Draft Environmental Assessment for Bryan Mound Raw Water Channel Upgrades to Prevent Silt Buildup

DOE/EA-2079

U. S. Department of Energy
Strategic Petroleum Reserve
900 Commerce Road East
New Orleans, Louisiana 70123

May 2018

Prepared by:

Fluor Federal Petroleum Operations, LLC

New Orleans, Louisiana

Technical Assistance Provided by:

Environmental Research Group, L.L.C.

Baltimore, Maryland
Phone (410) 366-5170

www.envrg.com

April 2018

Contents

Appendices:

Figures:

Tables:

Acronyms

BM	Bryan Mound
CCTV	Closed Captioned Television
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CRM	Cultural Resources Manager
CWA	Clean Water Act
CX	Categorical Exclusion
dB	Decibel
DOE	Department of Energy
EA	Environmental Assessment
El	Elevation
EO	Executive Order
ESA	Threatened and Endangered Species Act
FPPA	Farmland Protection Policy Act
FONSI	Finding of No Significant Impact
FY	Fiscal Year
GHG	Greenhouse Gas
IPaC	Information for Planning and Consultation
Leq	Equivalent Noise Level
MMB	Million Barrels
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NoI	Notice of Intent
NO_X	Oxides of Nitrogen
NO_2	Nitrogen Dioxide
NRCS	Natural Resources Conservation Service
PM	Particulate Matter

POL	Petroleum, Oil and Lubricant
RWIS	Raw Water Intake Structure
SHPO	State Historic Preservation Office(r)
SO_2	Sulfur Dioxide
SPR	Strategic Petroleum Reserve
SPR LE-II	Strategic Petroleum Reserve Life Extension II
SWPPP	Stormwater Pollution Prevention Plan
TAP	Toxic Air Pollutant
TCEQ	Texas Commission on Environmental Quality
TMDL	Total Maximum Daily Load
tpy	tons per year
USCB	United States Census Bureau
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Compounds

1. Executive Summary

This Environmental Assessment (EA) was prepared to fulfill the need for analysis of the Bryan Mound Raw Water Intake Structure (RWIS) Upgrades to Prevent Silt Buildup (work package BM-MM-1560) proposed action planned in support of the Strategic Petroleum Reserve Life Extension II (SPR LE-II) project. There is a total of 16 proposed actions occurring at Bryan Mound in support of the SPR LE-II; 15 of them were found to be eligible for categorical exclusion (CX) and are documented in DOE/EA-2073. This one was analyzed separately due to the nature of in-water work.

1.1 Analysis Results

Analysis results for the proposed indicates the following:

No impact to:

- Cultural Resources
- Ecological Resources (includes Threatened and Endangered Species)
- Environmental Justice
- Prime Farmland/Soils

Where temporary, minor impact is anticipated, it is related to activities inherent to construction work for the proposed action:

- Air Quality – fugitive dust, petroleum-powered generator emissions
- Noise - Heavy equipment, generators, heavy trucks used to haul equipment, materials and construction debris removal
- Water Resources – The potential for soil erosion at construction sites may increase surface water turbidity. The nature of the in-water work is anticipated to temporarily disrupt river bed and increase turbidity.
- Socioeconomics - Short-term, beneficial impact may be realized with local construction work hiring.

1.2 Cumulative Effects Results

The cumulative effects analysis looked at potential geographic and temporal overlap among all work packages associated with Bryan Mound SPR LE-II, including those where a CX applies. The results are similar to the analysis of the work packages that received full individual analysis; whereas there is no anticipated impact to cultural resources, ecological resources (including threatened and endangered species), environmental justice and prime farmland/soils. There is temporal overlap of several work packages that are scheduled to occur in 2020, but only those where construction is involved will cause temporary, minor impact in the areas of air quality, noise, water resources and temporary, minor beneficial impact on socioeconomics.

2 Introduction

The Strategic Petroleum Reserve (SPR) was created on December 22, 1975 by mandate of Congress through the Energy Policy and Conservation Act. The objective of the SPR is to provide the United States with crude oil should a supply disruption occur. Oil is currently stored by the SPR crude oil facilities in Louisiana (Bayou Choctaw and West Hackberry) and two in Texas (Big Hill and Bryan Mound). The current storage design capacity at the four facilities is 714 million barrels (MMB).

The proposed action will occur at Bryan Mound storage site which is located in Brazoria County, Texas, approximately three miles southwest of Freeport, Texas. The site was acquired in April 1977 and became operational in 1978. Bryan Mound currently has 20 storage caverns, a design storage capacity of 247.0 MMB and a cavern inventory of 240.7 MMB.

The specific location of the RWIS is located along the Brazos River from which raw water is pumped.

Area location is indicated on Figure 1 and the RWIS location within the facility is indicated on Figure 2.

Figure 1 – SPR Bryan Mound Facility Location

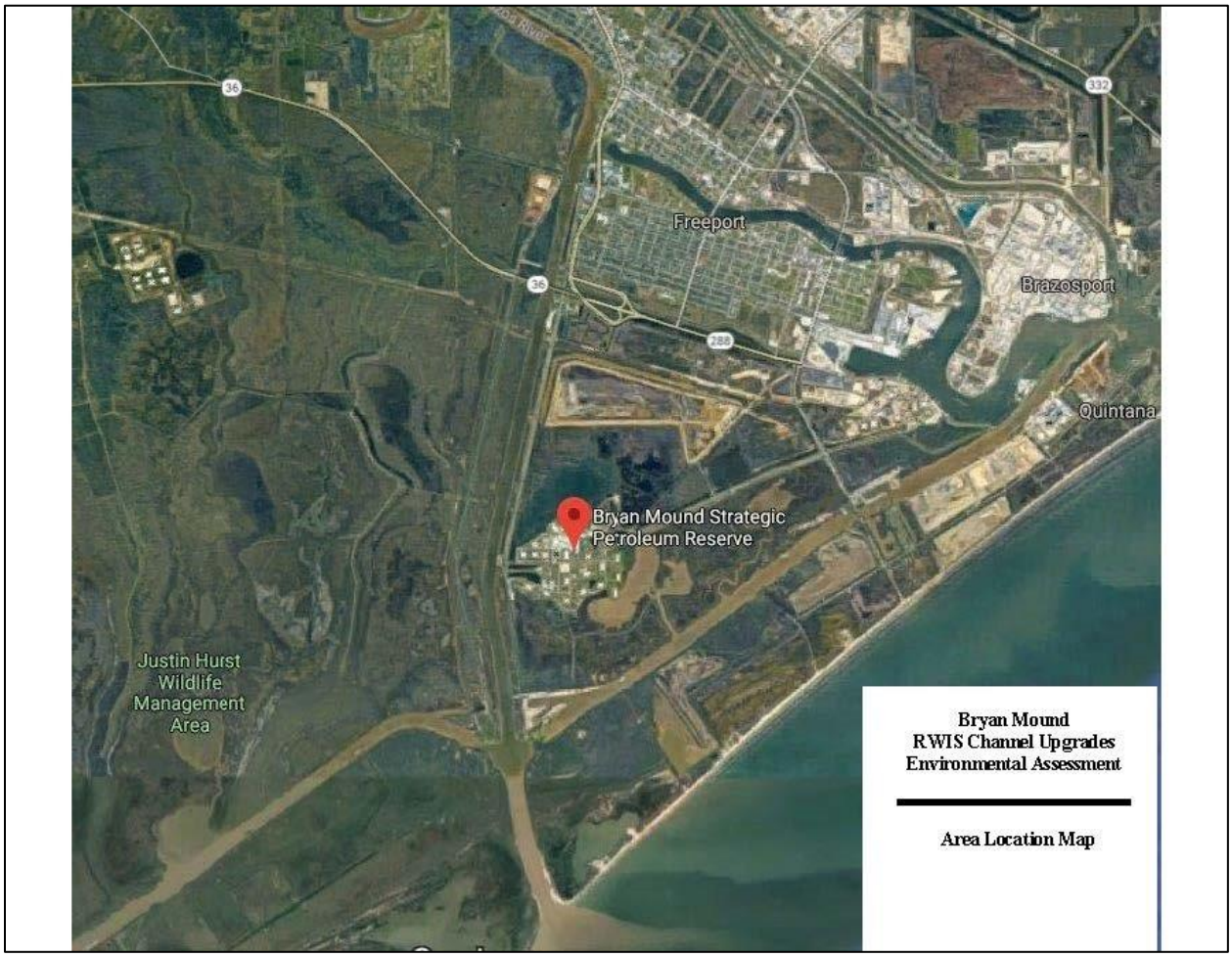
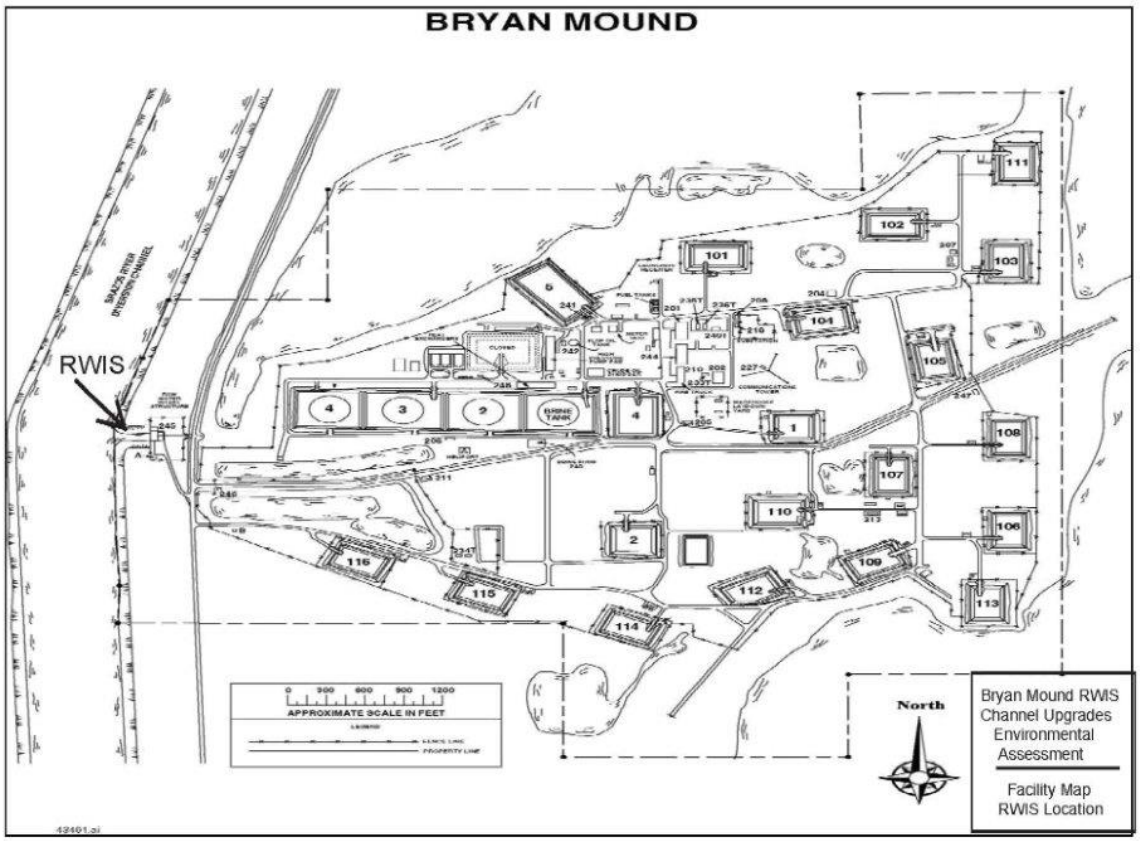


Figure 2 – Bryan Mound Facility Drawing and RWIS Location



The analysis of potential environmental impacts has been conducted in accordance with procedures set forth in NEPA, the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of the NEPA (40 Code of Federal Regulations [CFR] 1500-1508) and the Department of Energy (DOE) NEPA Implementing Procedures (10 CFR 1021).

2.1 Stakeholder Involvement

In compliance with 10 CFR 1021.301 and the NEPA, the DOE submitted a Notice of Intent (NoI) to prepare an EA. The NoI was mailed to federal, state and local stakeholders and a copy of the letter is provided in Appendix A.

The EA will be made available for review during a 30-day public comment period as per 40 CFR 1506.6 and 10 CFR 1021.301. Legal public notice of the Draft EA availability and distribution to Federal, State, local and tribal agencies will occur. Comments will be addressed in the Final EA and the Finding of No Significant Impact (FONSI) which will accompany it.

2.2 Document Structure

In the spirit of NEPA at 40 CFR 1500.4 (b) and its goal of paperwork reduction, this document has been written to be "analytic, not encyclopedic" in nature, ensuring thorough, cited analysis and documentation that does not impose a burden to the reader. It has been written in such a way that the public will understand any technical, regulatory or agency terms as required by 40 CFR 1502.8 and 10 CFR 1021.301.

The information contained in the affected environments baseline information is focused upon applicable federal, state and local regulatory requirements and policy. It serves as a metric to determine if an action may be impactful or not. The discussion is further supplemented with a summary of the criteria used to determine significance placed in the analysis discussion. 40 CFR 1508.27 indicates that significance "is determined by examining both the context and intensity of the proposed action." This means that significance determinations are unique to each proposed action.

Every effort has been made to streamline document organization and ensure that pertinent information is strategically placed to alleviate the need for referencing back to previous sections. The analysis is organized as such:

- Details of the proposed actions (the proposed and no-action alternatives)
- Current affected environment baseline conditions
- Project Analysis
    - Potentially impactful project activities
    - Analysis of each affected environment
        - Criteria for Determining Significance
        - Proposed Action Analysis
        - No-Action Alternative Analysis

3 Purpose and Need for Action

The proposed action is one of several work packages associated with the Strategic Petroleum Reserve Life Extension II (SPR LE-II) project. The SPR LE-II project included the identification of infrastructure improvement needs that are critical to maintain operational readiness, mission requirement execution and environmental stewardship. A separate EA, DOE/EA-2073, was prepared for the other work packages. Due to the nature of the work being performed in the Brazos River, it was decided to perform a separate EA for this work package.

The Intake Channel between the Brazos River and the Bryan Mound RWIS experiences episodic silting which reduces the available water flow into the intake structure. Periodic clean out of the channel is done with a barge-mounted long-arm backhoe as much as biannually. In the early 1990's, the drawdown rate at Bryan Mound was increased and the pumps in the intake structure were replaced in order to support the increased drawdown rate. (Fluor, 2017)

Silt accumulation in the Bryan Mound Intake Channel negatively impacts the ability of the site to meet its drawdown mission. Biannual dredging is not an ideal practice when the proposed alternative will reduce dredging activities to once per ten years.

4 Baseline Conditions of Affected Environment

4.1 Bryan Mound Affected Environment

4.1.1 Air Quality

The Texas Commission on Environmental Quality (TCEQ) Air program is responsible for carrying out the mandates of the Texas Air Quality Rules, as well as meeting Texas' federal obligations under the Clean Air Act. They are responsible for regulating stationary sources for which operating permits may be necessary. The air quality thresholds discussed here are to be used as guidance to determine if a proposed action would result in a significant impact to air quality (acute or cumulative) in relation to NEPA. This information should not be used to determine if an action would require a permit.

In Texas, six pollutants are used to calculate the Air Quality Index: carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, and particulate matter (PM) 2.5 and 10. Not all pollutants are monitored at each location in the state. There are two monitoring stations near Bryan Mound. The first is the Clute monitoring station approximately nine miles away in the city of Clute and it monitors volatile organic compounds (VOCs) only. The second is Lake Jackson which is approximately 12 miles away in the city of Lake Jackson. It monitors nitrogen oxides and ozone. Both are part of the TCEQ Houston Region.

The pollutant list mirrors the federal government's established standards which are known as the National Ambient Air Quality Standards (NAAQS). The pollutants of concern and the levels and thresholds specific to each are indicated in Table 1.

Table 1 National Ambient Air Quality Standards – Brazoria County

Pollutant	Primary[2]/ Secondary[3]	Averaging Time & Level	Threshold	Current Status
Carbon Monoxide (CO)	Primary	8 hours = 9 ppm[1] 1 hour = 35 ppm	Not to be exceeded more than once per year.	Attainment
Nitrogen Dioxide (NO_2)	Primary (1 hour)	1 hour = 100 ppb	98th % of 1-hour daily maximum concentrations, averaged over 3 years	Attainment
	Primary & Secondary (Annual)	Annual average = 53 ppb[1]	Annual Mean	Attainment
Lead[5]	Primary & Secondary	Rolling 3 month average = 0.15 ug/m^3	Not to be exceeded	Attainment
Ozone	Primary & Secondary	8-hour = .070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years.	Non-attainment
Particulate Matter 2.5[1] (PM 2.5)	Primary	Annual = 12 ug/m^{3,} [1]	Annual mean, averaged over 3 years	Attainment
	Secondary	Annual = 15 ug/m^3	Annual mean, averaged over 3 years	Attainment
	Primary and Secondary	24-hour = 35 ug/m^3	98th percentile, averaged over 3 years	Attainment
Particulate Matter 10[1] (PM 10)	Primary and Secondary	24-hour = 150 ug/m^3	Not to be exceeded more than once per year on average over 3 years	Attainment
Sulfur Dioxide (SO_2)	Primary	1-hour = 75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years	Attainment

Pollutant	Primary[2]/ Secondary[3]	Averaging Time & Level	Threshold	Current Status
	Secondary	3-hour = 0.5 ppm	Not to be exceeded more than once per year	Attainment

Source: U.S. Environmental Protection Agency (USEPA) website http://www.epa.gov/air/criteria.html accessed December 6, 2017

[1]**Units of measure**: parts per million (ppm), parts per billion (ppb), micrograms per cubic meter of air (ug/m^3) for PM.

[2]***Primary standards*** provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly.

[3]***Secondary standards*** provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

[4]**PM 10** is not currently being monitored at the Brazoria County monitoring area.

[5]**Lead** is included in the full list of NAAQS pollutants. Not all pollutants are monitored at each monitoring station, and lead is not monitored at the Lake Charles Metropolitan Statistical Area monitoring stations.

General Conformity Rule

Brazoria County is located in a non-attainment area for 8-hour ozone. Once attainment has been achieved it will be designated as a "maintenance area". A maintenance area is an area that was once designated as non-attainment but has been re-designated to attainment. (USEPA, 2016)

Each time an activity is proposed, the DOE performs analysis based on the General Conformity Rule to determine if the activity will exceed the thresholds de minimis presented in Table 2. If the emissions from the activities are below the de minimis levels, then a full General Conformity Analysis is not required.

40 CFR Part 93, Subpart B, 93.153, Applicability, provides in paragraph (b) (2) the following thresholds in maintenance areas:

Table 2 General Conformity Rule Thresholds for Maintenance Areas

Pollutant	Tons/year
Ozone (Oxides of Nitrogen [NO_X], SO_2 or Nitrogen Dioxide [NO_2]):	
All Maintenance Areas	100
Ozone (VOC's):	

Pollutant	Tons/year
Maintenance areas inside an ozone transport region	50
Maintenance areas outside an ozone transport region	100
Carbon monoxide: All Maintenance Areas	100
PM–10: All Maintenance Areas	100
$PM_{2.5}$:	
Direct emissions	100
SO_2	100
NO_X(unless determined not to be a significant precursor)	100
VOC or ammonia (if determined to be significant precursors)	100
Lead: All Maintenance Areas	25

Permit

In addition to being subject to the NAAQS, Bryan Mound operates under Permit #6176B issued by the TCEQ dated May 31, 2013 in accordance with Title 30 Texas Administrative Code 116.116(b). As part of permit requirements, the installation must submit annual comprehensive emission statements for each of the pollutants generated by each source, which are tanks, emergency engines and painting operations.

The tons per year (tpy) emission limits for each source is listed below in Table 30:

Table 3 Emission rates for Criteria Pollutants and Toxic Air Pollutants (TAPs) (in tpy)

PM^{10}	$PM^{2.5}$	SO2	NOx	CO	VOC
Emission Source		**1005 Brine Tank**			
					5.42
Emission Source		**1006 Sump Tank**			
					0.01

PM^{10}	$PM^{2.5}$	SO2	NOx	CO	VOC
Emission Source		**1007 Site Fugitive Emissions (5)**			
					0.07
Emission Source		**1008-3 Crude Oil Surge Tank 3**			
					3.35
Emission Source		**008-4 Crude Oil Surge Tank 4**			
					3.35
Emission Source		**1009 Diesel Storage Tank**			
					0.01
Emission Source		**1010 Diesel Storage Tank**			
					0.01
Emission Source		**1011 Gasoline Storage Tank**			
					0.40
Emission Source		**1012 Emergency Generator**			
0.05	0.05	0.60	1.78	0.41	0.05
Emission Source		**1013 Emergency Pump**			
0.02	0.02	0.01	0.21	0.05	0.02
Emission Source		**1014 Emergency Pump**			
0.01	0.01	0.01	0.08	0.02	0.01
Emission Source		**1015 Painting Operation**			
					0.68
Emission Source		**1017 Crude Oil Recovery Tank**			
					.024

Greenhouse Gas (GHG) (Executive Order [EO] 13693)

The Greenhouse Gas Reporting Program authority is carried out at the federal level of USEPA. The Consolidated Appropriations Act of 2008 triggered the issue of the Mandatory Reporting of Greenhouse Gases Rule (74 FR 56260/40 CFR 98). The rule states that any facility that emits 25,000 tpy or more of carbon dioxide equivalent (CO2e) is required to submit annual reports to the USEPA. Further information and guidance can be found at http://www.epa.gov/ghgreporting/basic-info/index.html.

There is an EO relevant to this effort: EO 13693.

EO 13693 directs government agencies to "reduce GHG emissions through reduction of energy intensity 30 percent by 2015, compared to a Fiscal Year (FY) 2003 baseline."

It also directs federal agencies to reduce targeted scope 1 and scope 2 GHG emissions by at least 40% by FY 2025 from a FY 2008 baseline. Section 2 of EO 13693 directs individual agencies to set scope 1 and 2 GHG emission reduction targets for FY 2025 from a FY 2008 baseline. In addition, the goal for scope 3 GHG emission reduction is 13% by 2025 from a 2008 baseline.

Scope 1 GHG emissions are direct emissions which result from sources owned or controlled by DOE. Included in this source are boilers/water heaters and intra-installation vehicular travel. The Bryan Mound facility's major Scope 1 GHG source is emergency engines.

Scope 2 GHG emissions are indirect emissions resulting from consumption of purchased electricity, heat or steam. This includes electricity purchased for heating equipment and general electrical use.

Scope 3 GHG emissions are "other indirect emissions" which include extraction and production of purchased materials and fuels-transport related activity not covered in Scope 2. This also includes emissions from commuting and air-travel.

4.1.2 Cultural Resources

There are no known archeological, historical, or cultural resources that would potentially be affected by the project. Given the disturbed state of almost all the facility area, involvement with any potential unidentified resource is unlikely. From a NEPA perspective, this means there is no significant impact anticipated. However, the following paragraph indicates requirements that will need to be fulfilled under Section 106 of the National Historic Preservation Act (NHPA).

Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Properties and other parties with an interest a reasonable opportunity to comment (consultation) beginning at the early stages of project planning. An undertaking is defined as "a project, activity or program

funded in whole or in part under the direct or indirect jurisdiction of a Federal Agency, including those carried out by or on behalf of a Federal Agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval. Once an undertaking has been identified, the CRM will determine if it is a type of activity that has the potential to cause effects on historic properties."

