1	☒	Click here to enter text.
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears as well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the corrosive liquid and the gloves tested for leaks prior to use.	MSI7000.133 version 3.0, Section 10.2.1	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 23, 2019** **AUDITOR: Alex Lewis**

	• Rubberized laboratory apron or a chemical and fire-resistant laboratory coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and SDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents? • Limit chemicals stored at the lab bench or other work areas to those amounts necessary for daily operation. The	MSI7000.133 version 3.0, Appendix A	☐	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 23, 2019** **AUDITOR: Alex Lewis**

	container size shall be the minimum convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 22, 2019** **AUDITOR: Angela Coale**

	CRITERIA	DOCUMENT NO.	ACC	
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI7000.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Click here to enter text.Checked sample #19217
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **NGMS,** vendor lab, date the minimum	ASI7000.12 version 2.0 section 3.1.5 Sample Labeling	☒	Checked sample BM190507-001

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 22, 2019** **AUDITOR: Angela Coale**

	retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.1	☒	Click here to enter text.
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.2	☒	Available in SharePoint
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI7000.133 version 3.0, Section 3.1	☒	Click here to enter text.
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI7000.133 version 3.0, Section 3.1	☒	Click here to enter text.
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI7000.133 version 3.0, Section 3.2 & 3.2.1	☒	Tested 6/4/19
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI7000.133 version 3.0, Section 3.3	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 22, 2019** **AUDITOR: Angela Coale**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI7000.133 version 3.0, Section 3.4	☒	Lab has no hydrometers
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI7000.133 version 3.0, Section 3.6	☒	Click here to enter text.
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI7000.133 version 3.0, Section 3.7	☒	Click here to enter text.
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI7000.133 version 3.0, Section 6.2	☒	
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 22, 2019** **AUDITOR: Angela Coale**

13.	Are <u>erroneous entries</u> crossed through once, initialed and dated in a manner that permits the incorrect entry to remain legible?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.
14.	Is a chemical inventory(listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
15.	Does the chemical inventory list the quantities, container type and location?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory SDS file, and is the copy updated on a quarterly basis within the SDS file?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
17.	Is there evidence of weekly inspections and monthly inventories and documentation been completed	MSI7000.133 version 3.0, Section 7.3.2.1	☒	Documented in ESS data base; Form #HW004E no longer in use
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears as well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the corrosive liquid and the gloves tested for leaks prior to use.	MSI7000.133 version 3.0, Section 10.2.1	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 22, 2019** **AUDITOR: Angela Coale**

	• Rubberized laboratory apron or a chemical and fire-resistant laboratory coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and SDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents? • Limit chemicals stored at the lab bench or other work areas to those amounts necessary for daily operation. The	MSI7000.133 version 3.0, Appendix A	☒	Clean lab; areas marked off; refrigerator labeled; chemicals stored properly

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: July 22, 2019** **AUDITOR: Angela Coale**

	container size shall be the minimum convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07-15-19** **AUDITOR: Hershel Watson**

	CRITERIA	DOCUMENT NO.	ACC	0
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI7000.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Click here to enter text.
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **NGMS,** vendor lab, date the minimum	ASI7000.12 version 2.0 section 3.1.5 Sample Labeling	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07-15-19** **AUDITOR: Hershel Watson**

	retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.1	☒	Click here to enter text.
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.2	☒	Click here to enter text.
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI7000.133 version 3.0, Section 3.1	☒	Click here to enter text.
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI7000.133 version 3.0, Section 3.1	☒	Click here to enter text.
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI7000.133 version 3.0, Section 3.2 & 3.2.1	☐	n/a
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI7000.133 version 3.0, Section 3.3	☐	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07-15-19** **AUDITOR: Hershel Watson**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI7000.133 version 3.0, Section 3.4	☐	n/a
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI7000.133 version 3.0, Section 3.6	☒	Click here to enter text.
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI7000.133 version 3.0, Section 3.7	☒	Click here to enter text.
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI7000.133 version 3.0, Section 6.2	☒	Click here to enter text.
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07-15-19** **AUDITOR: Hershel Watson**

13.	Are <u>erroneous entries</u> crossed through once, initialed and dated in a manner that permits the incorrect entry to remain legible?	MSI7000.133 version 3.0, Section 7.1.1	☒	Click here to enter text.
14.	Is a chemical inventory(listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
15.	Does the chemical inventory list the quantities, container type and location?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory MSDS file, and is the copy updated on a quarterly basis within the MSDS file?	MSI7000.133 version 3.0, Section 7.3.1	☒	Click here to enter text.
17.	Is there evidence of weekly inspections and monthly inventories and documentation been completed	MSI7000.133 version 3.0, Section 7.3.2.1	☐	N'a
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears as well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the corrosive liquid and the gloves tested for leaks prior to use.	MSI7000.133 version 3.0, Section 10.2.1	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07-15-19** **AUDITOR: Hershel Watson**

	• Rubberized laboratory apron or a chemical and fire-resistant laboratory coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and MSDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents? • Limit chemicals stored at the lab bench or other work areas to those amounts	MSI7000.133 version 3.0, Appendix A	☒	Click here to enter text.

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07-15-19** **AUDITOR: Hershel Watson**

	necessary for daily operation. The container size shall be the minimum convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			