It must be noted that NEPA analysis does not replace or negate the need for NHPA Section 106 review. Therefore, any action that may affect the physical landscape is subject to review for possible adverse impacts to be identified. Coordination with the State Historic Preservation Officer (SHPO) is required in all cases.

4.1.3 Ecological Resources

Vegetation is defined as plants and their geographic characteristics. Fish and wildlife are the animals and their habitats that occur within a region. Threatened and endangered species are any federally or state listed species in or around the facility. Section 7 of the Endangered Species Act, as amended (16 United States Code, Chapter 35 § 1531-1544), requires federal agencies evaluate the efforts of the proposed actions on protected plant and animal species and their habitats and take appropriate measures to conserve and project these species. Special-status species include plants and animals listed as sensitive, threatened, or endangered by the US Fish and Wildlife Service (USFWS), as well as those that are candidates or proposed for listing as threatened or endangered. Special status species also include those species protected by the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, and the Marine Mammal Protection Act.

The Texas Parks and Wildlife Department Species by County List reports the following species in Brazoria County:

Table 4 Plant Species in Brazoria County, TX

Common Name	Scientific Name	State Status	Federal Status
Awnless bluestem	*Bothriochloa exaristata*	None	None
Coastal gay-feather	*Liatris bracteata*	None	None
Florida pinkroot	*Spigelia texana*	None	None
Giant sharpstem umbrella-sedge	*Cyperus cephalanthus*	None	None
South Texas spikesedge	*Eleocharis austrotexana*	None	None
Texas meadow-rue	*Thalictrum texanum*	None	None

Common Name	Scientific Name	State Status	Federal Status
Texas sunflower	*Helianthus praecox ssp. Praecox*	None	None
Texas tauschia	*Tauschia texana*	None	None
Texas windmill-grass	*Chloris texensis*	None	None
Threeflower broomweed	*Thurovia trifloral*	None	None

Table 5 *Mammals, Birds, Fish and Reptile Species in Brazoria County, TX*

Common Name	Scientific Name	State Status	Federal Status
American Peregrine Falcon	*Falco peregrinus anatum*	Threatened	Delisted
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	None	Delisted
Bald Eagle	*Haliaeetus leucocephalus*	Threatened	Delisted
Black Rail	*Laterallus jamaicensis*	None	None
Brown Pelican	*Pelecanus occidentalis*	None	Delisted
Eskimo Curlew	*Numenius borealis*	Endangered	Endangered
Henslow's Sparrow	*Ammodramus henslowii*	None	None
Peregrine Falcon	*Falco peregrinus*	Threatened	Delisted
Piping Plover	*Charadrius melodus*	Threatened	Threatened
Red Knot	*Calidris canutus rufa*	None	Threatened
Reddish Egret	*Egretta rufescens*	Threatened	None
Snowy Plover	*Charadrius alexandrinus*	None	None
Sooty Tern	*Sterna fuscata*	Threatened	None
Sprague's Pipit	*Anthus spragueii*	None	None

Common Name	Scientific Name	State Status	Federal Status
Western Snowy Plover	*Charadrius alexandrinus nivosus*	None	None
White-faced Ibis	*Plegadis chihi*	Threatened	None
White-tailed Hawk	*Buteo albicaudatus*	Threatened	None
Whooping Crane	*Grus Americana*	Endangered	Endangered
Wood Stork	*Mycteria Americana*	Threatened	None
American eel	*Anguilla rostrata*	None	None
Sharpnose shiner	*Notropis oxyrhynchus*	None	Endangered
Smalltooth sawfish	*Pristis pectinata*	Endangered	Endangered
Jaguarundi	*Herpailurus yaguarondi*	Endangered`	Endangered
Louisiana black bear	*Ursus americanus luteolus*	Threatened	Delisted
Ocelot	*Leopardus pardalis*	Endangered	Endangered
Plains spotted skunk	*Spilogale putorius interrupta*	None	None
Red wolf	*Canis rufus*	Endangered	Endangered
West Indian manatee	*Trichechus manatus*	Endangered	Endangered
Smooth pimpleback	*Quadrula houstonensis*	Threatened	Candidate
Texas fawnsfoot	*Truncilla macrodon*	Threatened	Candidate
Alligator snapping turtle	*Macrochelys temminckii*	Threatened	None
Atlantic hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	Endangered
Green sea turtle	*Chelonia mydas*	Threatened	Threatened
Kemp's Ridley sea turtle	*Lepidochelys kempii*	Threatened	Threatened
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	Endangered

Common Name	Scientific Name	State Status	Federal Status
Loggerhead sea turtle	*Caretta caretta*	Threatened	Threatened
Texas diamondback terrapin	*Malaclemys terrapin littoralis*	None	None
Texas horned lizard	*Phrynosoma cornutum*	Threatened	None
Timber rattlesnake	*Crotalus horridus*	Threatened	None
Smooth Pimpleback	*Caretta caretta*	Candidate	Candidate

Source: Texas Parks and Wildlife Department Species by County List accessed at: http://tpwd.texas.gov/gis/rtest/ on March 1, 2017.

Please note that while they do not appear on the official Texas Parks and Wildlife Department Species by County list as depicted on Table 5, alligators are periodically seen on facility grounds.

While members of the above-listed species reportedly live in Brazoria County, none of them call the SPR Bryan Mound facility home. An Official Species List was generated using the USFWS Information for Planning and Consultation (IPaC). The list fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action" pursuant to the aforementioned Section 7 of the Endangered Species List. There are two IPaC reports included in Appendix D. One for the entire Bryan Mound Facility and the other focused specifically on the proposed action area. Both reports indicate: "There are no critical habitats within your project area under this office's jurisdiction."

The facility complies with EO 13186 *Responsibilities of Federal Agencies to Protect Migratory Birds & Migratory Bird Act.* Migratory birds are often spotted at each of the SPR facilities, including Bryan Mound. Mitigation activities to ensure the protection of migratory birds include flagging, avoidance of nesting areas and selective mowing cessation during critical times of the year to allow for adequate food and shelter.

4.1.4 Environmental Justice

Environmental justice addresses the disproportionate effect a federal action may have on low-income or minority populations or on children. In 1994, EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations was issued to focus attention of federal agencies on human health and environmental conditions in minority and low-income communities and to ensure that disproportionately high and adverse human health or environmental effects on these communities are identified and addressed. In 1997, EO 13045, Protection of Children from Environmental Health Risks and Safety Risks Protection of Children, was issued.

According to the US Census Bureau, the 2016 American Community Survey estimated total population for Brazoria County was 338,419. Of that total, 13 percent is made up African Americans. The Hispanic community makes up 29.2 percent, and 0.4 percent are of American Indian or Alaskan Native descent.

As defined by the CEQ report, Environmental Justice Guidance Under the National Environmental Policy Act, a minority population should be identified where either:

- The minority population of the affected area exceeds 50 percent; or
- The minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

According to the above definition, no minority population is present within the proposed project area.

4.1.5 Land Use

Land use comprises the natural condition or human-modified activities occurring at a particular location. Land uses are frequently regulated by management plans, policies, ordinances and regulation that determine the types of activities that are allowable or provide protection for specially designated or environmentally sensitive areas.

The SPR Bryan Mound facility has been operational since 1978. The facility is strictly used for oil industry activities with personnel support buildings (office/restrooms). DOE maintains appropriate operational permits and performs all regulatory compliance activities as required.

4.1.6 Noise

Noise is any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise intrusive. Human response to noise varies depending on the type and characteristics of the noise, the distance between the noise source and the receptor, receptor sensitivity, and the time of day. Noise is often generated by activities such as construction or vehicular traffic. Sound levels are expressed in decibel (dB) and various weighted dB scales (i.e. A, B, C) are used to approximate how people perceive different types of sounds. USEPA defined a long-term average noise descriptor, the “equivalent” noise level, or Leq. The day-night average sound level consists of the Leq with a 10-dB penalty for night-time noise. This metric provides a single measure of overall noise impact and is the accepted measure of determining human noise impacts.

Noise concerns would be addressed from a worker health and safety perspective. All four SPR locations are governed by OSHA 1910.119, *Process Safety Management of Highly Hazardous Chemicals* per a 1994 determination by the Department of Labor. The four storage sites also participate in the OSHA Voluntary Protection Program meaning the hazards analyses follow what OSHA considers industry best practices. A preliminary hazards review was performed and it indicates noise is not a concern from any of the proposed actions. (DOE, 2017)

4.1.7 Prime Farmland/Soils

The Natural Resources Conservation Service (NRCS) has listed no prime farmland within the proposed action area. More specifically, the soils in the project area are mapped as:

Table 6 ***Soil Descriptions in the Project Area***

Soil Type	Drainage Class	Average Slope	Prime Farmland
Ijam clay	Rarely flooded	---	No

The purpose of the Farmland Protection Policy Act (FPPA) is to minimize the extent to which Federal programs contribute to the unnecessary conversion of farmland to non-agricultural uses. The FPPA stipulates that Federal programs be compatible with State, local and private efforts to protect farmland. Prime farmland soils have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. In general, prime farmland soils experience adequate and dependable precipitation, a favorable temperature and growing season, have acceptable acidity or alkalinity, and have few or no surface stones. Prime farmland soils are permeable to water and air. These soils are not excessively erodible or saturated with water for long periods of time. No soil map unit classified as prime farmland soils is located within the project area (see Table 6 and Appendix C).

4.1.8 Socioeconomics

Bryan Mound is located near Freeport City, Texas in Brazoria County. It is anticipated that any potential socioeconomic impacts due to the proposed actions would be concentrated within these areas surrounding the facility.

The population estimate for Brazoria County as of 2016 was 338,419. This was a 7.5% increase from the 2010 Census. The Freeport City population had no significant change. (USCB, 2016). The table below shows population numbers for the area.

Table 7 ***Population in Areas Surrounding Bryan Mound (2016)***

	Brazoria County	**Freeport City**
Population Estimate 2016	338,419	12,122
Population 2010 Census	313,166	12,049
Percent Change	7.5%	-0.7%

The largest contributors to employment in the surrounding areas are educational services and health care and social assistance services. For Freeport City, the largest contributing sectors are construction, educational services and health care and social assistance; and arts, entertainment, recreation, accommodation and food services. (USCB, 2016).

As shown in the table below, there is a large income difference throughout the area. Unemployment rates differ greatly across the area as well.

Table 8 ***Employment and Income in Areas Surrounding Bryan Mound (2016)***

	Civilian Labor Force	Armed Forces Labor Force	Unemployment Rate	Median Household Income	Per Capita Income in past 12 months
Brazoria County	166,099	98	5.2%	$72,006	$89,752
Freeport City	5,292	0	13%	$36,044	$52,974

Low-income populations are identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty. The weighted average poverty threshold in 2013 (the most recent data available), was $23,834 for a four-person family. The median household income for the county and City of Freeport exceed the poverty thresholds, therefore it is determined that no affected low-income communities exist in the area.

4.1.9 Water Resources

The proposed action will be executed within the Brazos River channel, just outside of the intake channel where the raw water for RWIS activities is obtained. Figure 3 depicts an aerial view of the proposed action, with overlain drawing of the proposed final product.

Groundwater

Groundwater is monitored monthly and operations at the facility include constant monitoring that no petroleum-related contaminants are released to the environment. That includes the brine that is ultimately injected into the deep aquifer. There have been no compliance issues for groundwater.

Bryan Mound RWIS Channel Upgrade Environmental Assessment

Figure 3 Proposed Action

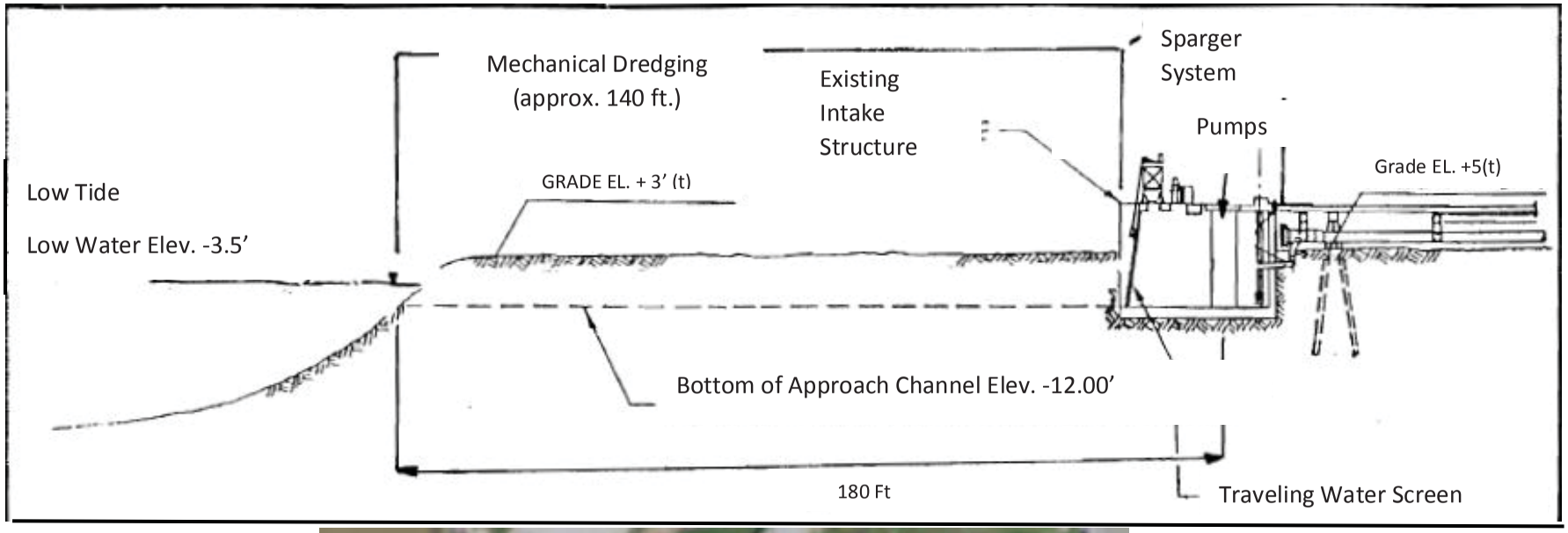
Surface Water

Section 303(d) of the CWA requires states to identify waters where current pollution control technologies alone cannot meet the water quality standards set for that waterbody. Every two years, states are required to submit a list of impaired waters plus any that may soon become impaired to EPA for approval. The impaired waters are prioritized based on the severity of the pollution and the designated use of the waterbody (e.g., fish propagation or human recreation). States must establish the Total Maximum Daily Loads (TMDLs) of the pollutant(s) in the waterbody for impaired waters on their list. The most current cycle for Texas is 2014 and the overall status for the Brazos River is "Good" (unimpaired) for all categories, which are: aquatic life use, general use, public water supply use and recreation use.

The SPR SWPPP addresses mitigation activities needed to ensure surface water quality is not impacted by normal facility operations.

It is worth reiterating here the discussion of ecological resources and the fact there are no critical habitats within the project area. This includes threatened and endangered aquatic species habitat.

Bryan Mound performs biannual dredging as per U.S. Corps of Engineers, Galveston District Permit No. SWG-12006-2568. The permit allows for annual removal of 2,000 to 6,000 cubic yards of silt to be dredged and placed onsite in specified spoils placement areas. Mechanical dredging is conducted in the area indicated on Figure 4. The distance from the intake structure to the furthest point into the channel where dredging would occur is approximately 140 feet. Looking back at Figure 3, it indicates that the furthest point into the channel the completed proposed action is 141 feet. This means construction and operation of the proposed action will not disturb the river bed in an area that is not already being disturbed by biannual permitted dredging.



N

Map Scale:
1" = 50'

RWIS Profile A - A Details

OFFICIAL USE ONLY

Bryan Mound
RWIS Channel Upgrade
Environmental Assessment

Figure 4
Permitted Dredge Area

Wetlands

The main portion of the facility has a few ponds, a lake to the north and is otherwise surrounded by estuarine and marine wetlands. Estuarine environments form a transition zone between river environments and marine environments, as is expected here with the facility so close to the Gulf of Mexico. Appendix E includes current USFWS National Wetlands Inventory maps for the facility accessible at https://www.fws.gov/wetlands/data/mapper.html (definitions of the codes used on the map are also available in the frequently asked questions section of the website).

Wetlands are not anticipated to be impacted by the proposed action. However, when wetland impacts do occur, Texas Parks and Wildlife manages a program that requires compensation for impact to wetlands. There are two types of mitigation banks in Texas: wetland and stream mitigation banks regulated by the US Army Corps of Engineers and species conservation banks regulated by the USFWS. Both types of banks are permanently protected and exist to replace natural resource values that are lost at an offsite location to development activity. The values of the natural resources replaced at a bank are quantified as a "credit", which can be sold to developers to offset natural resource impacts. For more information, please see https://valuewetlands.tamu.edu.

Analysis of cumulative impacts to wetlands will be performed via compliance with EO 11990, Protection of Wetlands, which directs federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction of modification of wetlands and to avoid direct or indirect support of new construction in wetlands whenever there is a practicable alternative. Under Section 404 of the CWA, the USACE is responsible for delineating federal jurisdictional wetlands and issuing permits for construction in wetlands. The USACE defines federal jurisdictional wetlands as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Types of wetlands are described in the 1987 USACE Wetland Delineation Manual. Once project design reaches the appropriate phase to implement such delineation work, it is anticipated to include (but not be limited to) the following analysis:

- Wetlands' role as nursery for certain species (e.g. threatened, endangered, recreationally/commercially valuable)
- Wetlands' ability to minimize downstream flooding
- Wetlands' ability to improve water quality.

5 Proposed Action and Alternatives

Three alternatives were analyzed and documented in Bryan Mound Raw Water Intake Channel Study Final Report dated June 7, 2017. Pertinent pages describing the analysis of alternatives from the document are presented in Appendix B. The proposed alternative is the construction of a gated weir or inflatable dam (see Figure 3). When the gates are fully closed or the rubber dam is fully inflated, the structure will become, essentially, a wall with the top at El (+) 3 feet. Thus,

the height of the center section is the same height of the upstream and downstream wing walls. When the pumps are operating, the four gates will be lowered or the rubber dam will be deflated. The sill for the gates or inflatable dam is at El (-) 6 feet or two feet above the river bed. When the pumps are not operating, the gates/dam will isolate the intake channel from the river.

Because the entrance is basically a wall most of the time, the structure was moved closer to the pump station and follows the El (-) 8 foot contour. The front face is angled at five degrees into the flow to keep sediment from depositing along the face of the intake entrance. The upstream face of the weir is approximately 135 feet from the face of the pump station. The downstream face of the weir is approximately 141 feet long.

Because of the gates being closed—or the inflatable dam inflated—there will be little to no circulation in the intake channel when river levels are near or below the top of the gates or inflatable dam. Circulation in the intake channel is the main reason for silt deposition. Marine growth and biofouling is not expected to be a concern on the gates.

No Action Alternative

No action would mean that silt would continue to deposit in the channel intake and require biannual dredging. Dredging creates a waste stream in that the dredged materials must be placed somewhere or removed off-site. Thus far, the dredged material has been placed in a pre-determined location on-site. The proposed action is anticipated to decrease the occurrence of dredging to every ten years; arguably a vast improvement over the current biannual events.

6 Project Analysis

BM-MM- 1560 RWIS Channel Upgrades to Prevent Silt Buildup

Potentially Impactful Activities: In-water Construction

Air Quality

Criteria for Determining Significance:

- A status of non-attainment of the NAAQS thresholds as found in Table 20;
- An exceedance of an emission limit specified in the permit (summarized in Table 21; and
- An inability to meet the goals set forth in EO 13693.

Proposed Action Analysis: Temporary, minor impact is anticipated. Heavy vehicle traffic will generate fugitive dust, increasing PM volume in the immediate area. It is not anticipated to decrease air quality for the nearest residents approximately three miles away in the town of Freeport. Emissions from gas-powered generators and increased vehicle traffic may increase VOC emissions, but not to a degree where NAAQS thresholds are exceeded. Project-specific permits will be obtained with appropriate, short-term emission limits which will be monitored to ensure no exceedances.

No Action Analysis: There would be no impact to air quality.

Cultural Resources

Criteria for Determining Significance: The results of a SHPO review will determine if the proposed action has the potential to cause impact to historic properties.

Proposed Action Analysis: No impact is anticipated. There will be no impact to cultural resources given there are none present at the facility.

No Action Analysis: There will be no impact to cultural resources.

Ecological Resources/Threatened and Endangered Species

Criteria for Determining Significance:

- A requirement to engage in formal consultation with the USFWS.
- The "take" (as defined by the Threatened and Endangered Species Act (ESA), or potential for "take", of any individual or group of individuals of a listed species.
- The loss or degradation, or potential for such, of any critical habitat (as defined by the ESA).

Proposed Action Analysis: No impact is anticipated. The USFWS IPaC report indicates that "there are no critical habitats within the project area" (see Appendix D). There will be no impact to ecological resources, to include threatened and endangered species.

No Action Analysis: There will be no impact to ecological resources/threatened and endangered species.

Environmental Justice

Criteria for Determining Significance:

- Create an environment where the health and safety of socioeconomically disadvantaged community members and their surrounding area is at risk;
- Create undesirable living conditions for socioeconomically disadvantaged community members; and
- Create health and safety risks that may disproportionately affect children (as indicated in EO 13045 *Protection of Children from Environmental Health Risks and Safety Risks*).

Proposed Action Analysis: No impact is anticipated. The proposed action will take place in an area already used by the SPR. The temporary nature of the work and the established industrial location will not create a negative impact upon the sensitive population to which environmental justice applies.

No Action Analysis: There will be no impact to environmental justice.

Land Use

Criteria for Determining Significance:

- An action that impairs the original viewshed of adjacent properties;
- An action that causes noise concerns outside noise decibel thresholds (see Noise); and
- An action that causes land use to be incompatible with existing adjacent land uses.

Proposed Action Analysis: No impact is anticipated. The completed proposed action will result in a structure that fits within the context of current activities taking place at Bryan Mound. Noise from construction will be temporary in nature and is not anticipated to be a nuisance or hazard for the nearest resident approximately three miles away in the town of Freeport. There will be no long-term ongoing noise from the completed action.

No Action Analysis: No impact is anticipated for land use.

Noise

Criteria for Determining Significance:

- Exceedance of the long-term average noise descriptor, or Leq, with a 10-decibel penalty for night-time noise

Proposed Action Analysis: Temporary, minor impact is anticipated. Heavy equipment and vehicles will be utilized to complete the proposed project and will result in an increase in noise levels normally heard in the area. The area is industrial; therefore, construction noise will be in context with the surrounding noisescape. The largest contributors of noise would be on-site generators, heavy vehicles used to haul equipment, materials and construction debris.

No Action Analysis: There will be no noise impact as the construction would not take place.

Prime Farmland/Soils

Criteria for Determining Significance:

- The unnecessary conversion of farmland to non-agricultural uses.

Proposed Action Analysis: No impact is anticipated. The proposed action will not result in the conversion of farmland to non-agricultural uses. It will take place within the Brazos River, an area that is not considered prime farmland.

No Action Analysis: There will be no impact to prime farmland/soils.

Socioeconomics

Criteria for Determining Significance:

- Create an environment where the health and safety of socioeconomically disadvantaged community members and their surrounding area is at risk;
- Create the potential to substantially affect human health or the environment by excluding persons, denying persons benefits, or subjecting persons to discrimination because of their race, color, national origin, or income level; and
- Create undesirable living conditions for socioeconomically disadvantaged community members.

Proposed Action Analysis: Short-term, beneficial impact anticipated The proposed action will take place in an area highly populated by the oil and gas industry. The nearest neighbors are three miles away in the town of Freeport. The completed project will not emit air or noise hazards, or otherwise cause any harm to low-income populations. The temporary nature of the construction work and the distance from which the facility sits away from the nearest neighboring communities will not create a negative impact upon the sensitive population to which environmental justice applies.

Short-term, economical beneficial impact may be seen with local construction-work hiring.

Water Resources

Criteria for Determining Significance:

- Increases the amount of impervious surface significantly, creating measurably more stormwater runoff than was originally experienced in the area;
- Results in the creation of a new channel or relocation of a natural drainage channel;
- Results in the discharge of pollutants that exceed federal and state water quality standards such as TMDLs or drinking water maximum contaminant levels.
- A loss of wetland habitat which could change the function and viability of the wetland;
- Wetland destruction or fill which would result in loss of wetlands or wetland function;
- A release of hazardous material, petroleum, oil and lubricant (POL), or other contaminants to a wetland that would risk injury to wildlife and humans; and
- Introduction of an invasive species which could alter the function and viability of a wetland.

Proposed Action Analysis: Temporary, minor impact is anticipated. Soil erosion is inherent with construction work and could result in additional silt being deposited in nearby surface water bodies. Heavy machinery brought via land for access to the work site could result in temporary erosion issues. This will be minimized by the implementation of best management practices consistent with the SPR Pollution Prevention Plan (Publication ASL5400.41), Version 10.0 (08-02-16).

The work site is the same area where SPR personnel is permitted to dredge biannually. The construction work is not anticipated to be any more disruptive to the river bed than dredging activities. Temporary silt dispersion will occur during construction, but once it ends, there is no long-term impact anticipated.

There are no critical habitats in the area and there is no anticipation that this work will cause impairment to the currently unimpaired waters of the Brazos River.

Wetlands at the facility are not anticipated to be impacted.

No Action Analysis: There will be no water quality impact as the construction would not take place.

7 Cumulative Impacts

The CEQ regulations stipulate that the cumulative effects analysis within an EA should consider the potential environmental effects resulting from "the incremental effects of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other action" (40 CFR 1508.7). Recent CEQ guidance in *Considering Cumulative Impacts* affirms this requirement, stating that the first steps in assessing cumulative effects involve defining the scope of the other actions and their interrelationship with the Proposed Action. The scope must consider geographic and temporal overlaps among the Proposed Action and other actions. It must also evaluate the nature of interactions among these actions. Cumulative effects are most likely to arise when a relationship or synergism exists between a Proposed Action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with, or in close proximity to, the Proposed Action would be expected to have more potential for a relationship than actions that may be geographically separated. Similarly, actions that coincide, even partially, in time would tend to offer a higher potential for cumulative effects. To identify cumulative effects, this EA addresses three questions:

1. Does a relationship exist such that elements of the Proposed Action might interact with elements of past, present, and reasonably foreseeable future actions?

2. If one or more of the elements of the Proposed Action and another action could be expected to interact, would the Proposed Action affect or be affected by the effects of the other action?

3. If such a relationship exists, does an assessment reveal any potentially significant effects not identified when the Proposed Action is considered alone?

In this EA, an effort has been made to identify all actions that are being considered and that are in the planning phase at this time. To the extent that details regarding such actions exist and the actions have a potential to interact with the Proposed Action and the No Action Alternative in this EA, these actions are included in this cumulative analysis. This approach enables decision makers to have the most current information available so that they can evaluate the environmental consequences of the Proposed Action and the No Action Alternative.

Cumulative Impact Analysis

There are sixteen work packages associated with the SPR LE-II at Bryan Mound. All but the RWIS Channel Upgrade, the subject of this EA, meet the criteria for a CX. Cumulative effects for fifteen Bryan Mound SPR-LE-II work packages were also included in DOE/EA-2073. It is not anticipated the proposed action will contribute to any significant cumulative impact.

The following two projects have construction-related activities and may contribute to temporary, minor impact:

BM-MM-1560	RWIS Channel Upgrades to Prevent Silt Buildup
BM-MM-590/590A	Replace Raw Water Intake Pipeline No. 1

Air Quality – Fugitive dust from construction equipment and vehicles

Noise – Construction related noise may annoy birds and wildlife so that they may avoid the area until it is over. Noise avoidance measures will be built into the design phase.

Surface water – Soil erosion from construction activities may cause silt to travel overland and be deposited into surface water, causing turbidity.

Socioeconomics – may have a beneficial impact due to short-term construction employment.

The remaining work packages do not include major construction activities and will not create an impact to potential affected environments:

BM-MM-369	Lighting Upgrades at Bryan Mound
BM-MM-774/774A	Replace Actuators on Meter Skid Valves
BM-MM-1055	Convert BMT-4 to External Floating Roof
BM-MM-1171	Replace Microwave Security System at CO Transfer Pumps
BM-MM-1340	Replace Perimeter Security Detection System
BM-MM-1354	Replace Crude Oil Injection Pumps BMP-1, -4
BM-MM-1355	Replace Brine Tank BMT-1 with Purpose Built System
BM-MM-1365	Replace Below Grade Firewater Headers
BM-MM-1371	Heat Exchanger Bundle Spares
BM-MM-1462	Replace Oil-in-Water Monitors
BM-MM-1524	RWIS Infrastructure Upgrades at Bryan Mound
BM-MM-1528	Replace CCTV System at Bryan Mound

8 References

16 United States Code, Chapter 35 § 1531-1544 Endangered Species Act

40 CFR Parts 1500-1508, Council on Environmental Quality.

EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks Protection of Children*

Executive Order 13186 *Responsibilities of Federal Agencies to Protect Migratory Birds & Migratory Bird Act*

Executive Order 13693, *Planning for Federal Sustainability in the Next Decade* signed March 19, 2015.

EPA 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low -Income Populations*

DOE, 2017 U.S. Department of Energy, Strategic Petroleum Reserve Life Extension Phase 2 Project Execution Plan, June, 2017

DOE, 2016 U.S. Department of Energy Life Extension 2 Conceptual Design Report, Volumes I-V, Strategic Petroleum Reserve, Project Management Office, Revision 2, November 3, 2016.

DOE, 2016 SPR Pollution Prevention Plan (Publication ASL5400.41), Version 10.0 August, 2016.

DOE, 1976 U.S. Department of Energy, Strategic Petroleum Reserve Final Environmental Impact Statement, December 1976.

EPA, 2016 U.S. EPA, Louisiana Water Quality Assessment Report, 2016 accessed at https://ofmpub.epa.gov

EPA 2016a U.S. EPA Air Quality Green Book, accessible at https://www3.epa.gov/airquality/greenbook/anayo_la.html

Fluor, 2017 Bryan Mound Raw Water Intake Channel Study Final Report. Northwest Hydraulic Consultants. June 7, 2017.

Louisiana Department of Wildlife and Fisheries Species by Parish List accessible at http://www.wlf.louisiana.gov/wildlife/species-parish-list

Texas Parks and Wildlife Department Species by County List accessible at: http://tpwd.texas.gov/gis/rtest/

USCB, 2016, U.S. Census Bureau Factfinder tool website: http://factfinder2.census.gov.

Appendix A – Interagency Communication

Department of Energy
Strategic Petroleum Reserve Project Management Office
900 Commerce Road East
New Orleans, Louisiana 70123

JAN 2 9 2018

18-ESH-001

U.S. Army Corps of Engineers, Galveston District
CESWG-RD-E
P.O. Box 1229
Galveston, TX 77553-1229

RECOMMENDED ENVIRONMENTAL ASSESSMENT FOR THE RAW WATER INTAKE STRUCTURE CHANNEL UPGRADES PROJECT ASSOCIATED WITH THE STRATEGIC PETROLEUM RESERVE, BRYAN MOUND FACILITY, BRAZORIA COUNTY, TEXAS

Pursuant to the National Environmental Policy Act (NEPA), the U.S. Department of Energy (DOE) intends to prepare an Environmental Assessment (EA) in support of proposed actions required to successfully execute the Strategic Petroleum Reserve (SPR) BM-MM-1560, Bryan Mound (BM) Raw Water Intake Structure (RWIS) Channel Upgrades project in Freeport, Texas. The BM RWIS Channel Upgrades task is part of the SPR Life Extension 2 (LE 2) project. The analysis of potential environmental impacts will be conducted in accordance with procedures set forth in NEPA, the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of the NEPA (40 Code of Federal Regulations (CFR) 1500-1508) and the DOE NEPA Implementing Procedures (10 CFR 1021).

The creation of the SPR was mandated by Congress through the Energy Policy and Conservation Act on December 22, 1975. The SPR mission is to store petroleum to reduce the adverse economic impact of a major petroleum supply interruption to the United States and carry out obligations under the international energy program. The SPR currently operates and maintains deep underground storage caverns created in salt domes along the Gulf Coast region: two sites in Texas (Bryan Mound and Big Hill) and two sites in Louisiana (West Hackberry and Bayou Choctaw). The four sites have a combined design storage capacity of 713.5 million barrels.

The LE 2 project is critical to ensure the SPR can maintain readiness, meet mission requirements, and operate in an environmentally responsible manner, now and for the next 25 years. The SPR vision is to fill the reserve to capacity with petroleum and to serve as the global benchmark for petroleum reserves.

Non-structural and structural alternatives were analyzed for their ability to reduce the frequency of dredging the BM RWIS inlet channel. The recommended alternative is a structural solution that constructs a gate or inflatable dam with steel face protection (such as Obermeyer Pneumatically Actuated Gate) which would remain closed when the raw water pumps are not in operation. This alternative would reduce required channel dredging from twice a year to once every 10 years. The steel face provides protection from vandalism and debris damage.

This project is managed by the SPR Project Management Office (SPRPMO) in New Orleans, Louisiana. Project execution has been contracted to the SPR Management and Operating (M&O) Contractor, Fluor Federal Petroleum Operations (FFPO). DOE invites input for any initial concerns you may have regarding the potential for significant acute impacts due to the implementation of the proposed action. You will receive notice when the completed draft DOE/EA-2079 is available for review.

Please direct any written comments, requests for additional information or requests to schedule meetings for further discussion to Mr. Stephen Reese, Environmental Specialist, DOE, SPRPMO, Environmental Division, at (504) 734-4404, or by email at Stephen.Reese@spr.doe.gov . You may also contact Ms. Jennifer Auger, M&O Contractor, FFPO, at (504) 734-4074, or by email at Jennifer.Auger@spr.doe.gov.

Sincerely,

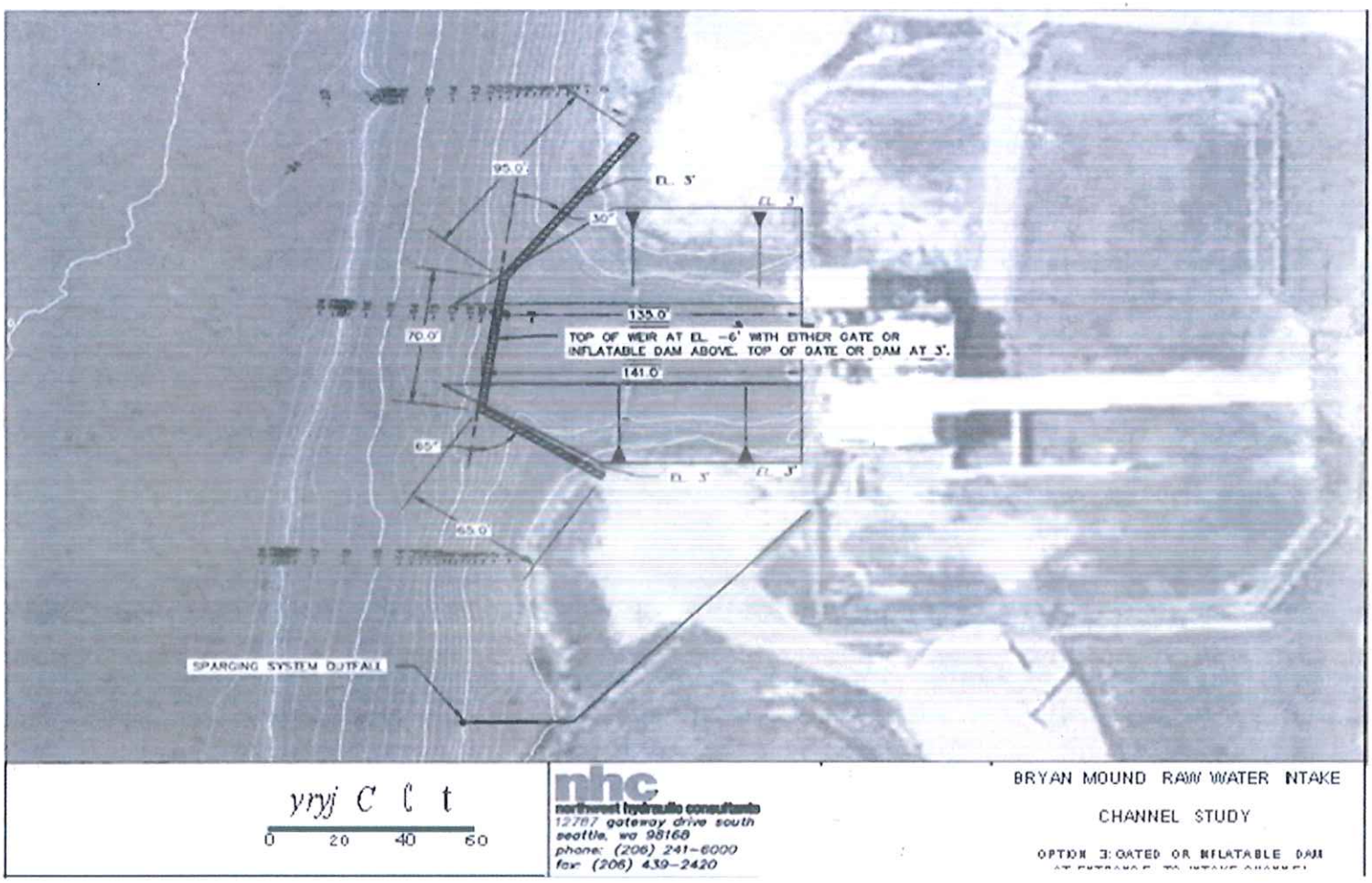
William C. Gibson, Jr.
Project Manager

FE-4441:SReese

Enclosure:
RWIS Channel Study Illustration

cc (w/enclosure):
S. Reese, DOE SPRPMO
J. Auger, FFPO

ENCLOSURE


95.0'
EL. 3'
30'
EL. 3'
139.0'
TOP OF WEIR AT EL. -6' WITH EITHER GATE OR INFLATABLE DAM ABOVE. TOP OF GATE OR DAM AT 3'.
70.0'
141.0'
60'
EL. 3'
EL. 3'
65.0'
SPARGING SYSTEM OUTFALL
0
20
40
60
nhc
northwest hydraulic consultants
12787 gateway drive south
seattle, wa 98168
phone: (206) 241-6000
fax: (206) 439-2420
BRYAN MOUND RAW WATER INTAKE
CHANNEL STUDY
OPTION 3: GATED OR INFLATABLE DAM

Appendix B - Applicable pages from Bryan Mound Raw Water Intake Channel Study Final Report

8 OPTIONS TO REDUCE SEDIMENT ACCUMULATION IN THE INTAKE CHANNEL

8.1 Non-Structural Options to Reduce Dredging Frequency

Non-structural options to reduce dredging frequency focus on utilizing the existing flow and fire pumps to remove accumulated sediment. There are four water pumps and each is operated quarterly at a flow rate of 0.41 million barrels per day (15,803 gal/min or 35.2 ft^3/s). The fire pumps are operated for one hour per month at a maximum of 4,000 gal/min (8.92 ft^3/s). These systems currently utilize the sparging system pipes and outflow into the Brazos River downstream of the RWIS. The non-structural options evaluated the benefits gained by moving the pump flow return to the intake channel so they would pull in water from the intake area and then expel it back into the intake area. The concept tested the ability of the return flow to mobilize sediment from the intake area to the main Brazos River.

The SRH-2D model was run to evaluate a range of pump return scenarios for June 2010, June 2015, and sustained low flow time frames. For each flow scenario, the model was run first as-is and without any change in pump return flows. Models were next run simulating scenarios where either the fire pumps or the water pumps returned flow to the intake channel. Return flows lasted for two hours in all cases and occurred after the peak in Brazos River flows or, in the case of the sustained low flow scenario, half way through the model run. Two water pumps were simulated as operating at the same time so the return flows were 70 ft^3/s (0.82 million barrels per day) in model scenarios. An additional model run simulating return flows from four water pumps (140 ft^3/s or 1.63 million barrels per day) was conducted for the June 2015 scenario. The results are provided in Figure 8.1 through 8.3. For each flow scenario there are two graphs: one for a location in the middle of the Brazos River upstream of the intake channel; the second for a location in the middle of the intake channel. The same locations are compared for each scenario. In the first graph, Brazos River bed deposition depths are graphed over time. Brazos River discharge is shown on the first graph to illustrate the correlation between increased flow rate and deposition. In the second graph, deposition depths in the middle of the intake channel are shown along with the suspended sediment concentration (SSC) in the intake channel. The options discharging sparging flows to the intake channel influence the suspended sediment concentration, causing a temporary decrease in concentration.

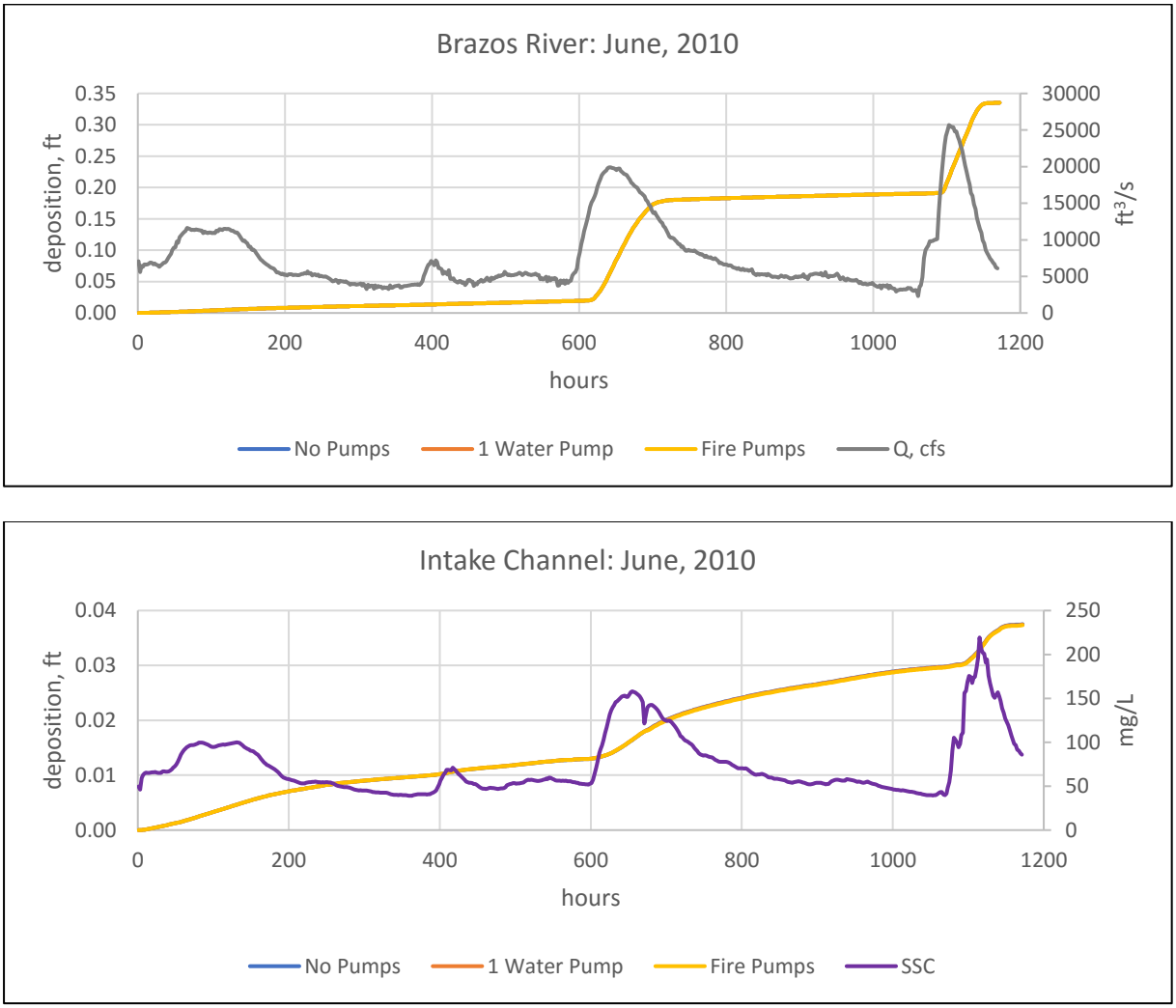


Figure 8.1. Graphs for June 2010 flows showing model results for the non-structural options. Deposition lines for the scenarios of no pumps operating, one water pump operating, and fire pumps operating are plotted on top of each other with the fire pumps scenario (yellow) on top. There is not a discernable difference in deposition for any of the non-structural options. The visible dip in the SSC (suspended sediment concentration) line (purple) occurs for scenarios with either the fire or water pumps operating

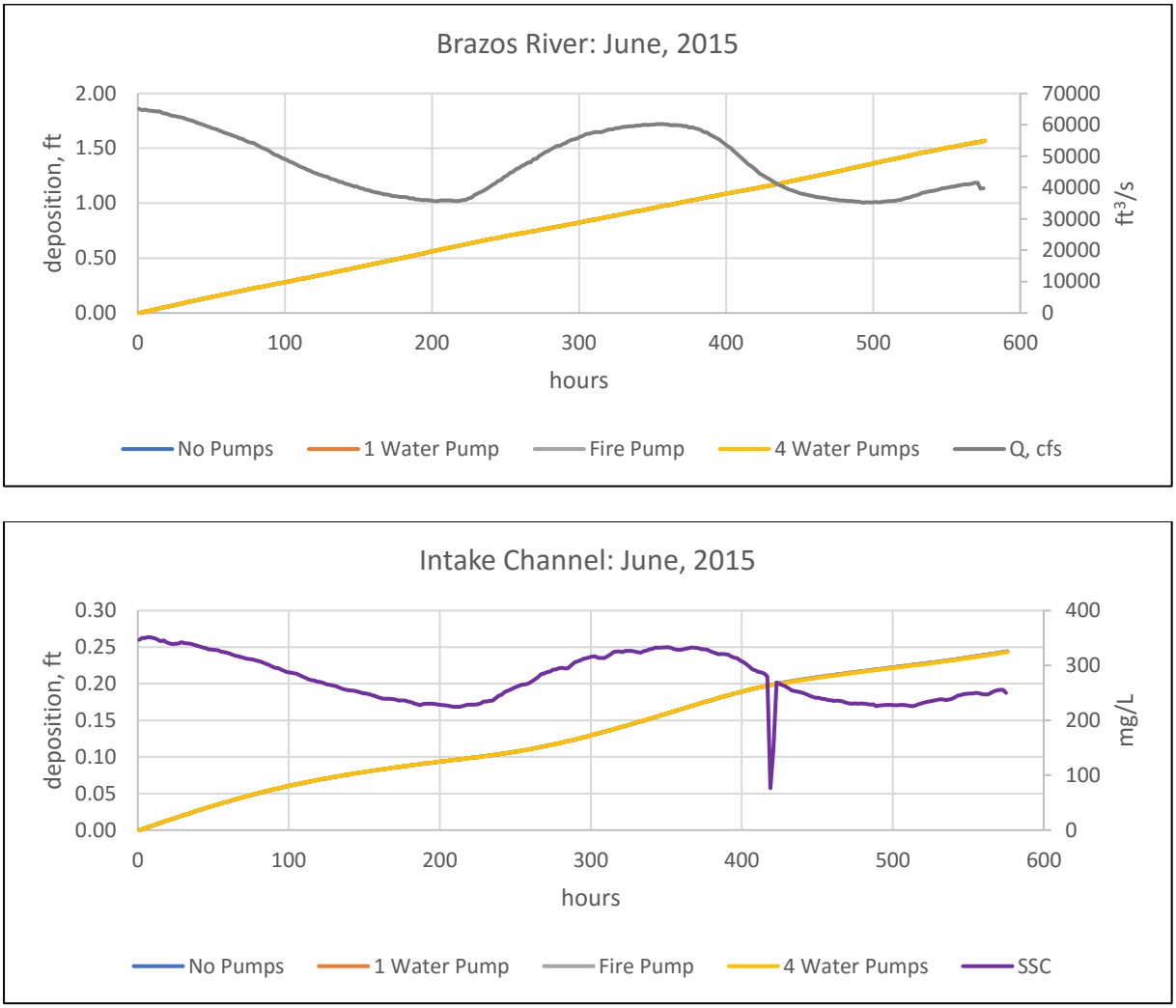


Figure 8.2. Graphs for June 2015 flows showing model results for the non-structural options. Deposition lines for the scenarios of no pumps operating, one water pump operating, fire pumps operating, and four water pumps operating are plotted on top of each other with the four water pumps scenario (yellow) on top. There is not a discernable difference in deposition for any of the non-structural options. The visible dip in the SSC (suspended sediment concentration) line (purple) occurs for scenarios with either the fire or water pumps operating

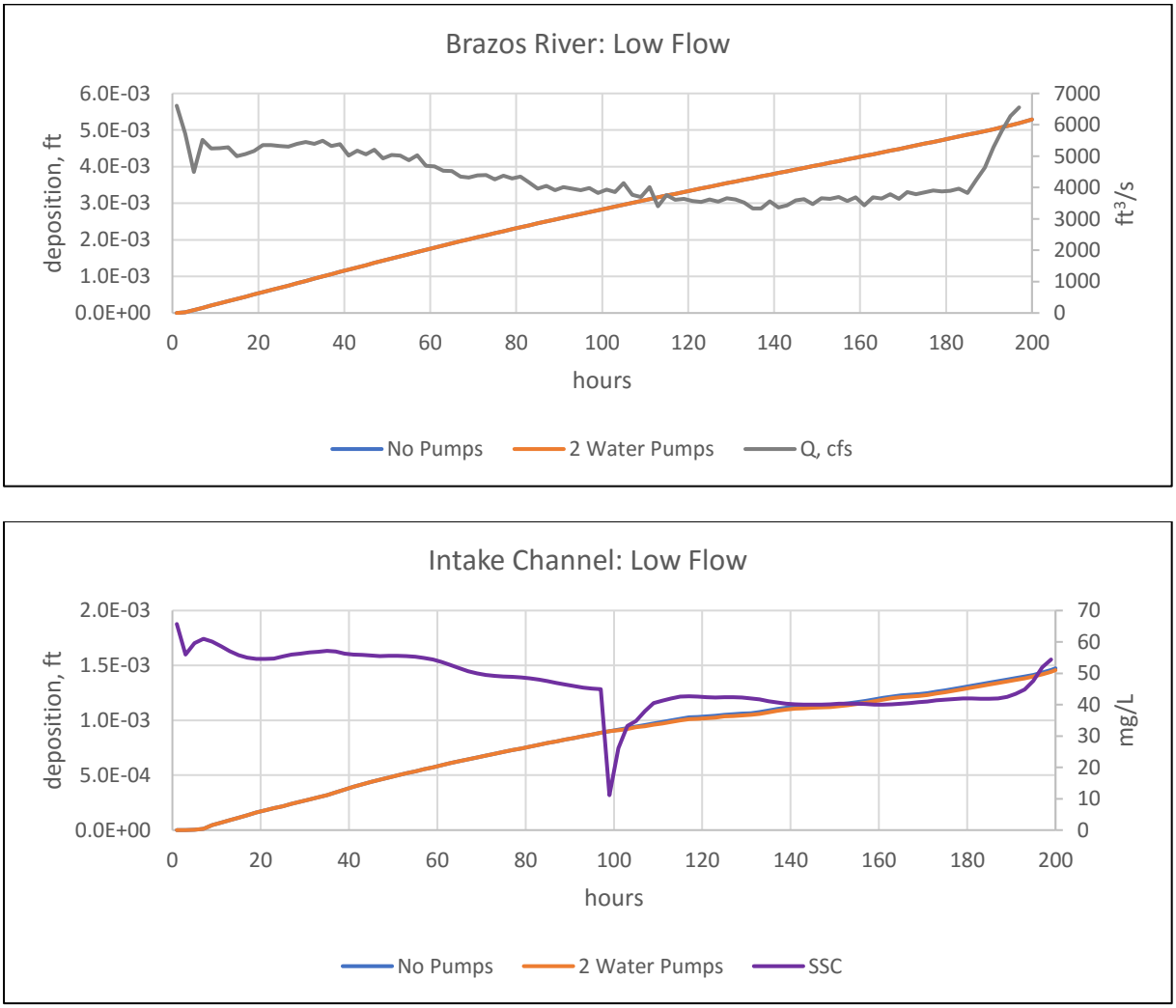


Figure 8.3. Graphs for low flows showing model results for the non-structural options. Deposition lines for the scenarios of no pumps operating and two water pumps operating are plotted on top of each other with the two water pumps scenario (orange) on top. There is not a discernable difference in deposition for any of the non-structural options. The visible dip in the SSC line (purple) occurs for scenarios with the water pumps operating

There is almost no impact of fire or water pump return flow on deposition in the intake channel, even during the sustained low flow scenario. Adding return flows from the pumps did impact the suspended sediment concentrations in the intake area, but that impact was limited to the period of time the pumps ran. Overall, there was little to no reduction in the rate of deposition within the intake channel from any of the pump combinations.

8.2 Structural Modifications and Hydraulics

The structural options focused on ways to keep or minimize sediment from entering the intake channel. The following section addresses the advantages and disadvantages of several structural solutions that are based on three major options, discussed below.

8.2.1 Option 1 – Low Weir

Option 1 – Low Weir (see Figure 8.4) has upstream and downstream wing walls with the top at El. +3 ft that key into the banks to enclose the intake channel so that water can only enter over the low weir. Note that at high flows (overbank flows), some sediment will likely enter the intake channel. The center 70-foot section directly in front the pump station has a top elevation of -8 feet. Above El. -8 ft, it is completely open. The front face is at the El. -12 ft contour, thus providing 4-foot high vertical wall to minimize sediment from entering the intake. The weir is set at 4 feet above the river bed to allow for uncertainties in the analysis. The front face is angled into the flow at five degrees following approximately the -12-foot bed contour to minimize sediment deposition along the weir. The upstream face of the weir is approximately 153 feet from the face of the pump station. The downstream face of the weir is approximately 159 feet.

At a low water level of El. -3.5 ft, the average flow velocity over the weir is approximately 0.5 ft/s. Note that the Hydraulic Institute (2012) stipulates that the maximum entrance velocity should not exceed 1.5 ft/s. At higher water levels, the flow velocities over the weir are less. The pump station will be able to pump 1.63 million barrels per day.

For Option 1, flow velocities in the river ranged from 3.5 to 6.8 ft/s, and the flow velocity within the intake channel is very low, see Figures 8.5 and 8.6.

Option 1 causes a significant increase of bed shear stress in front of the low weir—up to 0.015 lbf/ft^2 for 20,000 ft^3/s (Figure 8.7) and up to 0.16 lbf/ft^2 for 40,000 ft^3/s (Figure 8.8). Such values of shear stress are high enough to mobilize all sediment sizes and erode accumulated sediments during high flows. It is possible that during extremely high flows the bed would scour and lower the bed elevation immediately in front of the weir. This local lowering of the bed would increase the weir height above the bed. As shown in Figure 8.5 and Figure 8.6 there is a counter-clockwise circulation within the intake channel that is expected.

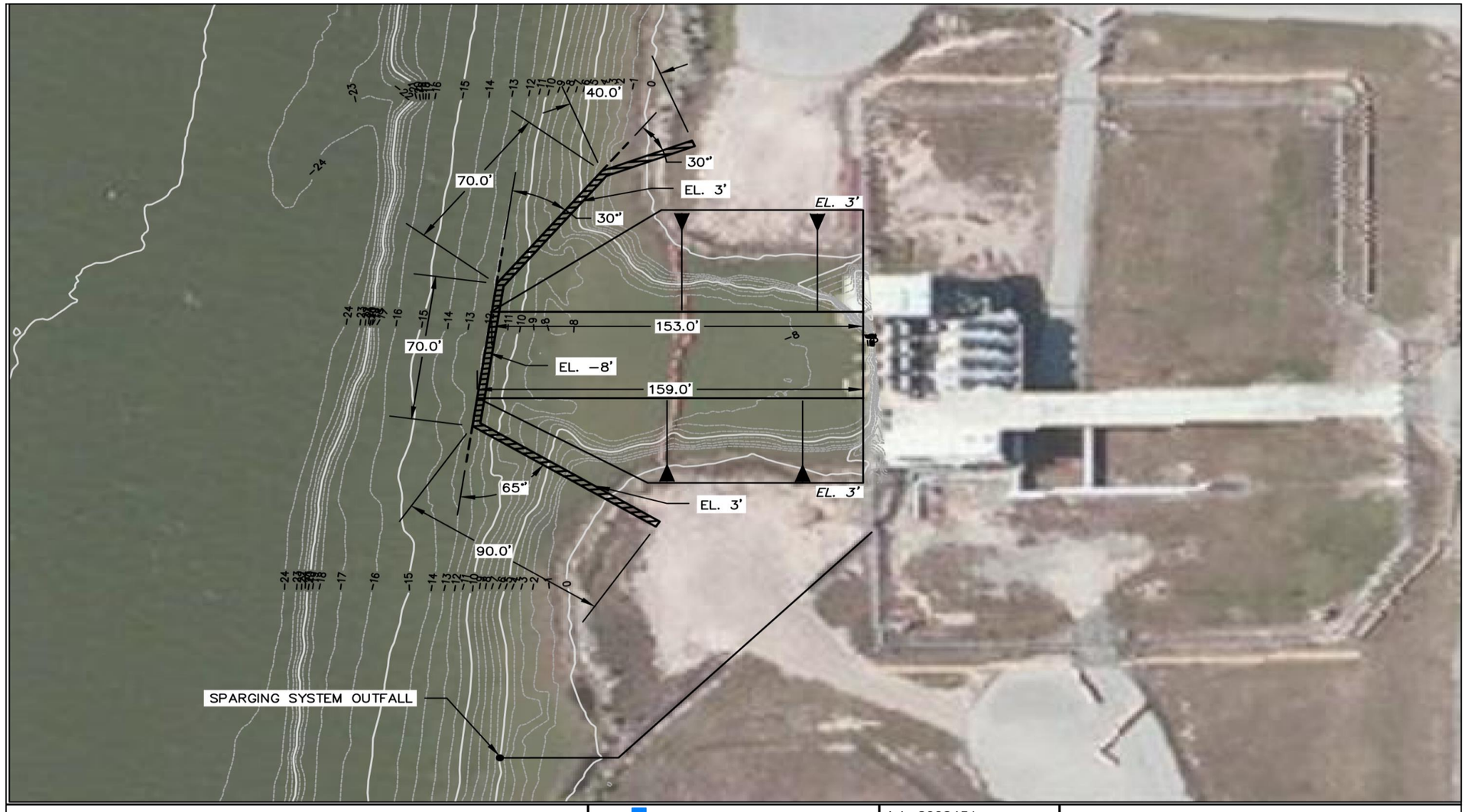


Figure 8.4. Option 1 - low weir at entrance to intake channel

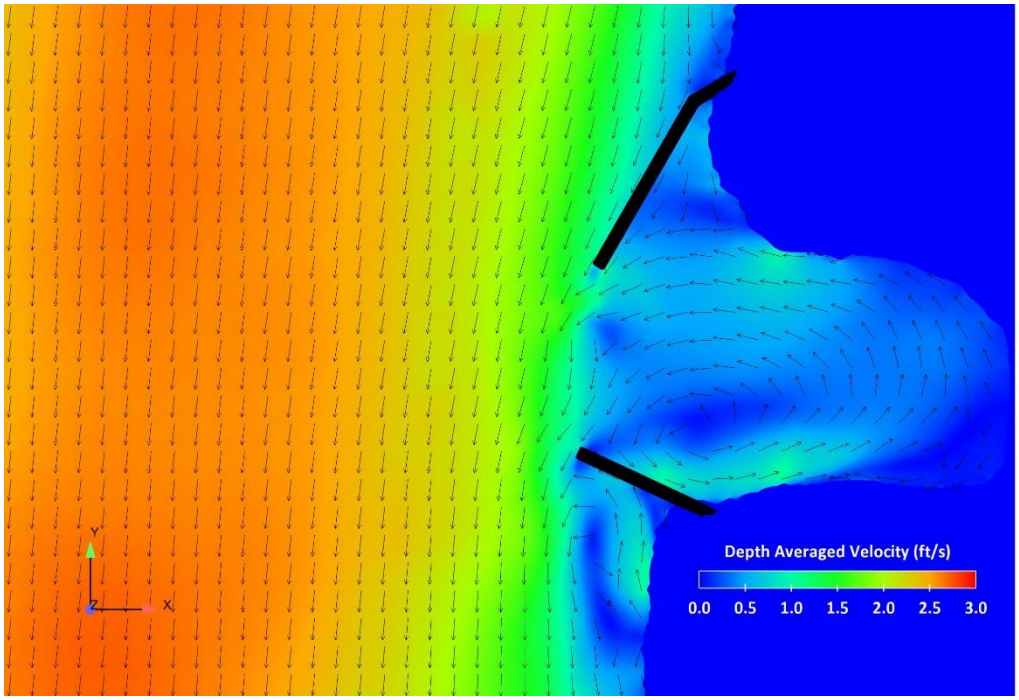


Figure 8.5. - Option 1 (low weir) depth-averaged flow velocities for a Brazos River flow of 20,000 ft^3/s

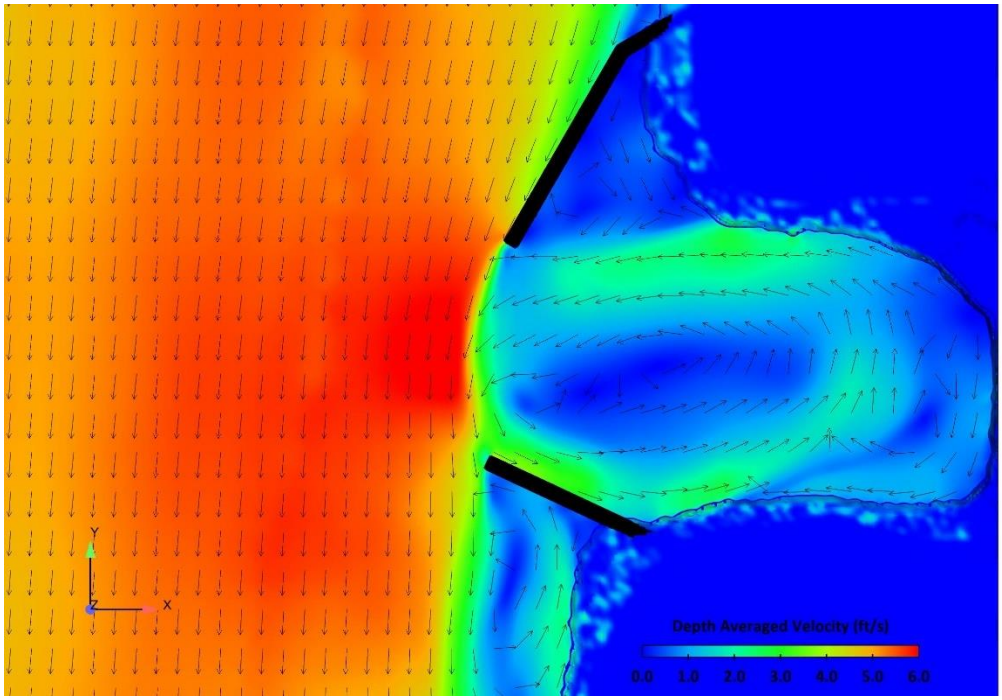


Figure 8.6. Option 1 (low weir) depth-averaged flow velocities for a Brazos River flow of 40,000 ft^3/s

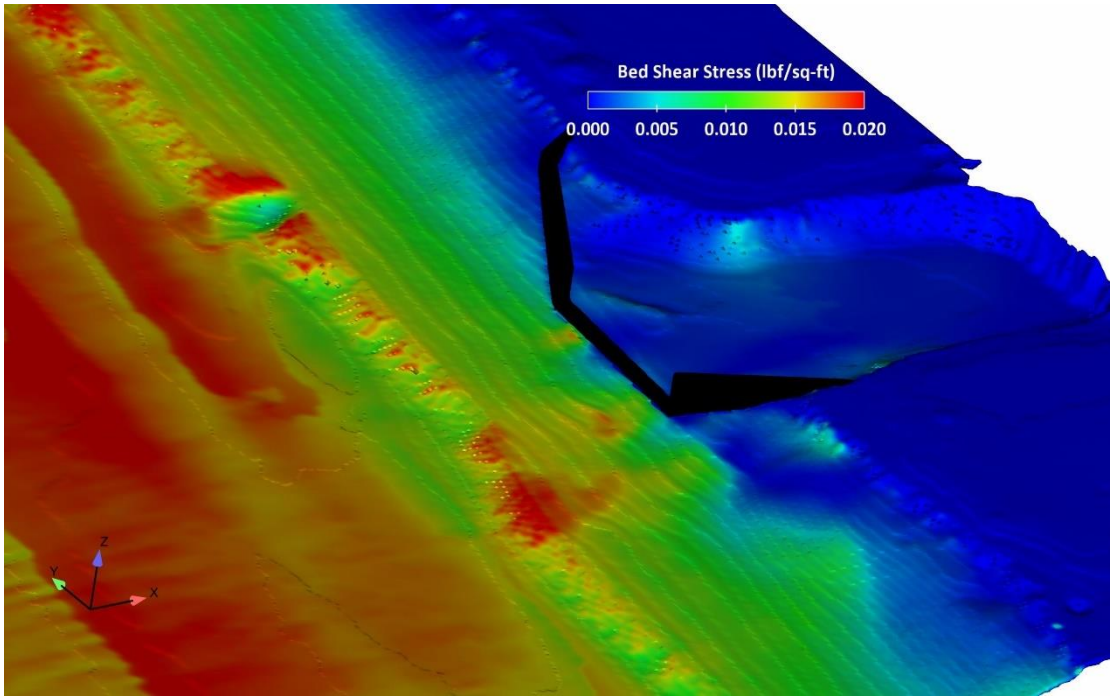


Figure 8.7. Option 1 (low weir) bed shear stress for a Brazos River flow of 20,000 ft^3/s

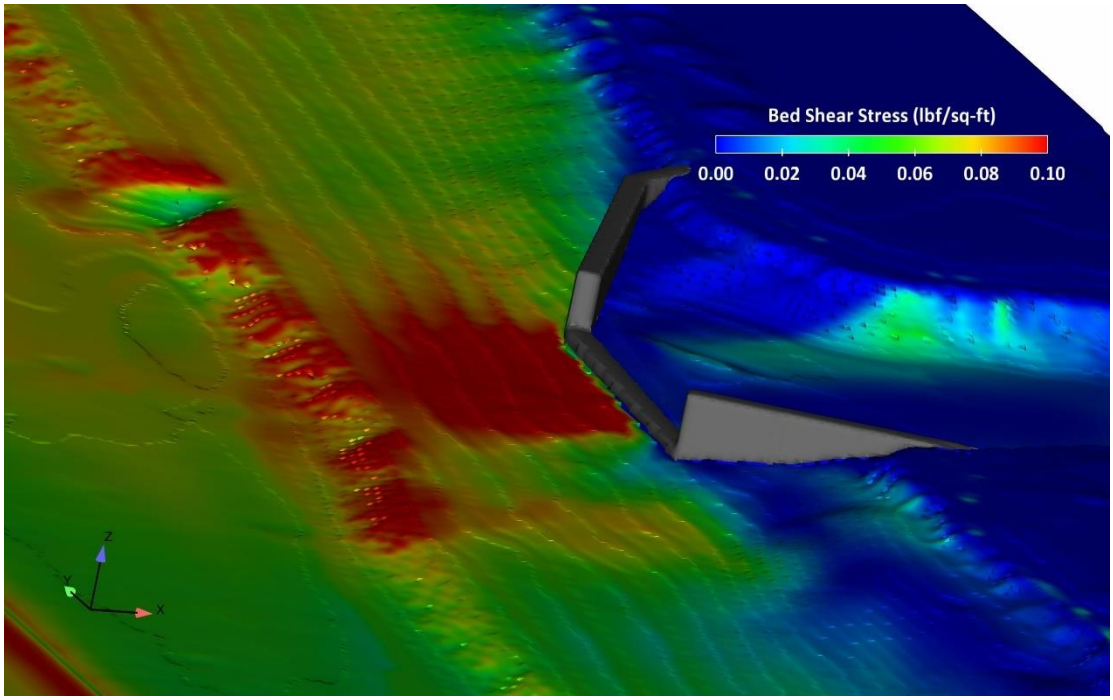


Figure 8.8. Option 1 (low weir) bed shear stress for a Brazos River flow of 40,000 ft^3/s

8.2.2 Option 2 – High Weir

Option 2 – High Weir (see Figure 8.9) is similar to Option 1 with the difference being that the 70-foot long weir directly in front of the pump station has been raised to El. -5 ft. Above El. -5 ft, it is completely open. As before, the two wing walls have a top at El. +3 ft and are keyed into the banks to enclose the intake channel so water can only enter the intake channel over the weir. Because the weir is at a higher elevation, the structure was moved closer to the pump station and follows the El. –9 ft contour. Similar to Option 1, the front face is angled at five degrees into the flow to keep sediment from depositing on the river side of the weir. The upstream face of the weir is approximately 140 feet from the face of the pump station. The downstream face of the weir is approximately 146 feet long.

At a low water level of El. -3.5 ft, the average flow velocity over the weir is approximately 1.3 ft/s. Note that these velocities do not exceed the Hydraulic Institute (2012) criteria, and the pump station will be able to pump 1.63 million barrels per day. At higher water levels, the flow velocities over the weir are less.

For Option 2, flow velocities in the river ranged from 3.5 to 6.8 ft/s, and the flow velocity within the intake channel is very low, see Figures 8.10 and 8.11.

Option 2 causes bed shear stress in front of the high weir to be as high as 0.01 lbf/ft^2 for 20,000 ft^3/s (Figure 8.12) and up to 0.10 lbf/ft^2 for 40,000 ft^3/s (Figure 8.13). These values of shear stress are smaller than those generated by Option 1, but still high enough to mobilize any accumulated sediment from the front of the weir during high flows. Finally, as shown in Figure 8.10 and Figure 8.11 there is a counter-clockwise circulation within the intake channel that is expected.

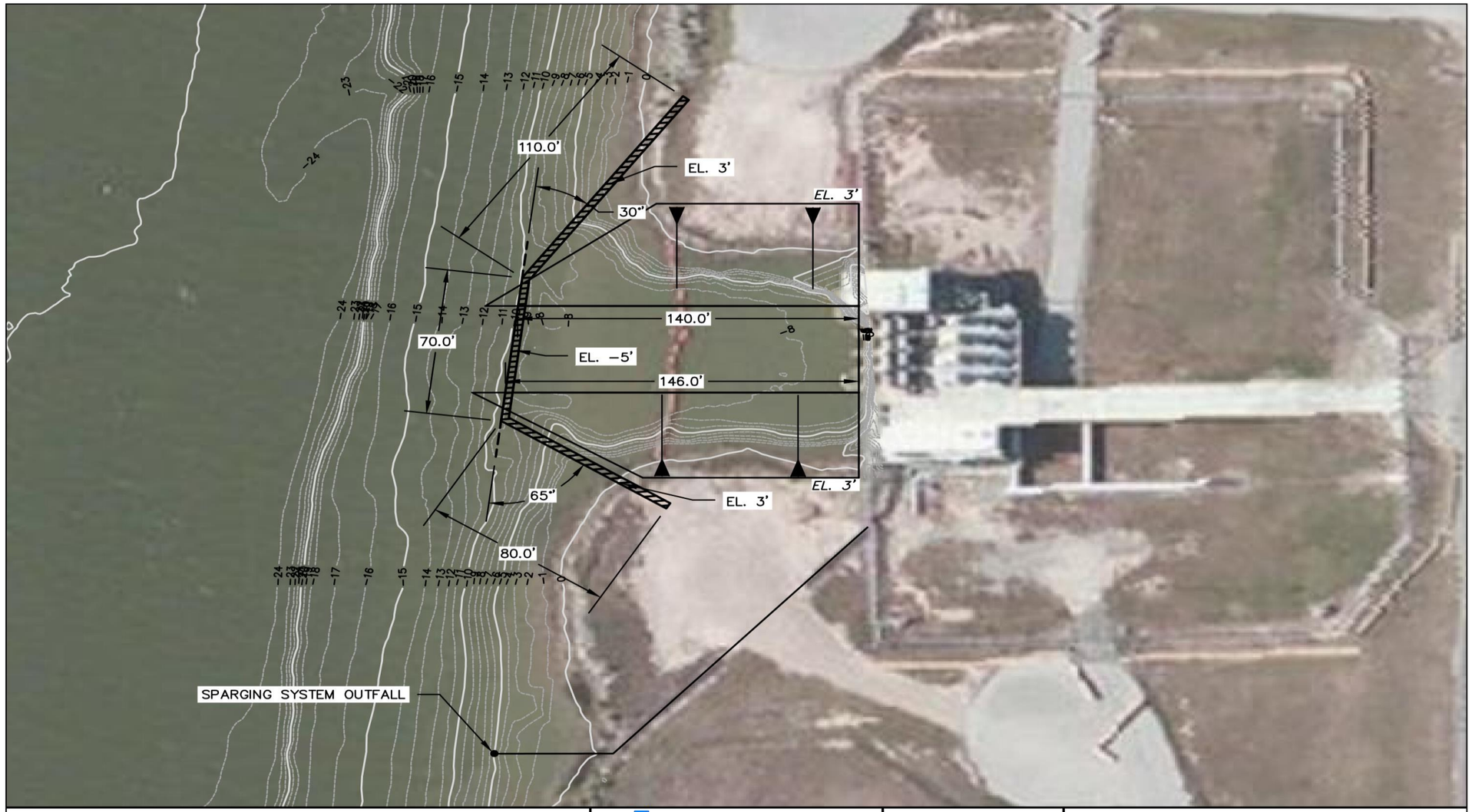


Figure 8.9. Option 2 - high weir at entrance to intake

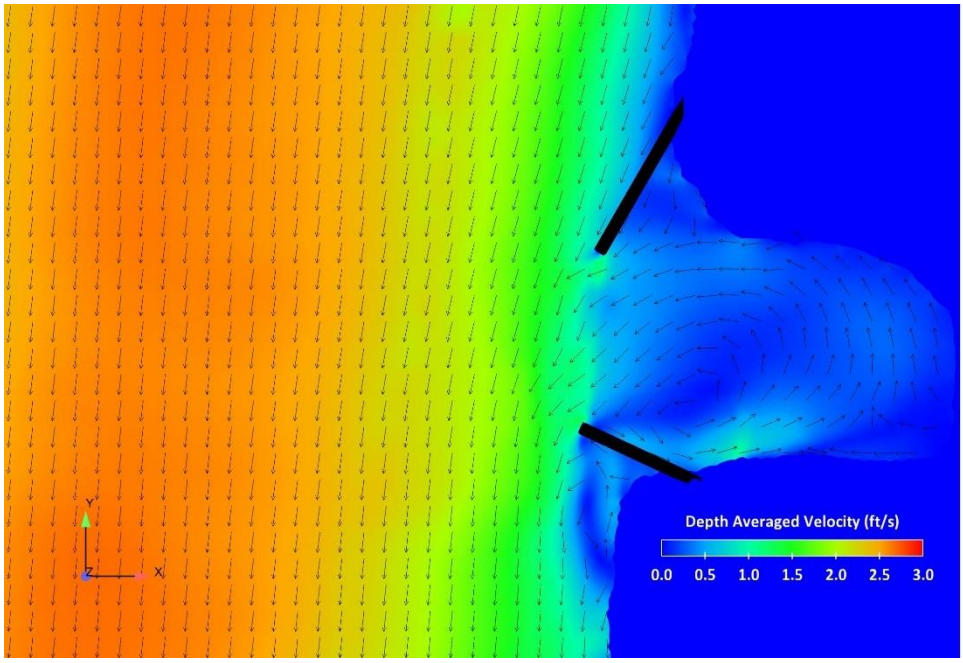


Figure 8.10. Option 2 (high weir) depth-averaged flow velocities for a Brazos River flow of 20,000 ft^3/s

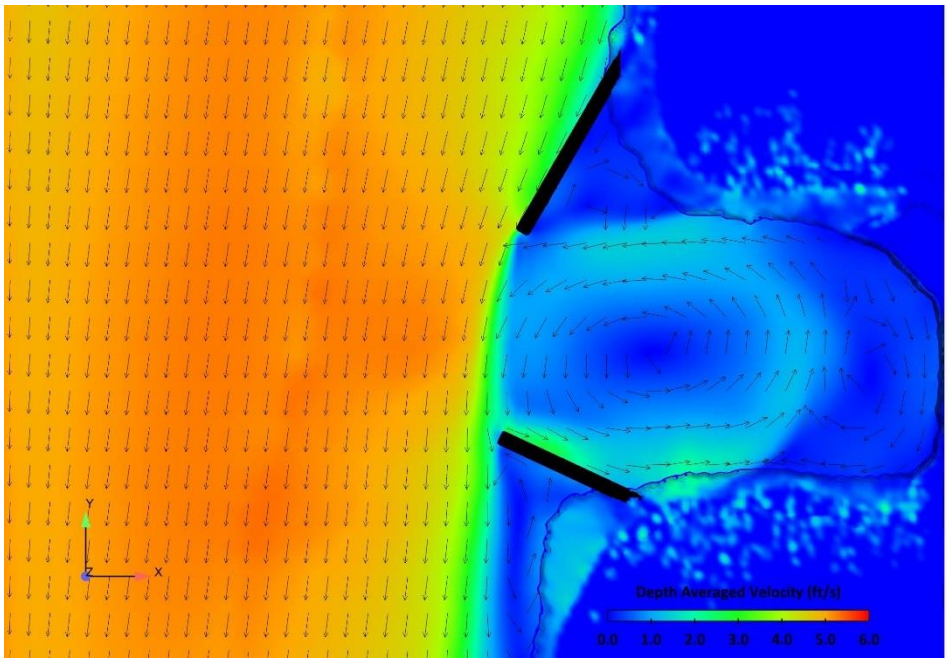


Figure 8.11. Option 2 (high weir) depth-averaged flow velocities for a Brazos River flow of 40,000 ft^3/s

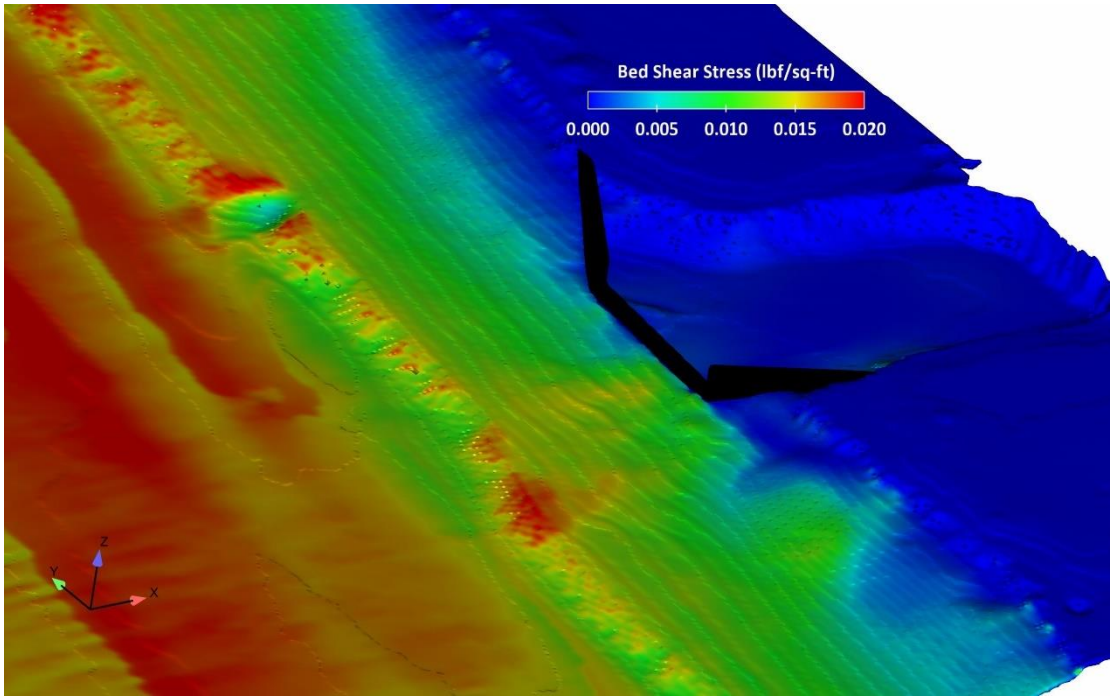


Figure 8.12. Option 2 (high weir) bed shear stress for a Brazos River flow of 20,000 ft^3/s

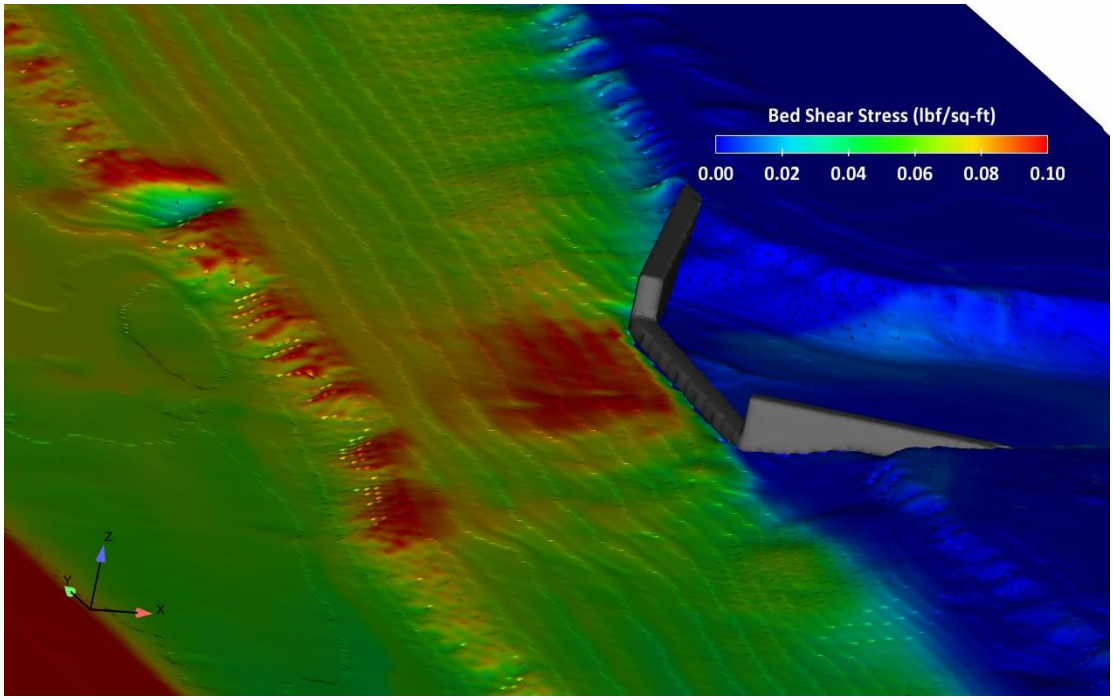


Figure 8.13. Option 2 (high weir) bed shear stress for a Brazos River flow of 40,000 ft^3/s

8.2.3 Option 3 - Gated Weir or Inflatable Dam

Option 3 - Gated Weir or Inflatable Dam (see Figure 8.14) is different from the first two options, with the center 70-foot section being either a series of four, 10 feet wide by 9 feet high conventional gates (Option 3a), or an inflatable rubber dam (Option 3b). When the gates are fully closed or the rubber dam is fully inflated, the structure will become, essentially, a wall with the top at El. +3 ft. Thus, the height of the center section is the same height of the upstream and downstream wing walls. When the pumps are operating, the four gates will be lowered (Option 3a) or the rubber dam will be deflated (Option 3b). The sill for the gates or inflatable dam is at El. -6 ft or 2 ft above the river bed. When the pumps are not operating, the gates/dam will isolate the intake channel from the river.

Because the entrance is basically a wall most of the time, the structure was moved closer to the pump station and follows the El. –8 ft contour. As before, the front face is angled at five degrees into the flow to keep sediment from depositing along the face of the intake entrance. The upstream face of the weir is approximately 135 feet from the face of the pump station. The downstream face of the weir is approximately 141 feet long.

At a low water level of El. -3.5 ft, the average flow velocity under Option 3a is approximately 1.4 ft/s and 0.8 ft/s for Option 3b. Note that these velocities do not exceed the Hydraulic Institute (2012) criteria, and the pump station will be able to pump 1.63 million barrels per day. At higher water levels, the flow velocities over the weir are less.

For Option 3, flow velocities in the river ranged from 3.5 to 6.8 ft/s, and the flow velocity within the intake channel is very low, see Figures 8.15 and 8.16.

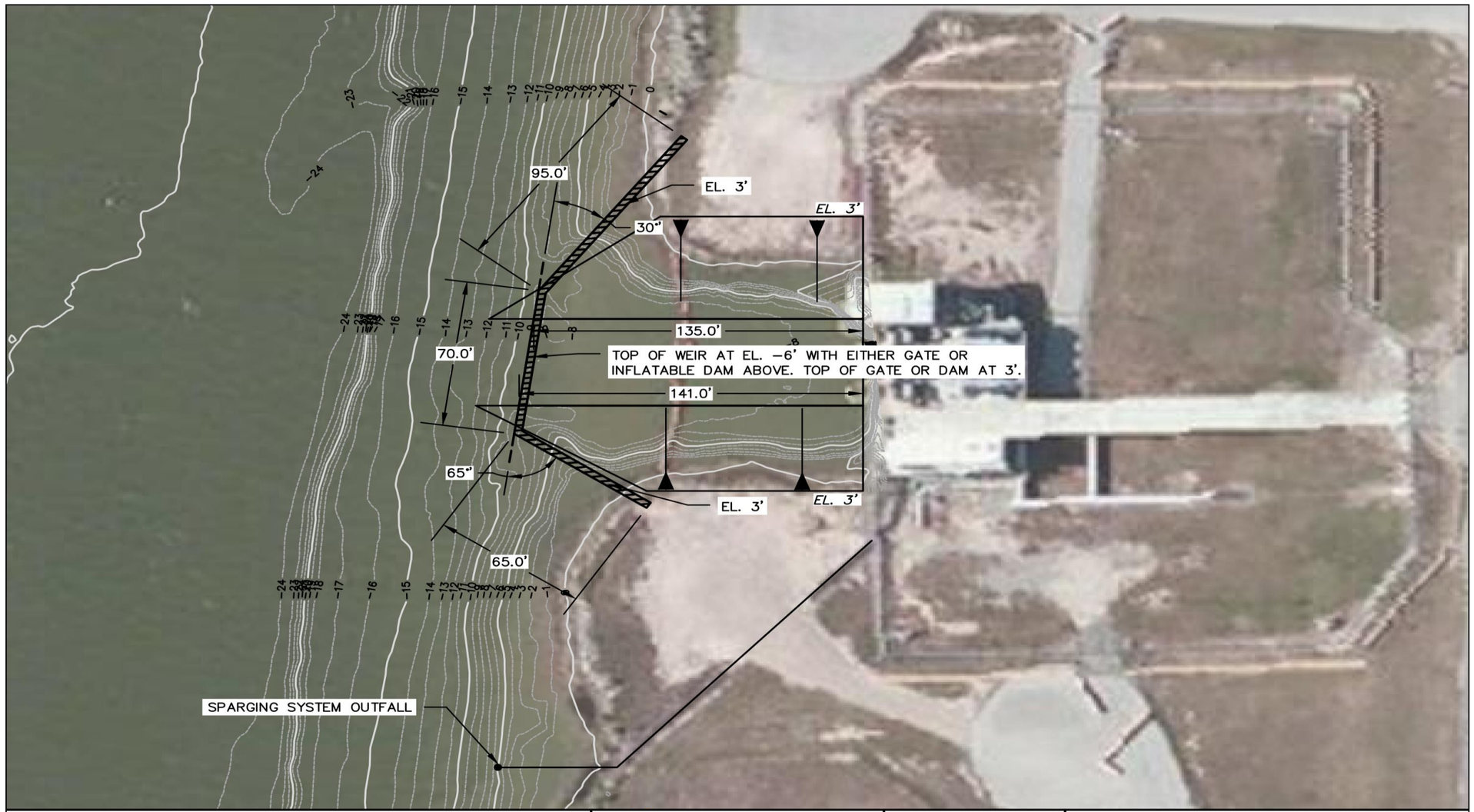


Figure 8.14. Option 3 - gated weir or inflatable dam at entrance to intake channel

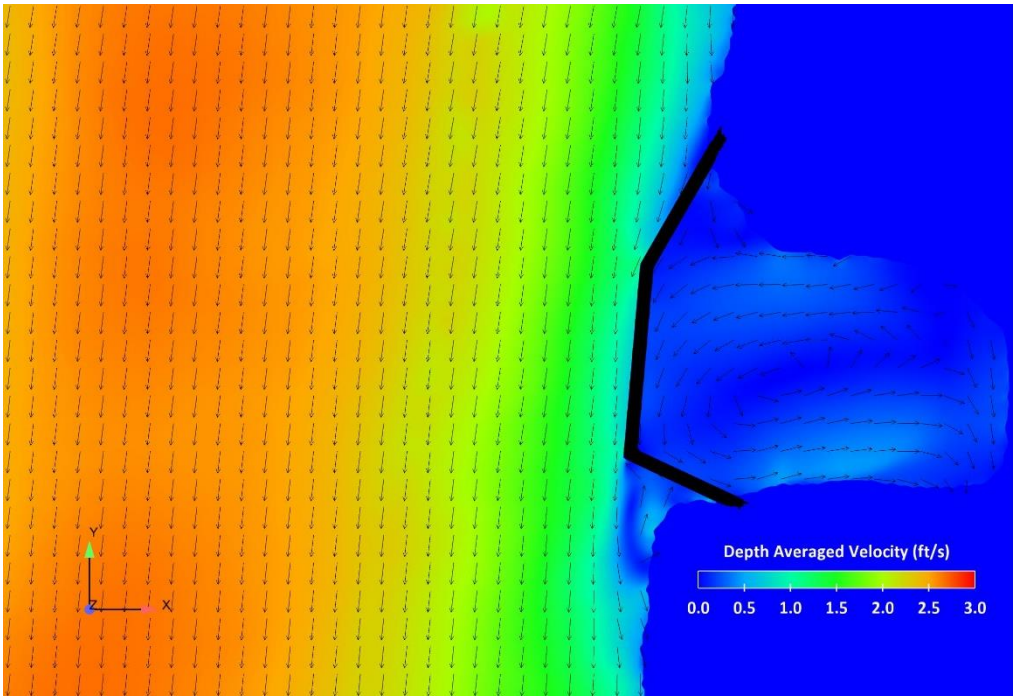


Figure 8.15. Option 3 (gated weir or inflatable dam) depth-averaged flow velocities for a Brazos River flow of 20,000 ft^3/s

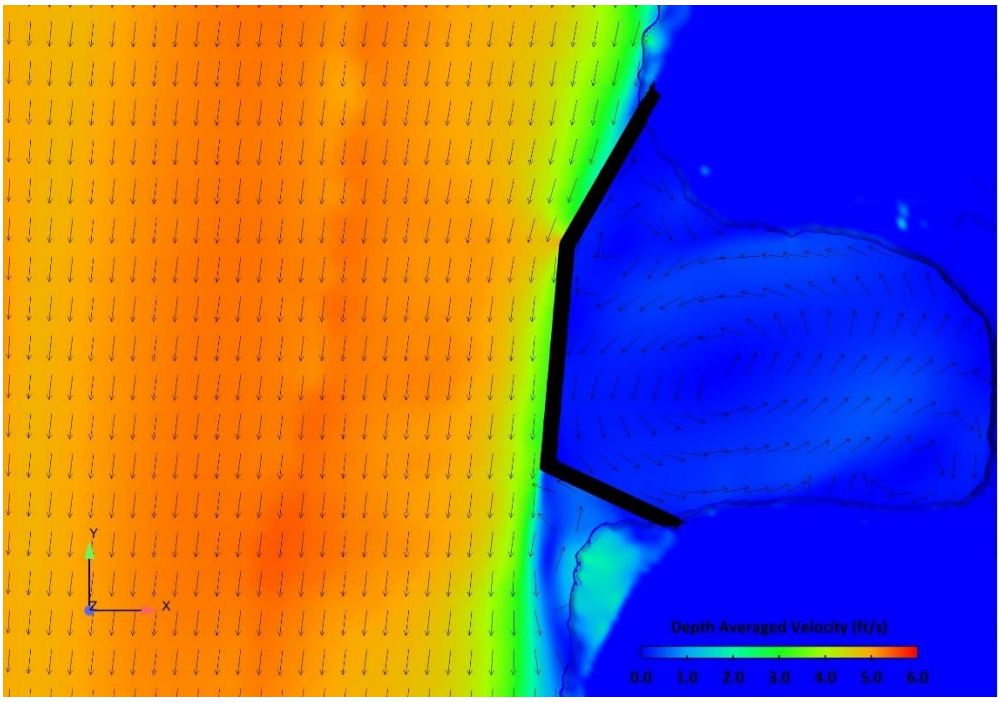


Figure 8.16. Option 3 (gated weir or inflatable dam) depth-averaged flow velocities for a Brazos River flow of 40,000 ft^3/s

Option 3, which is the least intrusive of the options analyzed, also caused the lowest increase in bed shear stress, see Figures 8.17 and 8.18. For a discharge of 40,000 ft^3/s, the bed shear stress locally reached up to 0.10 lbf/ft^2 which should keep the area in front of the weir free from sediment deposition during high flows. Because of the gates being closed—or the inflatable dam inflated—there will be little to no circulation in the intake channel when river levels are near or below the top of the gates or inflatable dam. From discussions with Obermeyer, the manufacture of the pneumatically actuated gates, marine growth and biofouling is not expected to be a concern on their gates.

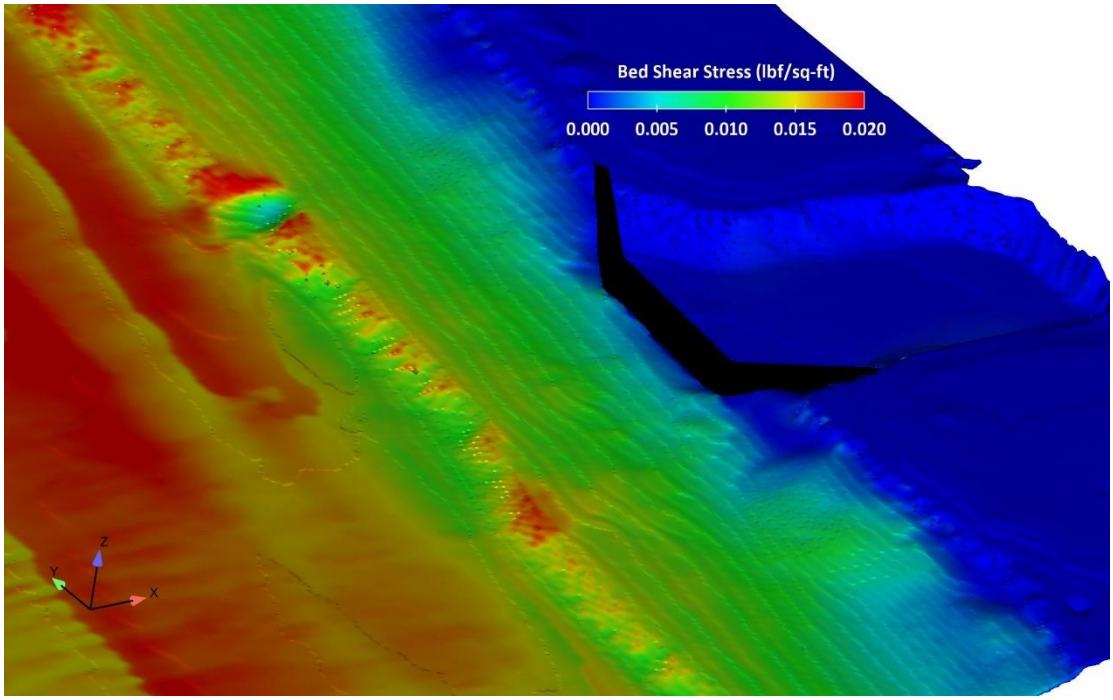


Figure 8.17. Option 3 (gated weir or inflatable dam) bed shear stress for a Brazos River flow of 20,000 ft^3/s

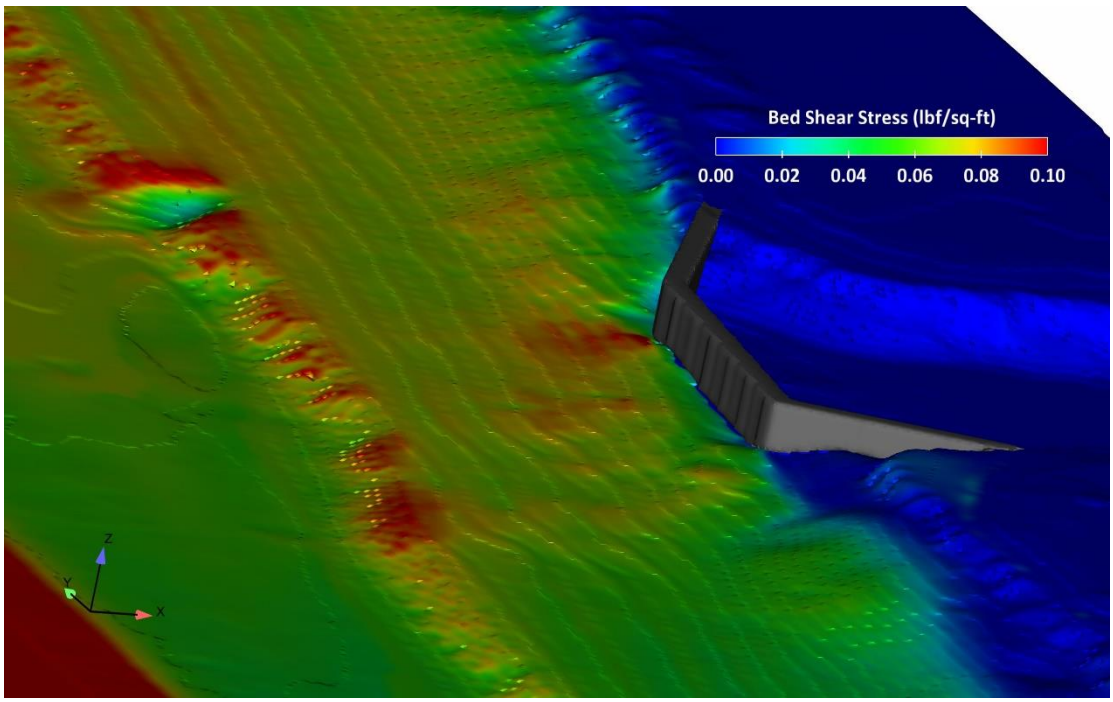


Figure 8.18. Option 3 (gated weir or inflatable dam) bed shear stress for a Brazos River flow of 40,000 ft^3/s

8.3 Options Considered and Discarded

During the initial analysis of possible options for the RWIS, a number of alternatives were discussed but discarded from in-depth consideration. These include passive horizontal intake, raised mid-channel intake, and cylindrical screens.

8.3.1 Passive horizontal intake

This is also called an infiltration gallery and consists of a screened intake pipe located in the bed of the main Brazos channel. A trench is dug into the channel bed, a screened or perforated pipe is placed within the trench, and the area is covered in porous gravels. Water preferentially flows from the channel through the highly porous gravel and into the pipe when the pumps are running.

This solution has worked well in select installations in rivers with gravel channel beds and little to no fine sized sediments in the bed. The Brazos River carries a high load of extremely fine sediments. We expect the screens on the intake for this system would be immediately clogged by the fine sediments and encased in mud. We would not recommend nor expect such a system to function in the lower Brazos River.

8.3.2 Raised mid-channel intake

A mid-channel intake location was initially considered. Under this option, pipes would run from the current water intake locations, through the intake channel, and into the main Brazos channel. The water intake would be located above the channel bed and screened. The combination of intake elevation and screen prevent sediment from entering the intake pipe. Water is drawn into the intake when the pumps are running.

A raised mid-channel intake has been a solution for situations where the channel has a coarse sand bed and the flows rarely reach rates that will suspend a significant amount of sediment. The high load of suspended silts and clays make this an unsuitable alternative for the lower Brazos River.

8.3.3 Cylindrical Screens

Cylindrical tee screens would be mounted on a bulkhead within the river channel and piped directly to the pump station. The present pump station would be sealed from river flows except through the cylindrical screens. The existing traveling screens would be removed. The screens would have an air burst cleaning system to remove debris.

The screens would be fine mesh to reduce debris entering the intake pipes, however, the fine sediment would still pass through the screens. In addition, the diameter of the screens dictates that they would need to be located in the navigation channel in order to get enough submergence on the screen. Thus, the concept was eliminated.

8.4 Structural Options and Sediment Transport

The ability of the structural options to reduce sediment deposition in the intake channel during flow events were evaluated using the SRH-2D model already described in Section 5. Options 1 and 2, the low and high weirs, were the focus of the sediment transport modeling, as Option 3 has a similar weir structure as Option 2. While all five flow scenarios from Table 5.1 were modeled, only results from the flow scenarios over 20,000 ft^3/s are discussed (Figures 8.19 through 8.22).

Deposition during low flows occurs from suspended sediment that has migrated into the intake channel area under the influence of the salinity wedge. Because the elevation of the intake channel is well above the channel bed, only suspended sediment will move into the intake channel area. Both structural options would have the effect of blocking a large proportion of this sediment. Only flow from the upper portion of the water column would be able to flow in and out of the intake channel, and this portion of the water column transports very little sediment. Under the structural options, during low flows, the sediment would deposit on the channel bed outside the intake channel. The CFD analysis has indicated that any sediment accumulated during the low flows would be transported downstream during the first increased flow event.

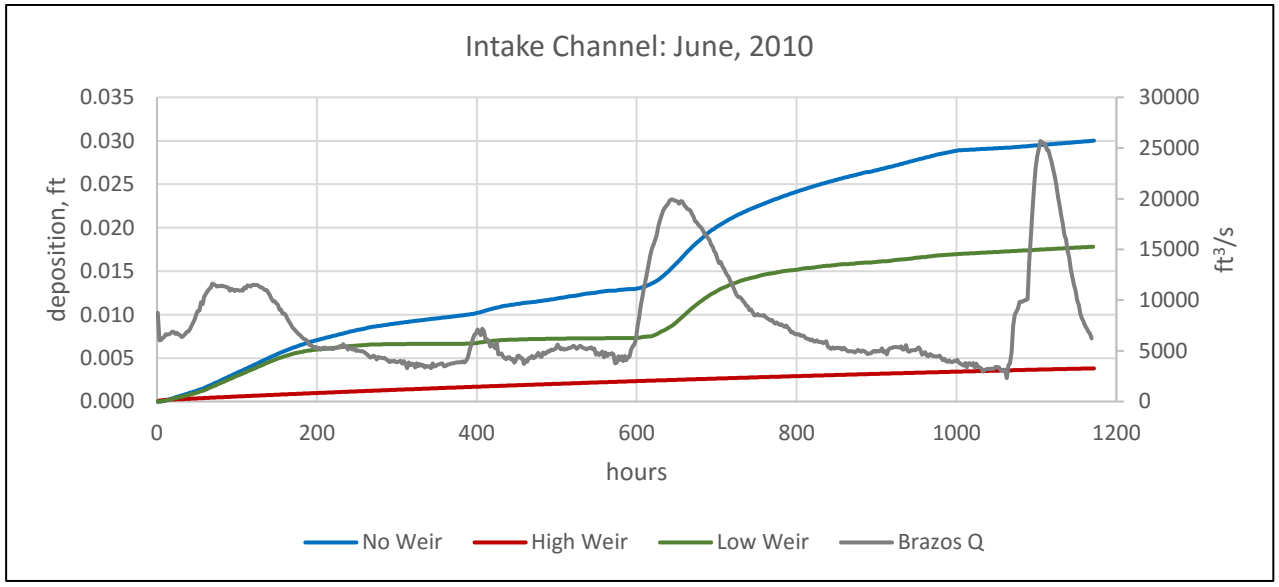


Figure 8.19. Modeled deposition during the June 2010 flow scenario with no, low, and high weir options

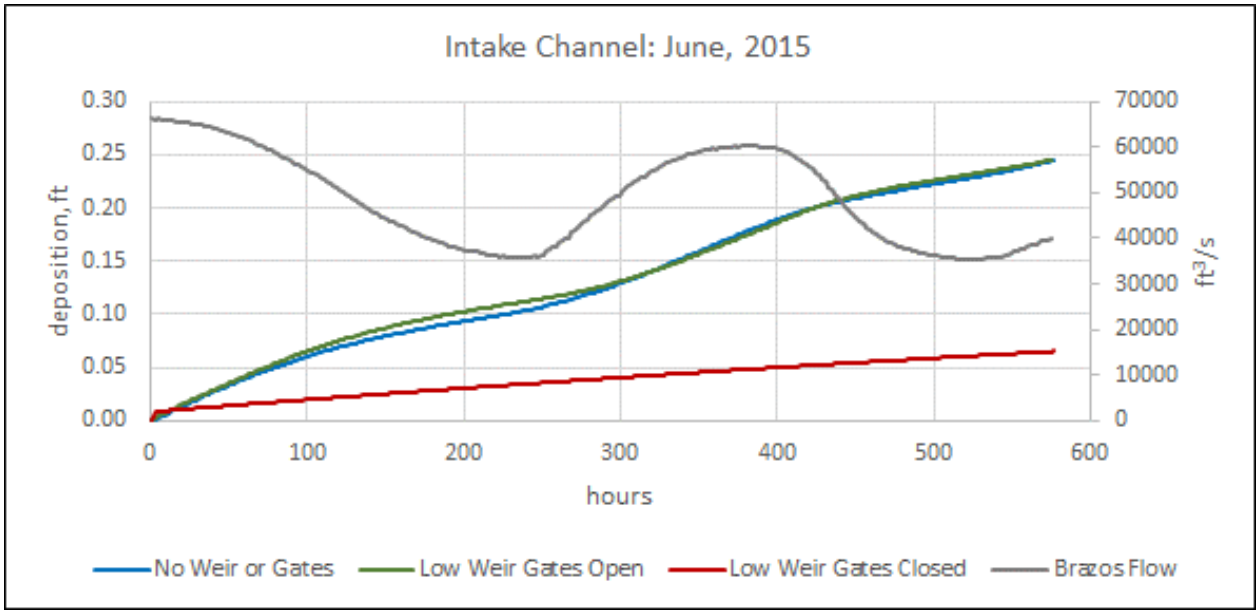


Figure 8.20. Modeled deposition during the June 2015 flow scenario with no, low, and high weir options

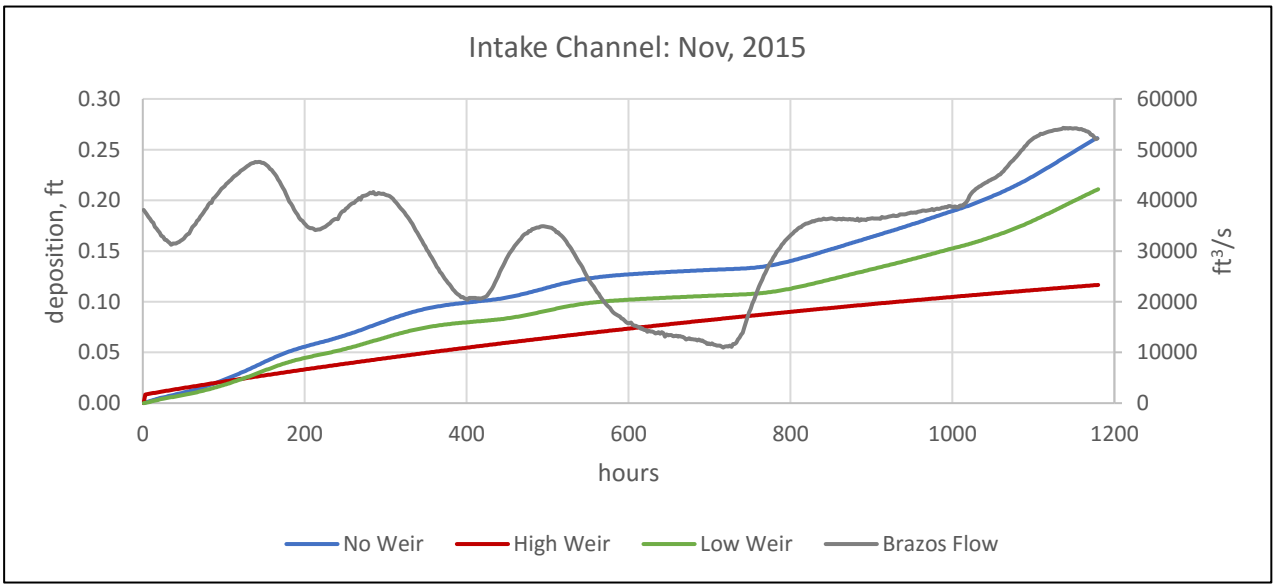


Figure 8.21. Modeled deposition during the November 2015 flow scenario with no, low, and high weir options

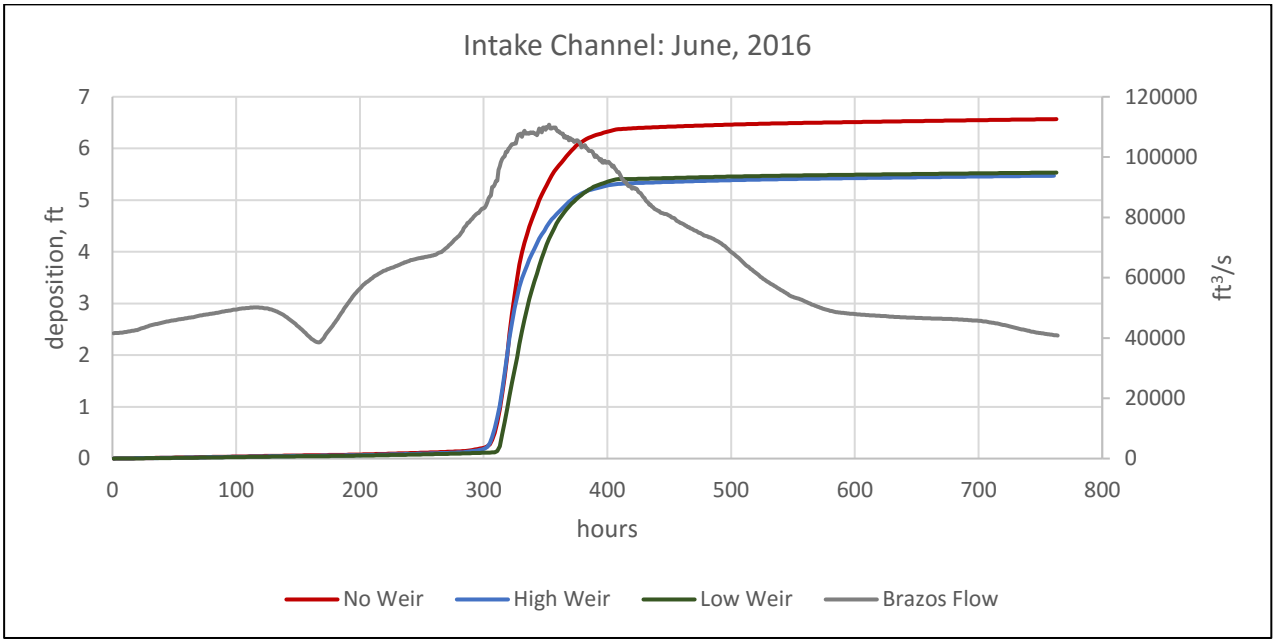


Figure 8.22. Modeled deposition during the June 2016 flow scenario with non-structural option with no weir (red), Option 1 low weir with no gates (green), and Option 2 high weir with no gates (blue)

In every case, there is a reduction in the total deposition in the intake channel during the flow scenario with a weir in place. The June 2016 flood event (Figure 8.22) stands out as the only scenario with significant intake channel deposition predicted. This is the extreme flood with a maximum flow rate of 112,000 ft^3/s—greater than any previously gaged flow rate. The expected, frequent flows are represented by the June 2010 scenario (Figure 8.19) and frequent floods by November 2015 (Figure 8.21) and June 2015 (Figure 8.20) scenarios. The model results show less sediment accumulation for the high weir when compared to the low weir option. The scale of deposition over a single flow event indicates little difference between deposition under the two weir options. The difference in the sedimentation rates between the low and high weir options becomes more significant over a full year of flows.

The time required to fill the intake channel with sediment was calculated by combining the modeled deposition depths and the anticipated deposition during low flows when the salinity wedge would be present in the channel (see Section 4) with the flow duration curve for the channel over a one-year time frame. It was assumed that the intake channel could fill to a maximum of seven feet of sediment before requiring dredging. The estimates of the time to fill the intake channel are based on this seven foot value, and the estimated time between dredging is estimated in Table 8.1. The flow duration curve developed by Strom and Rouhnia (2012) provides the amount of time a given flow rate is expected to occur based on the long-term flow record.

8.5 Advantages/Disadvantages

There are three non-structural alternatives and eight structural alternatives in this analysis. The structural alternatives are based on the three options discussed above, but with changes to the alignment of the sparging system discharge line or protection of the rubber dam in Option 3b.

Table 8.1 summarizes the advantages and disadvantages for the alternatives. In addition, it provides an estimated dredging frequency for each alternative, assuming the dredge evacuates to El. -12 ft. For all alternatives, during overbank flooding there will be overland flow transporting sediment into the intake channel.

Table 8.1. Structural and non-structural options/advantages and disadvantages

Alternative	Description	Advantages	Disadvantages	Estimated Frequency of Dredging
Non-Structural Options				
A	Status quo	• No capital cost.	• Dredging costs do not change from present.	• 2 times per year
B	Only pump during selected times, such as low flows or on the receding leg of the river flow hydrograph.	• No capital cost. • Reduces sediment deposition in the intake channel. • Reduces frequency of dredging.	• All flows can partially or completely fill in the intake channel. • Does not alleviate dredging.	• 2 times per year
C	Proactive dredging	• Generally allows the station to operate anytime. • No capital cost.	• All flows can partially or completely fill in the intake channel even with proactive dredging. • Dredging requirements similar what is done presently, approximately twice a year.	• 2 times per year
Structural Options				
D	Option 1 – Low weir at entrance to intake channel	• Reduces sediment deposition in the intake channel.	• Does not eliminate dredging. • Sediment carried by overbank and high flows can partially	• 1 time every 1.5 years

		• Time between dredging is increased. • No mechanical structures requiring maintenance.	or completely fill in the intake channel. • Marine growth expected on concrete portion of weir. • Weir may impede access from the river side of the intake channel for dredging.	
E	Option 2 – High weir at entrance to intake channel	• Reduces sediment deposition in the intake channel. • Time between dredging is increased. • No mechanical structures requiring maintenance. • Dredging will occur less frequently than Option 1. • Weir structure is closer to the bank than Option 1.	• Does not eliminate dredging. • Overbank flooding will deposit sediment in the intake channel. • Marine growth expected on concrete portion of weir. • Weir may impede access from the river side of the intake channel for dredging.	• 1 time every 3 years
F	Option 3a – Four gates at entrance to intake channel, gates are 9 ft high (top elevation at +3 ft)	• Significantly reduces sediment deposition in the intake channel. • Significantly reduces dredging requirements. • Weir structure is closer to the bank than Option 1. • Marine growth and biofouling not a concern on gates.	• Does not eliminate dredging. • Overbank flooding will deposit sediment in the intake channel. • One gate needs to be operated when operating a fire water pump. • At least one gate needs to be operated for large river water pump(s). • High capital costs. • High O&M costs.	• 1 time every 10 years

			• Water in the intake channel may become stagnant. • Marine growth expected on concrete portion of weir. • Weir may impede access from the river side of the intake channel for dredging.	
G	Option 3b-1 – Inflatable dam at entrance to intake channel, inflatable dam is 6 ft high (top elevation at El. 0 ft)	• Significantly reduces sediment deposition in the intake channel. • Significantly reduces dredging requirements. • Weir structure is closer to the bank than Option 1. • Marine growth and biofouling not expected on inflatable dam.	• Inflatable dam without protection can be subject to vandalism. • Does not eliminate dredging. • Overbank flooding will deposit sediment in the intake channel. • High capital costs. • High O&M costs. • Water in the intake channel may become stagnant. Marine growth expected on concrete portion of weir. • Weir may impede access from the river side of the intake channel for dredging.	• 1 time every 10 years
H	Option 3b-2 – Inflatable dam with face protection at entrance to intake channel (Obermeyer pneumatically actuated gates),	• Inflatable dam face is protected from vandals on the river. • Face protection is hinged to allow for vertical adjustment • Significantly reduces sediment	• Dam is not protected from vandals from shore. • The face protection hinges will require maintenance. • Overbank flooding will deposit	• 1 time every 10 years

	top elevation at El. 0 ft	deposition in the intake channel. • Significantly reduces dredging requirements. • Weir structure is closer to the bank than Option 1. • Marine growth and biofouling not a concern on gates.	sediment in the intake channel. • High capital cost. • High O&M costs. • Water in the intake channel may become stagnant. • Marine growth expected on concrete portion of weir. • Weir may impede access from the river side of the intake channel for dredging.	
I	Relocating sparging system to discharge into intake channel with Option 1	• Similar advantages to Option 1.	• Does not eliminate dredging. • May increase dredging in the intake channel. • Weir may impede access from the river side of the intake channel for dredging.	• 1 time every 1.5 years
J	Relocating sparging system to discharge into intake channel with Option 2	• Similar advantages to Option 2.	• Does not eliminate dredging. • May increase dredging in the intake channel. • Weir may impede access from the river side of the intake channel for dredging.	• 1 time every 3 years
K	Relocating sparging system to discharge into intake channel with Option 3	• For firewater pump testing the gates are closed or the inflatable dam is raised isolating the intake channel from the river. • Sediment deposition in the	• Does not eliminate dredging. • When operating the large river water pumps, one gate will have to be opened or the inflatable dam will have to lowered	• 1 time every 10 years

		intake channel will be minimal with this option. • When operating the large river water pumps, one gate will have to be opened or the inflatable dam will have to lowered approximately 1.5 ft below water level to provide enough water to the pumps.	approximately 1.5 ft below water level. This will allow some sediment deposition in the intake channel. • Operation of the relocated sparging system may cause adverse approach flow hydraulics to the large river water pumps. • Weir may impede access from the river side of the intake channel for dredging. • Water in the intake channel may become stagnant.	

Note, estimated frequency of dredging is based on the flows used in the analysis and 7 feet of deposition in the intake channel. Actual frequency of dredging may be more or less than predicted.

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

The Bryan Mound Raw Water Intake Structure is located at the end of an intake channel on the lower Brazos River from which it pumps raw water for the Strategic Petroleum Reserve in Texas. The site is approximately 2.7 miles upstream from the Gulf of Mexico where the channel bed is composed of mud and fine sediments, and the suspended sediment concentrations in the river flow can be high. The intake channel to the Raw Water Intake Structure experiences episodic sediment infilling which reduces the available water flow into the intake structure and requires periodic clean out of the intake channel.

NHC was contracted by FFPO to evaluate sediment deposition in the intake channel with the objectives to 1) understand the minimum depth required for intake operations to maintain a capacity of 1.63 million barrels per day; 2) understand the sediment patterns of the river and develop a metric to identify flow events with high potential for causing intake channel aggradation; and 3) develop conceptual level physical or procedural changes to the intake structure or channel to be able to pass the design flow while also reducing the frequency of dredging operations and cost over the long-term.

The minimum submergence required to operate the pumps was calculated based on the intake channel flow depth; the water depth required to prevent surface vortices from entering the raw water pumps; and net positive suction head requirements. At the minimum water level of El. -3.5 ft, the maximum bed level in the intake channel is El. -5 ft (seven feet of deposition), and at that level, the pump station will be able to pump 1.63 million barrels per day. The minimum depth to keep strong surface vortices from entering the pumps is El. 0 to +1 ft. A curtain wall installed at the entrance to each pump bay or in the stop log slot of each pump bay should allow the pumps to be free of surface vortices down to the minimum water leve. The design of the curtain wall can only be achieved using a physical model. The minimum depth required to minimize cavitation damage on the pump impellers or pump bowls is El. +0.3 ft, assuming a factor of safety (FS) of 20 percent of NPSHr, or El. -1.1 ft (FS of 5 ft). To operate at a lower water level without cavitating the pumps, the pump columns could be lengthened so the basket strainer is closer to the floor of the pump station, or, alternately, the pumps need to be replaced with pumps with less NPSHr.

Channel hydraulics and sediment transport mechanics were analyzed over a one-mile stretch of the Brazos River, centered on the intake channel and structure. Brazos River flows turn into the intake channel where the water is sheltered from much of the downstream flow forces in the main channel. Flow in the intake channel recirculate and slow, which allows any suspended sediment to deposit and aggrade the intake channel bed. The tendency for deposition is enhanced during low flows by the formation of a salinity wedge in the channel. There is a correlation between the record of sediment volume within the intake area, the Brazos River flow rate, and the suspended sediment concentration record at the USGS Rosharon gage. Brazos River suspended sediment concentrations over 200 mg/L have an increased likelihood of deposition within the intake channel. Suspended sediment concentrations exceed 200 mg/L when Brazos River flows exceed 20,000 ft^3/s. The suspended sediment concentration are also influenced by the antecedent channel flows. The first high flow will flush accumulated fine sediments from the upstream channel bed and have a greater concentration of suspended sediment than later flood flows of similar magnitude. The correlation between deposition at the intake channel and flow rate at the Rosharon gage provides a way for Bryan Mound staff to predict periods when deposition is expected within the intake channel.

Non-structural and structural alternatives were analyzed for their ability to reduce the frequency of dredging. The non-structural alternatives evaluated include 1) status quo; 2) pumping during selective times when sediment movement in the river is low; and 3) pro-active dredging, which was defined to mean that when a large amount of sediment is expected to deposit in the intake channel, the channel would be dredged before it arrives so the pump station is always operable. None of these non-structural alternatives reduced the number of dredging events.

Eight structural alternatives were evaluated which were based on the three structural design options. The three structural design options were: Option 1, called the low weir option, has a weir at the El. -12 ft river bed contour with the top of the submerged weir at El. -8 ft; Option 2, also called the high weir option, has the weir at the El. -9 ft river bed contour with the top of the submerged weir at El. -5 ft; and Option 3, a submerged weir and gated structure set at the El. -8 ft river bed contour with the top of the submerged weir at El. -6 ft. The gated part of the structure could either be a series of gates (Option 3a)

or inflatable dam (Option 3b) installed on top of the submerged weir. With the gates closed or the dam inflated, the amount of suspended sediment entering the intake channel is minimal. Bed shear stresses in the main channel will remain high enough under all structural options to prevent long-term aggradation on the channel side of the weir. Bed shear stresses in the Brazos channel near the weir are predicted to be higher for the low weir because it extends further toward the channel center. For all alternatives, the pump station will be able to pump 1.63 million barrels per day.

The other structural alternatives based on the three options include: an inflatable dam with protection plate, and relocating the sparging system to discharge into the intake channel instead of back into the Brazos River.

Sedimentation rates were predicted for the structural and non-structural options using a calibrated morphodynamic model and five flow scenarios that included low flows, normal flows, moderate floods, and the flood of record. Deposition within the intake channel during individual flow events was low for all except the extreme flood of June 2016, which was the largest flood measured on the Brazos River. If an equally large flood occurs, the intake channel may aggrade up to five or six feet, regardless of low or high weir solution implemented. The amount of aggradation over the long-term was estimated so the frequency of dredging could be predicted. Both weir options reduce intake channel aggradation and dredging frequency. Assuming the intake channel may be allowed to fill by seven feet between dredging, the frequency of intake channel dredging would be once every year and a half with the low weir and once every three years with the high weir. Dredging frequency would be approximately twice a year under the non-structural options, which is similar to the current rate. For Option 3, with either gates or a dam being closed when the pumps are not operating, the need for dredging would be further reduced to possibly once every 10 years.

9.2 Recommendations

Based on this analysis:

- Non-structural solutions by themselves are not recommended because they do not reduce the frequency of dredging.
- Option 1-Low Weir (Alternative D in Table 8.1) is not recommended because frequency of dredging has not been reduced significantly.
- Option 2-High Weir (Alternative E in Table 8.1) is a possibility since it reduced dredging frequency from twice a year to once every three years. If this option is accepted, we recommend that the center 70-foot section of weir be constructed so that a pneumatically actuated gate could be installed in case the need arises. We further recommend that pump operation occur when the Brazos River at the Rosharon Gage is 20,000 ft^3/s or less. This will minimize the influence of pump operation on suspended sediment inflow to the intake channel.

- Option 3a (Alternative F in Table 8.1), with four standard gates at the entrance to the intake channel, is not recommended because of capital and O&M costs likely being high. Maintenance of the gates is an issue.

- Option 3b-1 (Alternative G in Table 8.1), which is an inflatable dam that is six feet high, is a possibility since it will significantly reduce sedimentation in the intake channel and reduce the frequency of dredging to about once every 10 years. With the typical water level above the top of the dam, there will be some water interchange with the river, so stagnation may not be a major concern. The possibility of vandalism is low because it is submerged, however damage from debris or boats/barges is high.

- Option 3b-2 (Alternative H in Table 8.1), which is an inflatable dam with steel face protection (such as Obermeyer pneumatically actuated gate), is recommended because it minimizes dredging to about once every 10 years (similar Option 3b-1), and it is protected from vandals, debris, and boat/barges. The top is below normal water levels, thus there is some water exchange with the river. We further recommend that pump operation occur when the Brazos River at the Rosharon Gage is 20,000 ft^3/s or less. This will minimize the influence of pump operation on suspended sediment inflow to the intake channel.

- Relocating the sparging system so it discharges into the intake channel does not provide any added benefit and is not recommended.

REFERENCES

Bonner, T. H., J. Duke, G. Guillen, and K. O. Winemiller (2015), Instream flows research and validation methodology framework and Brazos Estuary characterization*Rep. 1400011722*, 202 pp, Austin, TX.

Carlin, J. A., and T. M. Dellapenna (2015), The evolution of a subaqueous delta in the Anthropocene: A stratigraphic investigation of the Brazos River delta, TX USA, *Continental Shelf Research*, *111, Part B*, 139-149.

Carlin, J. A., T. M. Dellapenna, K. Strom, and C. J. Noll Iv (2015), The influence of a salt wedge intrusion on fluvial suspended sediment and the implications for sediment transport to the adjacent coastal ocean: A study of the lower Brazos River TX, USA, *Marine Geology*, *359*, 134-147.

Engelund, F. and Fredsøe, J., 1976. A sediment transport model for straight alluvial channels, *Nordic Hydrology*, *7*, 293-306.

Gooch, T., K. O. Winemiller, T. H. Bonner, J. Davis, D. Dunn, D. Gise, G. Guillen, T. Morgan, and P. Price (2012), Brazos River Basin and Bay Expert Science Team Environmental Flow Regime Recommendations Report, 198 pp, Austin, TX.

Grabowski, R. C., I. G. Droppo, and G. Wharton (2011), Erodibility of cohesive sediment: the importance of sediment properties, *Earth-Science Reviews*, *105*(3), 101-120.

Greimann, B., Y. Lai, and J. Huang (2008), Two-dimensional total sediment load model equations, *Journal of hydraulic engineering*, *134*(8), 1142-1146.

Hydraulic Institute. American National Standard for Rotodynamic Pumps for Pump Intake Design, Parsippany, New Jersey, ANSI/HI 9.8-2012.

Johnston Pump Company, Model 33 NMC, Vertical Turbine Pump, 3 Stage, Centrifugal, January 1997.

Kruse, C. J., D. Ellis, A. Protopapas, N. Norboge, and B. Glover (2014), Texas Gulf Intracoastal Waterway Master Plan: Technical Report.

Lai, Y. G. (2009), Two-dimensional depth-averaged flow modeling with an unstructured hybrid mesh, *Journal of Hydraulic Engineering*, *136*(1), 12-23.

Lai, Y. G. (2012), Channel Morphology Prediction with and without a Temporary Channel Upstream of the Elephant Butte Reservoir, paper presented at World Environmental and Water Resources Congress 2012: Crossing Boundaries.

Milliman, J. D., and R. H. Meade (1983), World-Wide Delivery of River Sediment to the Oceans, *The Journal of Geology*, *91*(1), 1-21.

NHC, N. H. C. (2015), Bateman Island Causeway Modification Project Hydrodynamic and Geomorphic Assessment, 101 pp, Seattle, WA.

Osting, T., R. Matthews, and B. Austin (2004), Analysis of instream flows for the Lower Brazos River - hydrology, hydraulics, and fish habitat utilization, 161 pp, Austin, TX.

Phillips, J. D. (2015), Hydrologic and geomorphic flow thresholds in the Lower Brazos River, Texas, USA, *Hydrological Sciences Journal*, *60*(9), 1631-1648.

Robb, D.M., Vasquez, J.A. (2015). "Numerical Simulation of Dam Break Flows using Depth-Averaged Hydrodynamic and Three-Dimensional CFD Models". 22nd Canadian Hydrotechnical Conference, Montreal, Canada, April 29-May 2, 2015.

Salehi, M., and K. Strom (2012), Measurement of critical shear stress for mud mixtures in the San Jacinto estuary under different wave and current combinations, *Continental Shelf Research*, *47*, 78-92.

Sanks, R.L. (1998). Pumping Station Design, Second Edition, Butterworth - Heinemann, Woburn, MA, pgs. 259-261.

Schoenbaechler, C., C. G. Guthrie, and Q. Lu (2011), Coastal hydrology of the Brazos River Estuary, 13 pp, Austin, TX.

Strom, K., and M. Rouhnia (2012), Suspended sediment sampling and annual sediment yield on the Lower Brazos River, 61 pp, Austin, TX.

Van Prooijen, B., and J. Winterwerp (2010), A stochastic formulation for erosion of cohesive sediments, *Journal of Geophysical Research: Oceans*, *115*(C1).

Vasquez, J.A. (2017). “Modelling the Generation and Propagation of Landslide-Generated Waves”. 23rd Canadian Hydrotechnical Conference. Vancouver, May 31-June 3, 2017.

Vasquez, J.A., Hurtig, K., and Hughes, B., (2013). “Computational Fluid Dynamics (CFD) Modeling of Run-of-River Intakes”. HydroVision International, Denver, CO, U.S.A. July 23-26, 2013.

Vasquez, J.A. (2010). “Assessing Sediment Movement by CFD Particle Tracking”. 9th Federal Interagency Sedimentation Conference, FISC 2010, Las Vegas, NV. June 27-July 1, 2010.

Vasquez, J.A., and Roncal, J.J. (2009) “Testing River2D and Flow-3D for sudden dam-break flow simulations”. Canadian Dam Association Conference, Whistler, BC, Canada.

Vasquez, J.A., and Walsh, B.W. (2009) “CFD simulation of local scour in complex piers under tidal flow”. IAHR Conference, Vancouver, Canada. Aug. 9-14, 2009.

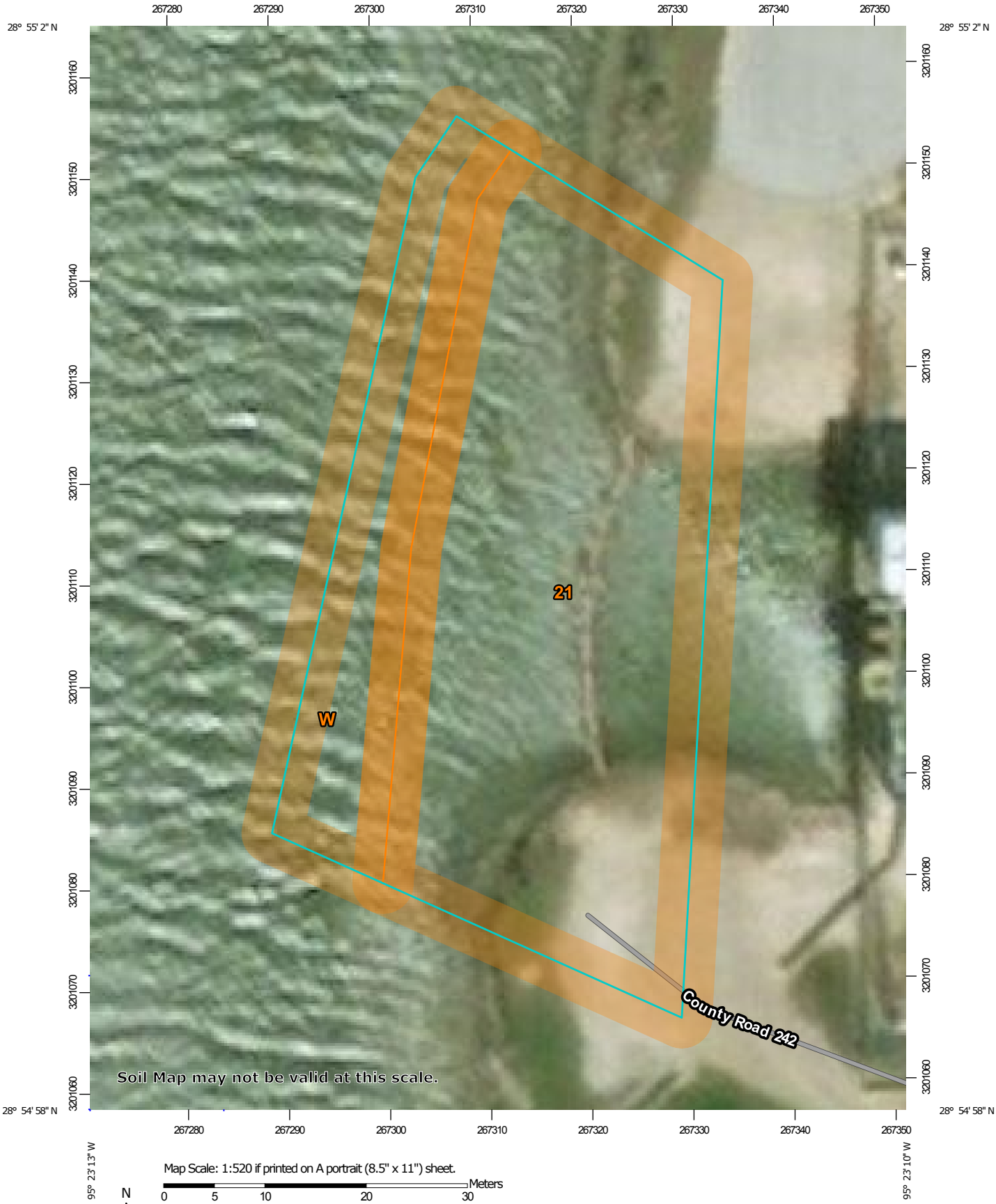
Vogl, A. L., and V. L. Lopes (2009), Impacts of water resources development on flow regimes in the Brazos River, *Environmental Monitoring and Assessment*, *157*(1), 331-345.

Waters, M. R., and L. C. Nordt (1995), Late Quaternary floodplain history of the Brazos River in east-central Texas, *Quaternary Research*, *43*, 311-319.

Appendix C - Natural Resources Conservation Service

Soil Classification Reports

Soil Map—Brazoria County, Texas
(Bryan Mound Raw Water Intake Structure)



Map Scale: 1:520 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 5 10 20 30

Feet
0 25 50 100 150

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Brazoria County, Texas
Survey Area Data: Version 15, Nov 7, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Feb 22, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
21	Ijam clay, rarely flooded	0.5	78.0%
W	Water	0.1	22.0%
Totals for Area of Interest		**0.7**	**100.0%**

Prime and other Important Farmlands

This table lists the map units in the survey area that are considered important farmlands. Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance. This list does not constitute a recommendation for a particular land use.

In an effort to identify the extent and location of important farmlands, the Natural Resources Conservation Service, in cooperation with other interested Federal, State, and local government organizations, has inventoried land that can be used for the production of the Nation's food supply.

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

For some of the soils identified in the table as prime farmland, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures.

A recent trend in land use in some areas has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, and other fruits and vegetables. It has the special combination of soil quality, growing season, moisture supply, temperature, humidity, air drainage, elevation, and aspect needed for the soil to economically produce sustainable high yields of these crops when properly managed. The water supply is dependable and of adequate quality. Nearness to markets is an additional consideration. Unique farmland is not based on national criteria. It commonly is in areas where there is a special microclimate, such as the wine country in California.

In some areas, land that does not meet the criteria for prime or unique farmland is considered to be *farmland of statewide importance* for the production of food, feed, fiber, forage, and oilseed crops. The criteria for defining and delineating farmland of statewide importance are determined by the appropriate State agencies. Generally, this land includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some areas may produce as high a yield as prime farmland if conditions are favorable. Farmland of statewide importance may include tracts of land that have been designated for agriculture by State law.

In some areas that are not identified as having national or statewide importance, land is considered to be *farmland of local importance* for the production of food, feed, fiber, forage, and oilseed crops. This farmland is identified by the appropriate local agencies. Farmland of local importance may include tracts of land that have been designated for agriculture by local ordinance.

Report—Prime and other Important Farmlands

Prime and other Important Farmlands–Brazoria County, Texas		
Map Symbol	**Map Unit Name**	**Farmland Classification**
21	Ijam clay, rarely flooded	Not prime farmland
W	Water	Not prime farmland

Data Source Information

Soil Survey Area: Brazoria County, Texas
Survey Area Data: Version 15, Nov 7, 2017

Appendix D - U.S. Fish and Wildlife Service

Information for Planning and Consultation (IPaC) Reports

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
Phone: (281) 286-8282 Fax: (281) 488-5882
http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

In Reply Refer To: December 11, 2017
Consultation Code: 02ETTX00-2018-SLI-0451
Event Code: 02ETTX00-2018-E-00948
Project Name: Bryan Mound SPR LE-II

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The U.S. Fish and Wildlife Service (Service) field offices in Clear Lake, Tx, and Corpus Christi, Tx, have combined administratively to form the Texas Coastal Ecological Services Field Office. A map of the Texas Coastal Ecological Services Field Office area of responsibility can be found at: http://www.fws.gov/southwest/es/TexasCoastal/Map.html. All project related correspondence should be sent to the field office responsible for the area in which your project occurs. For projects located in southeast Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; 17629 El Camino Real Ste. 211; Houston, Texas 77058. For projects located in southern Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; P.O. Box 81468; Corpus Christi, Texas 78468-1468. For projects located in six counties in southern Texas (Cameron, Hidalgo, Starr, Webb, Willacy, and Zapata) please write: Santa Ana NWR, ATTN: Ecological Services Sub Office, 3325 Green Jay Road, Alamo, Texas 78516.

The enclosed species list identifies federally threatened, endangered, and proposed to be listed species; designated critical habitat; and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project.

New information from updated surveys, changes in the abundance and distribution of species, changes in habitat conditions, or other factors could change the list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation for updates to species list and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Candidate species have no protection under the Act but are included for consideration because they could be listed prior to the completion of your project. The other species information should help you determine if suitable habitat for these listed species exists in any of the proposed project areas or if project activities may affect species on-site, off-site, and/or result in "take" of a federally listed species.

"Take" is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. In addition to the direct take of an individual animal, habitat destruction or modification can be considered take, regardless of whether it has been formally designated as critical habitat, if the activity results in the death or injury of wildlife by removing essential habitat components or significantly alters essential behavior patterns, including breeding, feeding, or sheltering.

Section 7

Section 7 of the Act requires that all Federal agencies consult with the Service to ensure that actions authorized, funded or carried out by such agencies do not jeopardize the continued existence of any listed threatened or endangered species or adversely modify or destroy critical habitat of such species. It is the responsibility of the Federal action agency to determine if the proposed project may affect threatened or endangered species. If a "may affect" determination is made, the Federal agency shall initiate the section 7 consultation process by writing to the office that has responsibility for the area in which your project occurs.

Is not likely to adversely affect - the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. The Federal agency or the designated non-Federal representative should seek written concurrence from the Service that adverse effects have been eliminated. Be sure to include all of the information and documentation used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.

Is likely to adversely affect - adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires the Federal action agency to initiate formal section 7 consultation with this office.

No effect - the proposed action will not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area). No further coordination or contact with the Service is necessary. However, if the project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.

Regardless of your determination, the Service recommends that you maintain a complete record

of the evaluation, including steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles.

Please be advised that while a Federal agency may designate a non-Federal representative to conduct informal consultations with the Service, assess project effects, or prepare a biological assessment, the Federal agency must notify the Service in writing of such a designation. The Federal agency shall also independently review and evaluate the scope and contents of a biological assessment prepared by their designated non-Federal representative before that document is submitted to the Service.

The Service's Consultation Handbook is available online to assist you with further information on definitions, process, and fulfilling Act requirements for your projects at: http://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf

Section 10

If there is no federal involvement and the proposed project is being funded or carried out by private interests and/or non-federal government agencies, and the project as proposed may affect listed species, a section 10(a)(1)(B) permit is recommended. The Habitat Conservation Planning Handbook is available at: http://www.fws.gov/endangered/esa-library/pdf/HCP_Handbook.pdf

Service Response

Please note that the Service strives to respond to requests for project review within 30 days of receipt, however, this time period is not mandated by regulation. Responses may be delayed due to workload and lack of staff. Failure to meet the 30-day timeframe does not constitute a concurrence from the Service that the proposed project will not have impacts to threatened and endangered species.

Proposed Species and/or Proposed Critical Habitat

While consultations are required when the proposed action may affect listed species, section 7(a)(4) was added to the ESA to provide a mechanism for identifying and resolving potential conflicts between a proposed action and proposed species or proposed critical habitat at an early planning stage. The action agency should seek conference from the Service to assist the action agency in determining effects and to advise the agency on ways to avoid or minimize adverse effect to proposed species or proposed critical habitat.

Candidate Species

Candidate species are species that are being considered for possible addition to the threatened and endangered species list. They currently have no legal protection under the ESA. If you find you have potential project impacts to these species the Service would like to provide technical assistance to help avoid or minimize adverse effects. Addressing potential impacts to these species at this stage could better provide for overall ecosystem healh in the local area and ay avert potential future listing.

Several species of freshwater mussels occur in Texas and four are candidates for listing under the ESA. The Service is also reviewing the status of six other species for potential listing under the ESA. One of the main contributors to mussel die offs is sedimentation, which smothers and suffocates mussels. To reduce sedimentation within rivers, streams, and tributaries crossed by a project, the Service recommends that that you implement the best management practices found at: http://www.fws.gov/southwest/es/TexasCoastal/FreshwaterMussels.html.

Candidate Conservation Agreements (CCAs) or Candidate Conservation Agreements with Assurances (CCAAs) are voluntary agreements between the Service and public or private entities to implement conservation measures to address threats to candidate species. Implementing conservation efforts before species are listed increases the likelihood that simpler, flexible, and more cost-effective conservation options are available. A CCAA can provide participants with assurances that if they engage in conservation actions, they will not be required to implement additional conservation measures beyond those in the agreement. For additional information on CCAs/CCAAs please visit the Service's website at http://www.fws.gov/endangered/what-we-do/cca.html.

Migratory Birds

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions for the protection of migratory birds. Under the MBTA, taking, killing, or possessing migratory birds is unlawful. Many may nest in trees, brush areas or other suitable habitat. The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March through August to avoid destruction of individuals or eggs. If project activities must be conducted during this time, we recommend surveying for active nests prior to commencing work. A list of migratory birds may be viewed at http://www.fws.gov/migratorybirds/regulationspolicies/mbta/mbtandx.html.

The bald eagle (Haliaeetus leucocephalus) was delisted under the Act on August 9, 2007. Both the bald eagle and the goden eagle (Aquila chrysaetos) are still protected under the MBTA and BGEPA. The BGEPA affords both eagles protection in addition to that provided by the MBTA, in particular, by making it unlawful to "disturb" eagles. Under the BGEPA, the Service may issue limited permits to incidentally "take" eagles (e.g., injury, interfering with normal breeding, feeding, or sheltering behavior nest abandonment). For more information on bald and golden eagle management guidlines, we recommend you review information provided at http://www.fws.gov/midwest/eagle/pdf/NationalBaldEagleManagementGuidelines.pdf.

The construction of overhead power lines creates threats of avian collision and electrocution. The Service recommends the installation of underground rather than overhead power lines whenever possible. For new overhead lines or retrofitting of old lines, we recommend that project developers implement, to the maximum extent practicable, the Avian Power Line Interaction Committee guidelines found at http://www.aplic.org/.

Meteorological and communication towers are estimated to kill millions of birds per year. We recommend following the guidance set forth in the Service Interim Guidelines for

Recommendations on Communications Tower Siting, Constructions, Operation and Decommissioning, found online at: http://www.fws.gov/habitatconservation/communicationtowers.html, to minimize the threat of avian mortality at these towers. Monitoring at these towers would provide insight into the effectiveness of the minimization measures. We request the results of any wildlife mortality monitoring at towers associated with this project.

We request that you provide us with the final location and specifications of your proposed towers, as well as the recommendations implemented. A Tower Site Evaluation Form is also available via the above website; we recommend you complete this form and keep it in your files. If meteorological towers are to be constructed, please forward this completed form to our office.

More information concerning sections 7 and 10 of the Act, migratory birds, candidate species, and landowner tools can be found on our website at: http://www.fws.gov/southwest/es/TexasCoastal/ProjectReviews.html.

Wetlands and Wildlife Habitat

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to ood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the oodplain and/or wetland area during construction to prevent possible contamination of water and soils.

Wetlands and riparian areas are high priority fish and wildlife habitat, serving as important sources of food, cover, and shelter for numerous species of resident and migratory wildlife. Waterfowl and other migratory birds use wetlands and riparian corridors as stopover, feeding, and nesting areas. We strongly recommend that the selected project site not impact wetlands and riparian areas, and be located as far as practical from these areas. Migratory birds tend to concentrate in or near wetlands and riparian areas and use these areas as migratory yways or

corridors. After every effort has been made to avoid impacting wetlands, you anticipate unavoidable wetland impacts will occur; you should contact the appropriate U.S. Army Corps of Engineers office to determine if a permit is necessary prior to commencement of construction activities.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping (42 C.F.R. 26961), where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/.

If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005, ext. 246, if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
(281) 286-8282

Project Summary

Consultation Code: 02ETTX00-2018-SLI-0451

Event Code: 02ETTX00-2018-E-00948

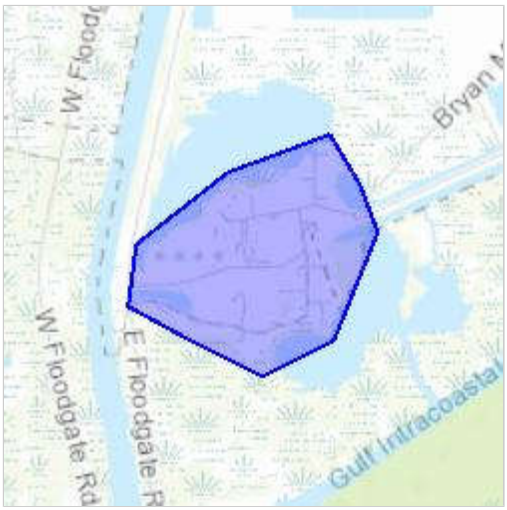
Project Name: Bryan Mound SPR LE-II

Project Type: DEVELOPMENT

Project Description: SPR LE-II Bryan Mound Facility

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/28.917442652108143N95.3768331278622W



Counties: Brazoria, TX

Endangered Species Act Species

There is a total of 11 threatened, endangered, or candidate species on this species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

Mammals

NAME	STATUS
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

Reptiles

NAME STATUS

Green Sea Turtle *Chelonia mydas* Threatened
Population: North Atlantic DPS
No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/6199

Hawksbill Sea Turtle *Eretmochelys imbricata* Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/3656

Kemp's Ridley Sea Turtle *Lepidochelys kempii* Endangered
There is **proposed** critical habitat for this species. The location of the critical habitat is not available.
Species profile: https://ecos.fws.gov/ecp/species/5523

Leatherback Sea Turtle *Dermochelys coriacea* Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/1493

Loggerhead Sea Turtle *Caretta caretta* Threatened
Population: Northwest Atlantic Ocean DPS
There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/1110

Clams

NAME STATUS

Smooth Pimpleback *Quadrula houstonensis* Candidate
No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/8967

Texas Fawnsfoot *Truncilla macrodon* Candidate
No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/8965

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
Phone: (281) 286-8282 Fax: (281) 488-5882
http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

In Reply Refer To: March 04, 2018
Consultation Code: 02ETTX00-2018-SLI-0920
Event Code: 02ETTX00-2018-E-01935
Project Name: RWIS Channel Upgrade

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The U.S. Fish and Wildlife Service (Service) field offices in Clear Lake, Tx, and Corpus Christi, Tx, have combined administratively to form the Texas Coastal Ecological Services Field Office. A map of the Texas Coastal Ecological Services Field Office area of responsibility can be found at: http://www.fws.gov/southwest/es/TexasCoastal/Map.html. All project related correspondence should be sent to the field office responsible for the area in which your project occurs. For projects located in southeast Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; 17629 El Camino Real Ste. 211; Houston, Texas 77058. For projects located in southern Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; P.O. Box 81468; Corpus Christi, Texas 78468-1468. For projects located in six counties in southern Texas (Cameron, Hidalgo, Starr, Webb, Willacy, and Zapata) please write: Santa Ana NWR, ATTN: Ecological Services Sub Office, 3325 Green Jay Road, Alamo, Texas 78516.

The enclosed species list identifies federally threatened, endangered, and proposed to be listed species; designated critical habitat; and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project.

New information from updated surveys, changes in the abundance and distribution of species, changes in habitat conditions, or other factors could change the list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation for updates to species list and information. An updated list may be

requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Candidate species have no protection under the Act but are included for consideration because they could be listed prior to the completion of your project. The other species information should help you determine if suitable habitat for these listed species exists in any of the proposed project areas or if project activities may affect species on-site, off-site, and/or result in "take" of a federally listed species.

"Take" is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. In addition to the direct take of an individual animal, habitat destruction or modification can be considered take, regardless of whether it has been formally designated as critical habitat, if the activity results in the death or injury of wildlife by removing essential habitat components or significantly alters essential behavior patterns, including breeding, feeding, or sheltering.

Section 7

Section 7 of the Act requires that all Federal agencies consult with the Service to ensure that actions authorized, funded or carried out by such agencies do not jeopardize the continued existence of any listed threatened or endangered species or adversely modify or destroy critical habitat of such species. It is the responsibility of the Federal action agency to determine if the proposed project may affect threatened or endangered species. If a "may affect" determination is made, the Federal agency shall initiate the section 7 consultation process by writing to the office that has responsibility for the area in which your project occurs.

Is not likely to adversely affect - the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. The Federal agency or the designated non-Federal representative should seek written concurrence from the Service that adverse effects have been eliminated. Be sure to include all of the information and documentation used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.

Is likely to adversely affect - adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires the Federal action agency to initiate formal section 7 consultation with this office.

No effect - the proposed action will not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area). No further coordination or contact with the Service is necessary. However, if the

project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.

Regardless of your determination, the Service recommends that you maintain a complete record of the evaluation, including steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles.

Please be advised that while a Federal agency may designate a non-Federal representative to conduct informal consultations with the Service, assess project effects, or prepare a biological assessment, the Federal agency must notify the Service in writing of such a designation. The Federal agency shall also independently review and evaluate the scope and contents of a biological assessment prepared by their designated non-Federal representative before that document is submitted to the Service.

The Service's Consultation Handbook is available online to assist you with further information on definitions, process, and fulfilling Act requirements for your projects at: http://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf

Section 10

If there is no federal involvement and the proposed project is being funded or carried out by private interests and/or non-federal government agencies, and the project as proposed may affect listed species, a section 10(a)(1)(B) permit is recommended. The Habitat Conservation Planning Handbook is available at: http://www.fws.gov/endangered/esa-library/pdf/HCP_Handbook.pdf

Service Response

Please note that the Service strives to respond to requests for project review within 30 days of receipt, however, this time period is not mandated by regulation. Responses may be delayed due to workload and lack of staff. Failure to meet the 30-day timeframe does not constitute a concurrence from the Service that the proposed project will not have impacts to threatened and endangered species.

Proposed Species and/or Proposed Critical Habitat

While consultations are required when the proposed action may affect listed species, section 7(a)(4) was added to the ESA to provide a mechanism for identifying and resolving potential conflicts between a proposed action and proposed species or proposed critical habitat at an early planning stage. The action agency should seek conference from the Service to assist the action agency in determining effects and to advise the agency on ways to avoid or minimize adverse effect to proposed species or proposed critical habitat.

Candidate Species

Candidate species are species that are being considered for possible addition to the threatened and endangered species list. They currently have no legal protection under the ESA. If you find you have potential project impacts to these species the Service would like to provide technical

assistance to help avoid or minimize adverse effects. Addressing potential impacts to these species at this stage could better provide for overall ecosystem healh in the local area and ay avert potential future listing.

Several species of freshwater mussels occur in Texas and four are candidates for listing under the ESA. The Service is also reviewing the status of six other species for potential listing under the ESA. One of the main contributors to mussel die offs is sedimentation, which smothers and suffocates mussels. To reduce sedimentation within rivers, streams, and tributaries crossed by a project, the Service recommends that that you implement the best management practices found at: http://www.fws.gov/southwest/es/TexasCoastal/FreshwaterMussels.html.

Candidate Conservation Agreements (CCAs) or Candidate Conservation Agreements with Assurances (CCAAs) are voluntary agreements between the Service and public or private entities to implement conservation measures to address threats to candidate species. Implementing conservation efforts before species are listed increases the likelihood that simpler, flexible, and more cost-effective conservation options are available. A CCAA can provide participants with assurances that if they engage in conservation actions, they will not be required to implement additional conservation measures beyond those in the agreement. For additional information on CCAs/CCAAs please visit the Service's website at http://www.fws.gov/endangered/what-we-do/cca.html.

Migratory Birds

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions for the protection of migratory birds. Under the MBTA, taking, killing, or possessing migratory birds is unlawful. Many may nest in trees, brush areas or other suitable habitat. The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March through August to avoid destruction of individuals or eggs. If project activities must be conducted during this time, we recommend surveying for active nests prior to commencing work. A list of migratory birds may be viewed at http://www.fws.gov/migratorybirds/regulationspolicies/mbta/mbtandx.html.

The bald eagle (*Haliaeetus leucocephalus*) was delisted under the Act on August 9, 2007. Both the bald eagle and the goden eagle (*Aquila chrysaetos*) are still protected under the MBTA and BGEPA. The BGEPA affords both eagles protection in addition to that provided by the MBTA, in particular, by making it unlawful to "disturb" eagles. Under the BGEPA, the Service may issue limited permits to incidentally "take" eagles (e.g., injury, interfering with normal breeding, feeding, or sheltering behavior nest abandonment). For more information on bald and golden eagle management guidlines, we recommend you review information provided at http://www.fws.gov/midwest/eagle/pdf/NationalBaldEagleManagementGuidelines.pdf.

The construction of overhead power lines creates threats of avian collision and electrocution. The Service recommends the installation of underground rather than overhead power lines whenever possible. For new overhead lines or retrofitting of old lines, we recommend that project

developers implement, to the maximum extent practicable, the Avian Power Line Interaction Committee guidelines found at http://www.aplic.org/.

Meteorological and communication towers are estimated to kill millions of birds per year. We recommend following the guidance set forth in the Service Interim Guidelines for Recommendations on Communications Tower Siting, Constructions, Operation and Decommissioning, found online at: http://www.fws.gov/habitatconservation/communicationtowers.html, to minimize the threat of avian mortality at these towers. Monitoring at these towers would provide insight into the effectiveness of the minimization measures. We request the results of any wildlife mortality monitoring at towers associated with this project.

We request that you provide us with the final location and specifications of your proposed towers, as well as the recommendations implemented. A Tower Site Evaluation Form is also available via the above website; we recommend you complete this form and keep it in your files. If meteorological towers are to be constructed, please forward this completed form to our office.

More information concerning sections 7 and 10 of the Act, migratory birds, candidate species, and landowner tools can be found on our website at: http://www.fws.gov/southwest/es/TexasCoastal/ProjectReviews.html.

Wetlands and Wildlife Habitat

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to flood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the floodplain and/or wetland area during construction to prevent possible contamination of water and soils.

Wetlands and riparian areas are high priority fish and wildlife habitat, serving as important sources of food, cover, and shelter for numerous species of resident and migratory wildlife. Waterfowl and other migratory birds use wetlands and riparian corridors as stopover, feeding, and nesting areas. We strongly recommend that the selected project site not impact wetlands and riparian areas, and be located as far as practical from these areas. Migratory birds tend to concentrate in or near wetlands and riparian areas and use these areas as migratory flyways or corridors. After every effort has been made to avoid impacting wetlands, you anticipate unavoidable wetland impacts will occur; you should contact the appropriate U.S. Army Corps of Engineers office to determine if a permit is necessary prior to commencement of construction activities.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping (42 C.F.R. 26961), where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/.

If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005, ext. 246, if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
(281) 286-8282

Project Summary

Consultation Code: 02ETTX00-2018-SLI-0920

Event Code: 02ETTX00-2018-E-01935

Project Name: RWIS Channel Upgrade

Project Type: DEVELOPMENT

Project Description: Bryan Mound RWIS Channel Upgrade

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/28.91674580112894N95.38647754095018W

Counties: Brazoria, TX

Endangered Species Act Species

There is a total of 11 threatened, endangered, or candidate species on this species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

Mammals

NAME	STATUS
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Clams

NAME	STATUS
Smooth Pimpleback *Quadrula houstonensis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8967	Candidate
Texas Fawnsfoot *Truncilla macrodon* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8965	Candidate

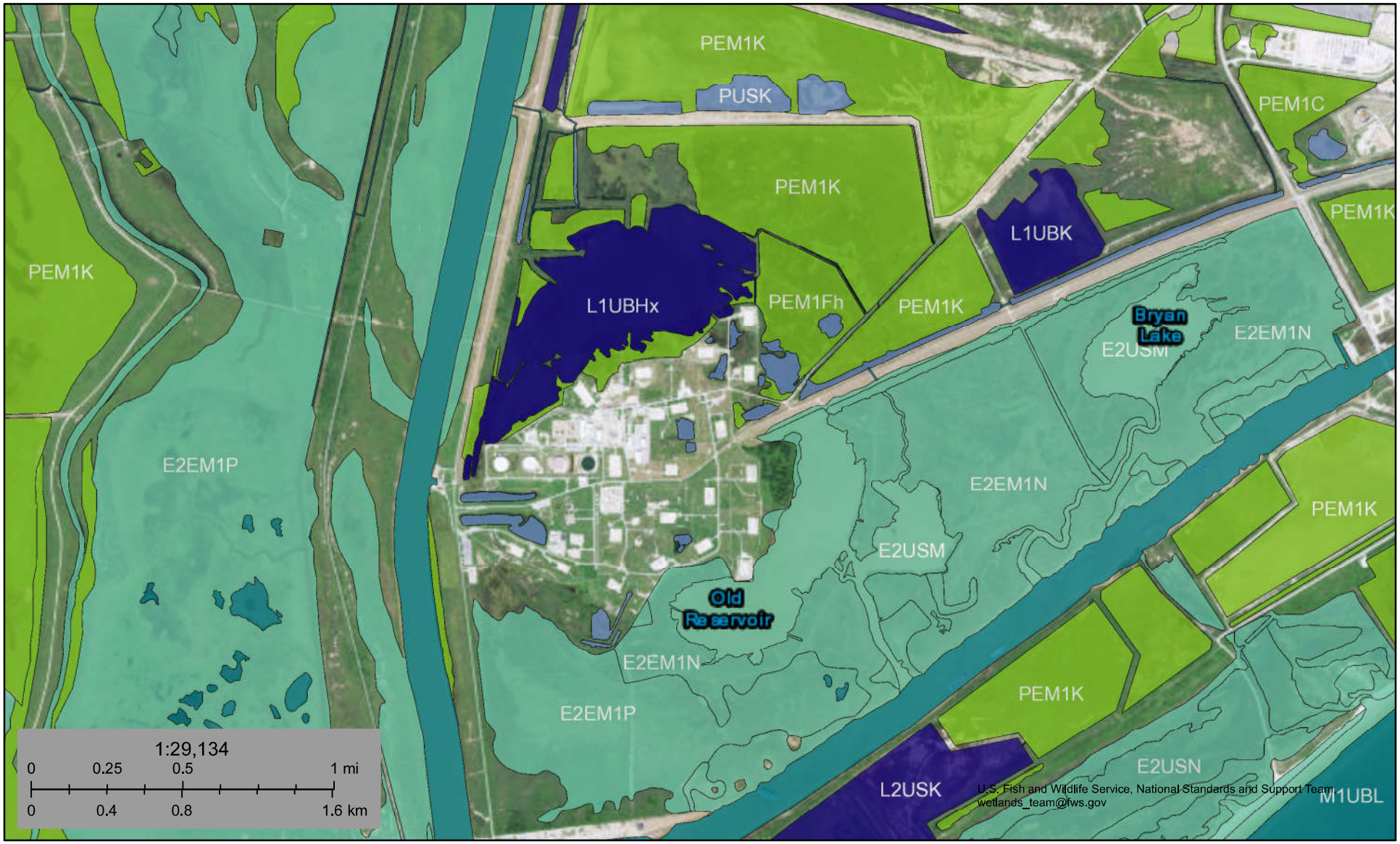
Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

Appendix E - U.S. Fish and Wildlife Service Wetland Map

U.S. Fish and Wildlife Service
National Wetlands Inventory

SPR Bryan Mound Wetlands Map



December 13, 2017

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper