Environmental Appendix D
Integrated Planning and Design Analysis and Environmental Assessment
Waco Metropolitan Area Regional Sewerage System Treatment Plant
Waco and McLennan County, Texas
Brazos River
Section 14 Emergency Streambank and Shoreline Protection

May 2021

US Army Corps of Engineers®
Fort Worth District

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List of Acronyms

ACE Annual Chance Exceedance
AQCR Air Quality Control Region
CEQ Council on Environmental Quality
CFR Code of Federal Regulations
CO Carbon monoxide
CWA Clean Water Act
cy cubic yards
dB Decibel
DNL Day night level
EO Executive Order
EPA Environmental Protection Agency
ESA Endangered Species Act
F Fahrenheit
FEMA Federal Emergency Management Agency
FWOP Future without Project
FWP Future with Project
HUD Housing and Urban Development
IFR/EA Integrated Feasibility Report/Environmental Assessment
IPaC Information, Planning, and Consultation
MBTA Migratory Bird Treaty Act
NAAQS National Ambient Air Quality Standard
NEPA National Environmental Policy Act
NO_2 Nitrogen dioxide
NWI National Wetland Inventory
O_3 Ozone
OSHA Occupation Safety and Health Administration
Pb Lead
PL Public Law
PM_{10} Particulate Matter – 10 micron
$PM_{2.5}$ Particulate Matter – 2.5 micron
RWTP Regional Wastewater Treatment Plant
SO_2 Sulfur dioxide
STGCD South Trinity Groundwater Conservation District
TCEQ Texas Commission on Environmental Quality
TMDL Total Maximum Daily Load
TN Total nitrogen
TP Total phosphorus
USACE U.S. Army Corps of Engineers
USC United States Code
USFWS U.S. Fish and Wildlife Service
USGS U. S. Geological Survey
WMARSS Waco Metropolitan Area Sewer System

WRDA Water Resources Development Act

1 Introduction

This project is authorized under Section 14 of the flood Control Act of 1946; Public Law (PL) 79-526 as amended. Under Sec 14 the U.S. Army Corps of Engineers (USACE) is authorized to plan, design, and construct small flood control projects.

This project will investigate the specific erosion along the Brazos River bank in the area adjacent to the Waco Regional Treatment Plant (Figure 1) and look for solutions that will stop the erosion of the river bank which is endangering the water treatment plant and all the utilities services associated with it including the water intake point for the City of Robinson and the water pump station for the Sandy Creek Power plant. Solutions will incorporate naturalistic channel design whenever possible and investigate any alternatives to protect the river bank.

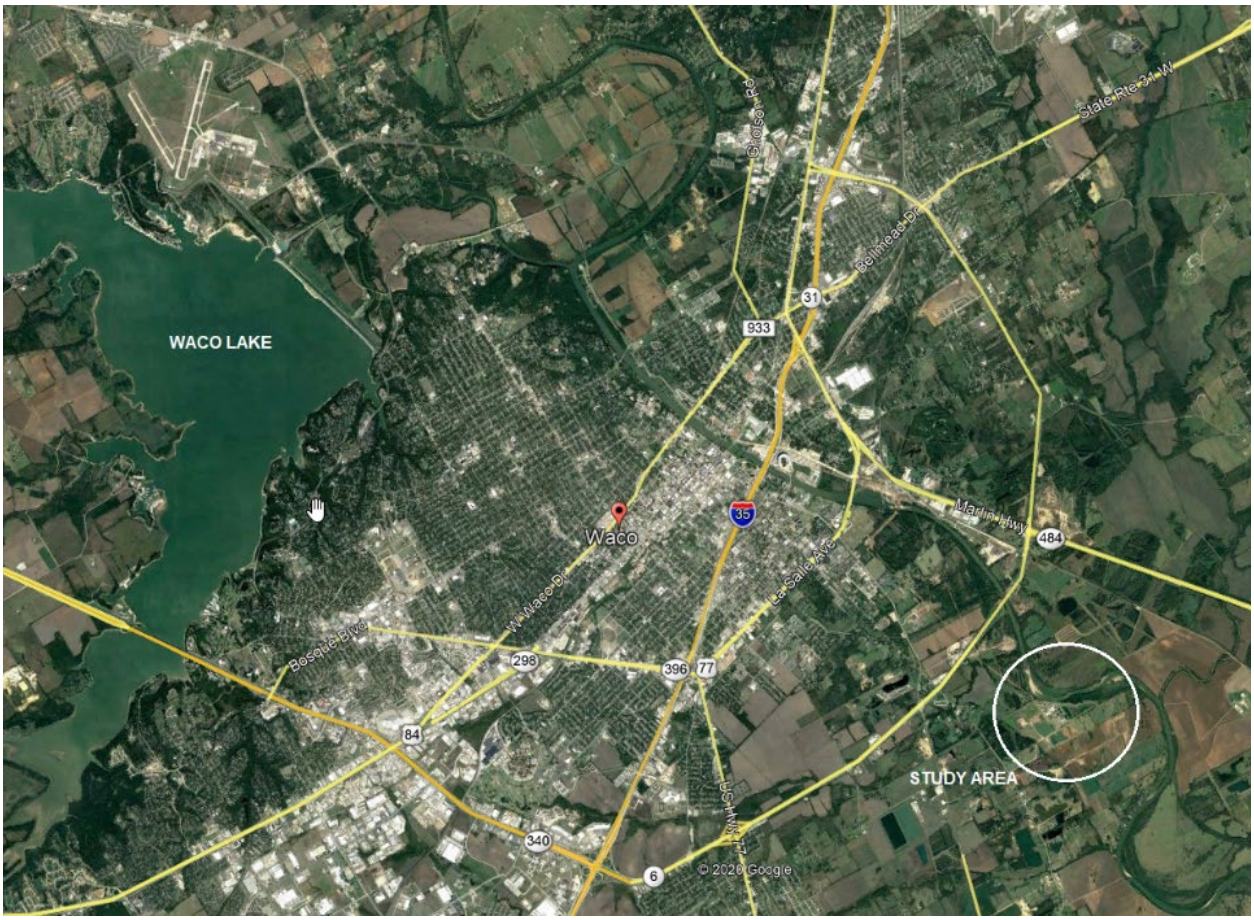

Figure 1. Project Location

2 Study Area

The study area is located southeast of the city center of Waco, Texas on the Brazos River. The Brazos is a winding river that bends as it travels throughout the area. At one of the

bends is the Waco Metropolitan Area Sewer System (WMARSS) Regional Wastewater Treatment Plant (RWTP) and the City of Robinson's Water Supply Intake (Figure 2).

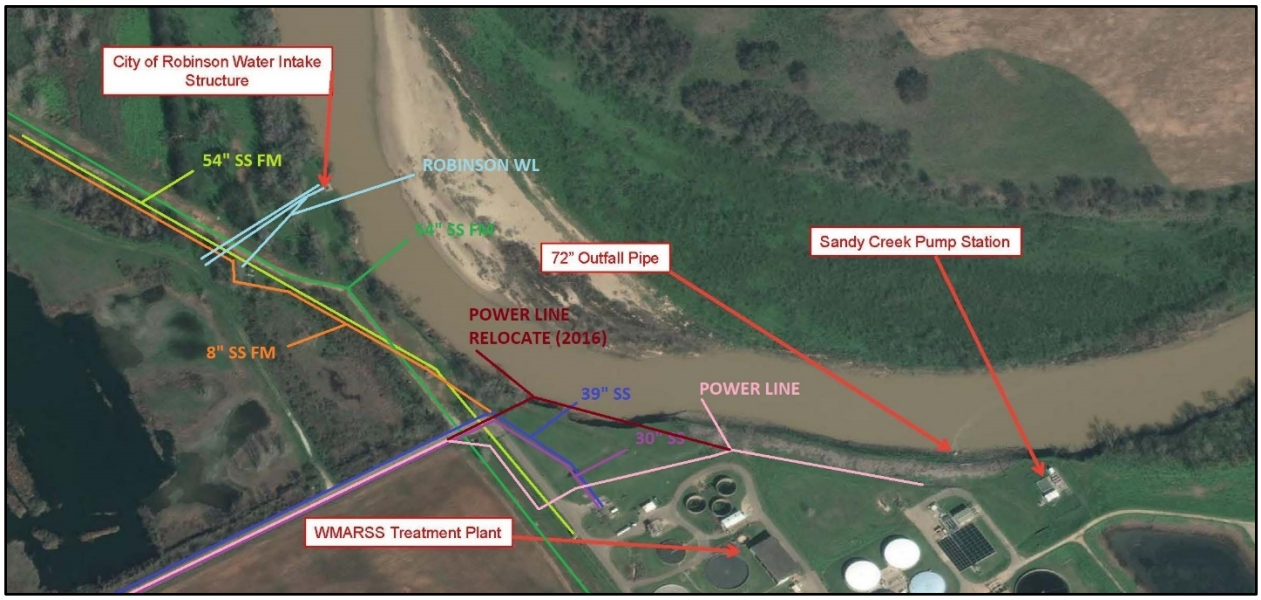

Figure 2. Project Location and Study Area.

3 Purpose, Need, and Authority for the Action

The Waco Wastewater Treatment Plant services both the cities of Waco and Robinson in Texas. It is located on the Brazos River, a river that meanders as the riverbanks erode. The erosion has been encroaching on the plant over the last ten years due to high flows in the river from various storm events within the watershed causing an approximate erosion rate of 7 ft per year. In the last flood event in 2016, the City reported a loss of 50' feet of bank. The power company had to relocate 4 power poles. The loss caused power poles, guy wire anchors, and security fencing to fall into the river. Currently only 100' of bank remains until the access road is damaged and only 200' until holding tanks are damaged.

The right bank of the Brazos River, adjacent to the Waco Regional Treatment Plant, has been steadily eroding during the past several years. The erosion, if allowed to continue, will impact three critical infrastructure facilities: Waco Regional Treatment Plant, city of Richardson water intake (located about 1,000 feet upstream), and the Sandy Creek power plant intake structure (located within the Waco Regional Treatment Plant facility).

4 Alternatives

A total of four alternatives were assessed, including the no-action alternative, also known as the Future without Project (FWOP) condition.

4.1 No-Action Alternative

Under the No-Action Alternative the banks of the river along the project site would continue to erode further jeopardizing the stability of the land upon which the wastewater treatment plant sits.

4.2 Longitudinal Peaked Stone Dike and Tie Back

Alternative 1 consists of a longitudinal peaked stone toe dike placed at the toe along a 1,300-feet section upstream of exiting riprap bank protection and 300 feet section downstream of existing riprap on the right bank of the Brazos River. The upstream reach of the stone toe dike would begin at Station 0+00, north of The City of Robinson intake structure. The downstream reach of the stone dike would run adjacent to the Sandy Creek Pump Station. The existing bank should be dressed up by placing fill material at a slope of 1V:2H. The longitudinal stone toe dike would have a triangular cross section with an approximate height of eight feet, a base width of about 48-feet, and 3H:1V side slopes. The entire 1,600-foot reach of the longitudinal stone toe dike would have stone tie-back dikes extending out perpendicularly from the crest of the longitudinal stone dike to the bank and would be spaced every 100-feet along the longitudinal stone dike. The crest height of the tie-back dikes would match the crest height of the longitudinal stone dike at the juncture of the two and would slope up toward the bank on a slope of 5H:1V. The tie-back dikes would be keyed into the bank three feet below the existing ground. The exposed embankment would be planted with native vegetation. This alternative would require approximately 31,200 cubic yards of riprap material into the river channel, 26,200 cubic yards of fill material to dress up bank and 9,400 square yards of native vegetation.

4.3 Stone Riprap Toe Protection

Alternative 2 consists of stone riprap placed at the toe along approximately 1,300-feet upstream of existing riprap bank protection and 300 feet downstream of existing riprap on the right bank of the Brazos River. The upstream reach of the riprap would begin at Station 0+00, north of The City of Robinson intake structure. The downstream reach of the riprap would run adjacent to the Sandy Creek Pump Station. The existing bank should be dressed up by placing fill material at a slope of 1V:2H. An 18-inch thick stone riprap layer will be placed along the toe of the dressed-up bank and extend to the top of bank to provide erosion protection to the toe of the bank from river scour. This alternative would require approximately 26,200 cubic yards of fill material to dress up bank, 7,400 cubic yards of riprap material, and 3,700 cubic yards of bedding material into the river channel.

4.4 Longitudinal Peaked Stone Toe Protection with Bendway Weirs

Alternative 3 consists of bendway weirs constructed of stone in combination with a longitudinal peaked stone toe dike placed at the toe along approximately 1,300-feet section upstream of exiting riprap bank protection and 300 feet section downstream of existing riprap on the right bank of the Brazos River. The upstream reach of the stone toe dike would begin at Station 0+00, north of The City of Robinson intake structure. The downstream reach of the stone dike would run adjacent to the Sandy Creek Pump Station. The existing bank should be dressed up by placing fill material at a slope of 1V:2H. The weirs have a trapezoidal cross-section about 4 feet in height, a five-foot crest width, 2H:1V side slopes and would slope downward toward the center of the riverbed on a 20H:1V slope. The weirs would be spaced every 100 feet and would extend out toward the centerline of the riverbed 15 feet from the longitudinal stone toe dike. The weirs are angled upstream approximately 10 to 15 degrees from the radius of the bend to direct flow away from the bank toward the center of the riverbed. The bendway weirs would extend up the bank on a 3H:1V slope to intersect bank, continuing up the slope at 2H:1V, with a key-in 3 feet below top of bank. This alternative would require approximately 25,000 cubic yards of riprap material into the river channel, 26,200 cubic yards of fill material to dress up bank and 10,500 square yards of native vegetation.

5 Existing Conditions

The following section describes the existing conditions of the study area. This analysis established a baseline, or existing condition, to provide a frame of reference to evaluate the performance of alternative plans.

5.1 Land Use

The Brazos River runs through the project site. The wastewater treatment plant for the City of Waco is to the south of the study area. The study area is bordered by agricultural land.

5.2 Climate

The region has a humid subtropical climate with hot summers. The climate is characterized by extreme variations in temperature. The average annual temperature is 66.9º Fahrenheit (F), with a high in August of 85.7º F and a low in January of 46.9º F. Precipitation averages 33.41 inches/yr, with the highest rains seen in the late spring (3.36 inches in April and 4.55 inches in May) and the least amount of rain the summer (1.82 inches in July and 1.83 inches in August) (NOAA, 2020).

5.3 Water Resources

Water resources include both surface water and groundwater resources, associated water quality, and floodplains. Surface water includes all lakes, ponds, rivers, streams, impoundments, wetlands and estuaries within the watershed. Subsurface water, commonly referred to as ground water, is typically found in certain areas known as aquifers. Aquifers are areas with high porosity rock where water can be stored within pore spaces. Water quality describes the chemical and physical composition of water affected by natural conditions and human activities.

5.3.1 Hydrology and Hydraulics

The Brazos River runs through the study area. The U. S. Geological Survey (USGS) maintains a flow gage upstream of the project site near Waco (USGS 08096500). The mean daily discharge rate in cubic feet/second (cfs) at the gage is 2,060 cfs, with a 25th percentile of 278 cfs and a 75th percentile of 2,220 cfs. The minimum daily discharge rate of 39 cfs was recorded in 2014 while a maximum of 20,000 was recorded in 1977 (USGS, 2020).

5.3.2 Floodplains

Federal Emergency Management Agency (FEMA) National Flood Insurance Maps were used to delineate the 100-year floodplains for the study area (FEMA, 2019). Additional Hydrology and Hydraulic models further refined the areas inundated at various annual chance exceedances (ACEs), including the 0.01 ACE. The FEMA Flood Maps delineate the watershed using different zone designations associated with the probability of flooding frequency for that area. The study area contains six different zone designations:

- A and AE – Areas subject to inundation by the one percent ACE,
- AO – Areas subject to inundation by the one percent ACE shallow flooding, usually sheet flow on sloping terrain) where average depths are between one and three feet,
- AH – Areas subject to inundation by the one percent ACE shallow flooding, usually areas of ponding) where average depths are between one and three feet,
- VE – Areas subject to inundation by the one percent ACE with additional hazards due to storm-induced velocity wave action
- X – Areas outside of the 0.2 percent floodplain
- NP – Areas not mapped by the FEMA National Flood Insurance Program.

FEMA has designated the areas adjacent to and surrounding the project area as Zone A. This is shown in Figure 3.

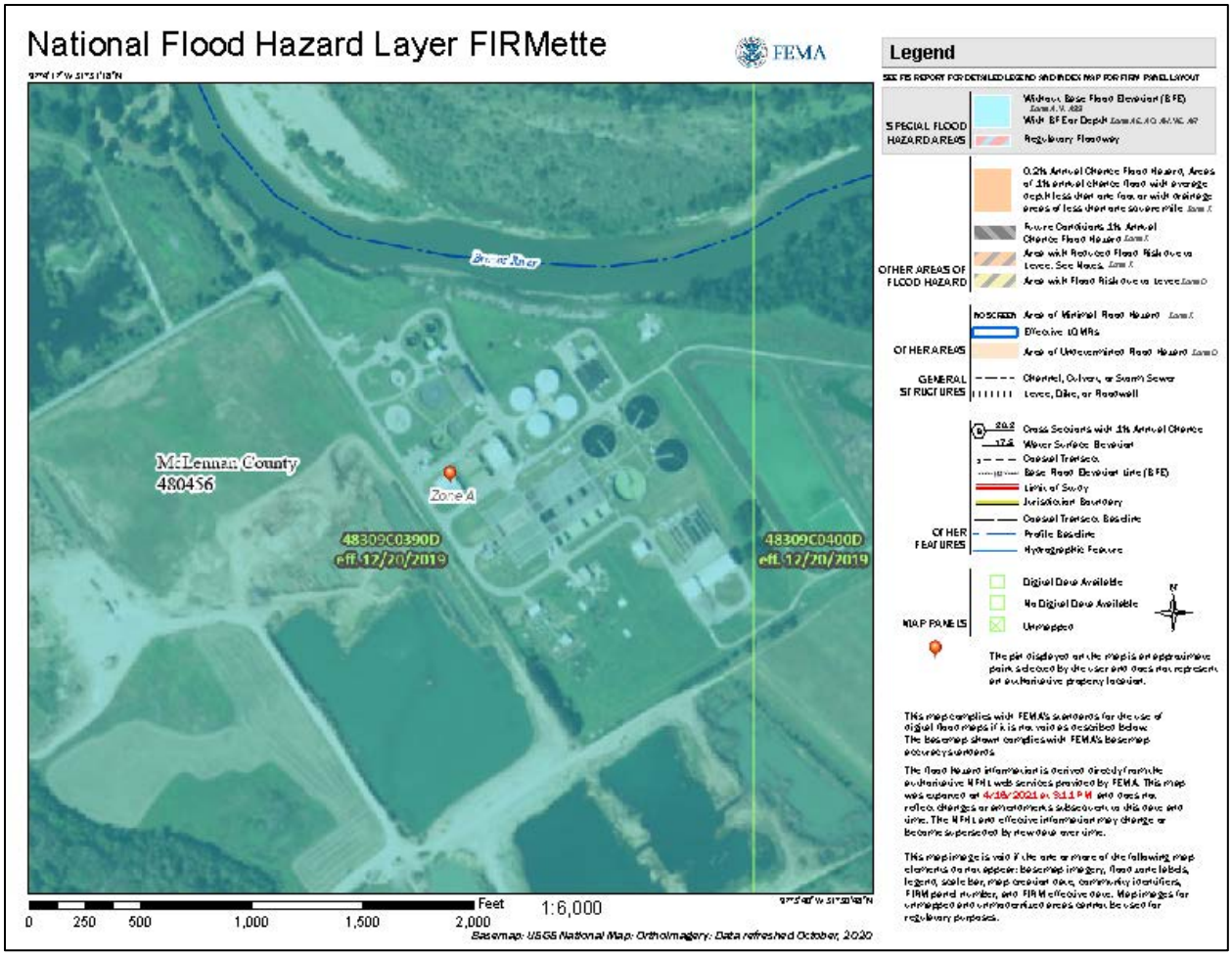

Figure 3. FEMA Flood Zone

5.4 Wetlands

Wetlands are often defined as areas where the frequent and prolonged presence of water at or near the soil surface drives the natural system. Wetland areas require specific hydrology, soil types (i.e. hydric soils), and plant species that are characterized as requiring wetland habitats.

The USFWS (2020) has mapped wetlands within the study area as part of the National Wetlands Inventory (NWI). Although the USFWS have identified several errors in the national NWI, the database provides a good baseline prior to field identification.

The NWI mapper identifies wetland areas surrounding the project area which include a large freshwater forested/shrub wetland (PFO1A), and the Brazos River, classified as Riverine (R2USA, R2USC, and R2UBH) (Figure 4).

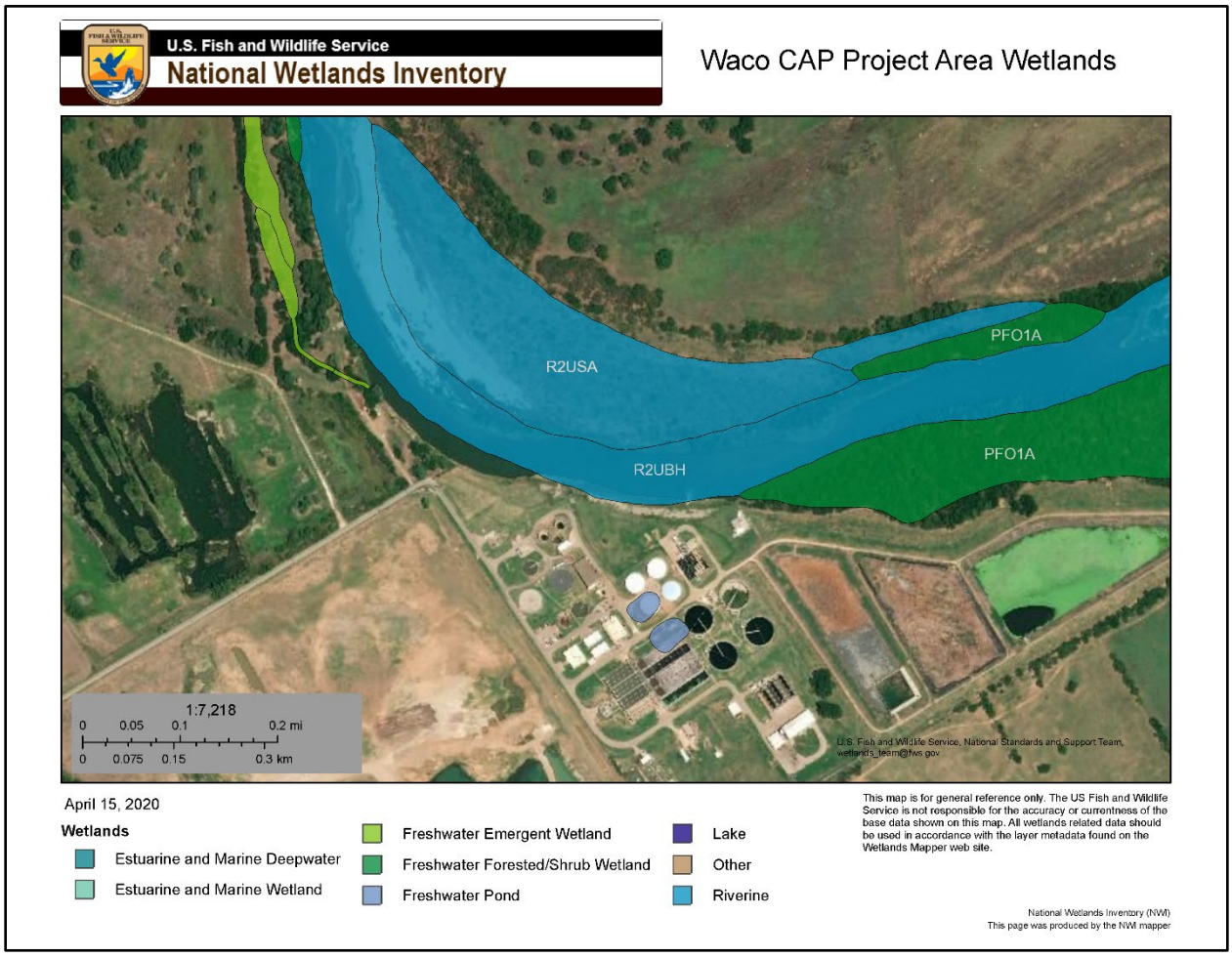

Figure 4. Wetlands around the Waco CAP Study Area.

5.5 Ground Water

The project area is underlain by the Trinity Aquifer. It is primarily recharged by precipitation. The management of the groundwater resources is regulated by the South Trinity Groundwater Conservation District (STGCD). TCEQ has designated the Trinity Aquifer a priority groundwater management area due to the decline in groundwater levels. The groundwater is pumped for use in municipalities, manufacturing, and livestock (STGCD, 2010).

5.6 Air Quality

The U.S. Environmental Protection Agency (EPA) has the primary responsibility for regulating air quality nationwide. The Clean Air Act (42 U.S.C. 7401 *et seq.*), as amended, requires the EPA to set National Ambient Air Quality Standards (NAAQS) for

wide-spread pollutants from numerous and diverse sources considered harmful to public health and the environment.

EPA has set NAAQS for six principal pollutants, which are called “criteria” pollutants. These criteria pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), sulfur dioxide (SO_2), and lead (Pb). If the concentration of one or more criteria pollutants in a geographic area is found to exceed the regulated “threshold” level, the area may be classified as a non-attainment area. Areas with concentrations of criteria pollutants that are below the levels established by the NAAQS are considered in attainment.

The project area is in Air Quality Control Region (AQCR) 212 – Austin-Waco. This region includes Bastrop, Bell, Blanco, Bosque, Brazos, Burleson, Burnet, Caldwell, Coryell, Falls, Freestone, Grimes, Hamilton, Hays, Hill, Lampasas, Lee, Limestone, Llano, Madison, McLennan, Mills, Robertson, San Saba, Travis, Washington, and Williamson Counties. This region is in attainment of all NAAQS criteria pollutants (EPA, 2020).

5.7 Water Quality

The Texas Commission on Environmental Quality (TCEQ) monitors the state’s surface waters under Sections 303(d) and 305(b) of the Clean Water Act. The agency reports concerns regarding public health, fitness for use by aquatic species, and specific pollutants to the EPA under these sections. TCEQ has two Surface Water Quality Monitoring (SWQM) stations on the Brazos River near the project site, one upstream (SWQM 12038) and one downstream (SWQM 12037). This section of the Brazos River encompasses Stream Segment 1242 (Brazos River above Navasota River). In the 2018 review of the state’s water bodies TCEQ found this area of the Brazos River have a High level of Aquatic Life Use (TCEQ, 2019) and did not include the river segment among the List of Impaired Waters.

5.8 Geologic Resources

Geologic resources are defined as the topography, geology, soils, and mining minerals of a given area. The existing physiography, soils, and geomorphology of the study area is a result of complex interactions of geological, hydrological, and meteorological processes.

5.9 Soils

The Farmland Protection Policy Act of 1981 (FPPA)(P.L. 97-98) is intended to minimize the impact of Federal actions on the conversion of prime farmland, unique farmland, or land of statewide or local importance to non-agricultural uses. Farmland consists of

cropland, forest land, rangeland, and pastures. Urban lands containing prime farmland soils are not covered under the FPPA.

Prime farmland is land that has the best combination of physical and chemical properties for producing food, feed, forage, fiber, and oilseed crops. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. 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. Nearness to markets is also a consideration. Unique farmland is not based on national criteria. Farmland of statewide importance do not meet the qualifications of prime or unique farmland.

Table 1 lists the soil types found in the study area. None of the soils are listed as prime or unique farmlands. Weswood, silt loam, rarely flooded is listed as a hydric soil.

Soil Type	Acreage	% of Study Area
Weswood, silt loam, rarely flooded	4.3	34.2
Yahola loam, rarely flooded	2.0	16.2
Water	6.2	49.6

Table 1. Soil types in the Waco Wastewater Treatment Plant Study Area (NRCS, 2020)

5.10 Biological Communities

5.10.1 Vegetation

The cut bank is denuded of vegetation with the exception of scattered pioneer grass and forbs such as knotweeds, cheatgrass, and nut-sedges. The vegetated terrace on the south bank is located 8 to 15 feet above the normal high water mark. The vegetation on the terrace within and adjacent to the wastewater treatment plant consists of maintained Bermudagrass turf. Forested areas occur on the terrace up- and downstream of the wastewater treatment plant on the south eroded cut bank of the river. The forested areas are dominated by hackberry (*Celtis laevigata*), green ash (*Fraxinus pensylvanica*), black willow (*Salix nigra*), and cedar elm (*Ulmus crassifolia*). Understory vegetation within the forested areas include Texas wintergrass (*Nasella leucotricha*), Canada wildrye (*Elymus canadensis*), poison ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), and peppervine (*Ampelopsis arborea*).

5.10.2 Threatened and Endangered Species

Wildlife and plant species may be classified as threatened or endangered under the Endangered Species Act (ESA) of 1973. Protection of non-marine protected species is overseen by the USFWS and NMFS is responsible for protected marine species. The purpose of the ESA is to establish and maintain a list of threatened and endangered species and establish protections for their continued survival. Section 7 of the ESA requires federal agencies to coordinate with USFWS and NMFS to ensure that any

federal action is complaint with the ESA and that the action will not jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification to their critical habitat.

Five ESA-listed species and one candidate species were identified in a species list requested from the USFWS Information, Planning, and Consultation (IPaC) system (***Attachment 1***): Golden-cheeked warbler (*Dendroica chrysoparia*), Least tern (*Sterna antillarum*), Piping plover (*Charidrius melodus*), Red knot (*Calidris canutus* rufa), Whooping crane (*Grus americana*) and the candidate Texas fawnsfoot (*Truncilla macrodon*). Of the listed species the least tern, the piping plover, and the red knot only need to considered for wind-related projects. There is no critical habitat for any species within the study area.

5.10.2.1 Golden-cheeked warbler

The Golden-cheeked warbler is known to breed in the Edwards Plateau, Lampasas Cut Plain, and Llano Uplift regions of Central Texas. The species overwinters in the highlands of southern Mexico and Central America. The nesting habitat for the warbler is dense forests and woodlands of Ashe junipers (*Juniperus ashei*) with other deciduous species mixed among them, including oaks (*Quercus* spp.), elms (*Ulmus* spp.) and walnuts (*Juglans* spp.) (Keddy-Hector, 1992).

5.10.2.2 Whooping crane

Whooping cranes were originally found throughout most of North America. In the nineteenth century, the main breeding area was from the Northwest Territories to the prairie provinces in Canada, and the northern prairie states to Illinois. A nonmigratory flock existed in Louisiana, but is now extirpated. Whooping cranes wintered from Florida to New Jersey along the Atlantic Coast, along the Texas Gulf Coast, and in the high plateaus of central Mexico. They now breed in isolated, marshy areas of Wood Buffalo National Park, Northwest Territories, Canada. They winter primarily in the Aransas NWR and adjacent areas of the central Texas Gulf Coast (USFWS, 1995). During migration they use various stopover areas in western Canada and the American Midwest.

Two experimental flocks have been established by incubating eggs and rearing the young in captivity before releasing them into the wild. Cranes were introduced in Grays Lake NWR in Idaho in 1975; these birds winter at Bosque del Apache NWR in central New Mexico. This population was not successful and is now extirpated. Introduction of another flock to Kissimmee Prairie in Florida began in 1993. The Florida population will be nonmigratory (NatureServe, 2018).

The natural wild population of whooping cranes spends its winters at the Aransas NWR, Matagorda Island, Isla San Jose, portions of the Lamar Peninsula, and Welder Point on the east side of San Antonio Bay (NatureServe, 2018). The main stopover points in Texas for migrating birds are in the central and eastern panhandle (USFWS, 1995).

5.10.2.3 Texas Fawnsfoot

Texas fawnsfoot is a small brown rhomboidal freshwater mussel. It occurs in the Colorado, Trinity, and Brazos River drainages in Central Texas (Howells et al., 1996). Its habitat consists of sand, gravel, and sandy-mud bottoms with water flowing over it. These conditions are not very well studied but are rather drawn from an inference (NatureServe, 2018).

5.10.3 Special Status Species and Protected Habitat

5.10.3.1 Migratory Birds

The Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712) prohibits the take of migratory birds resulting from activities unless authorized by the USFWS. Take includes pursuing, hunting, capturing, and killing of migratory birds or any part of their nests or eggs. The Act also prohibits the sale, purchase, or shipment of migratory birds, nests, or eggs. The MBTA is an international treaty with the U.S., Canada, Mexico, Japan and Russia. Non-native bird species are not protected under the MBTA.

Six migratory bird species were identified in a species list requested from the USFWS IPaC system: American golden-plover (*Pulvialis dominica*), Bald eagle (*Haliaeetus leucocephalus*), Buff-breasted sandpiper (*Calidris subruficollis*), Harris's sparrow (*Zonotrichia querula*), Lesser yellowlegs (*Tringa flavipes*), and Semipalmated sandpiper (*Calidris pusilla*). The Bald eagle is also protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c).

5.11 Socioeconomics

Socioeconomics is defined as the basic attributes and resources associated with the human environment, particularly population, demographics, and economic development. Demographics entail population characteristics and include data pertaining to race, gender, income, housing, poverty status, and educational attainment. Economic development or activity typically includes employment, wages, business patterns, and area's industrial base, and its economic growth.

Waco is the 22nd largest city in the State of Texas with a population of 138,138 based on the 2018 U.S. census estimate data, which is a 10.7% increase from 2010 (U.S. Census Bureau, 2020). Waco is the County seat and the only metropolitan area of McLennan County. Waco functions as the industrial, commercial, distribution, and population core of the county.

According to the 2018 census, the population of McLennan County includes approximately 254,607 residents, which is approximately an 8.4 percent increase from the 2010 Census (U.S. Census Bureau, 2020). The project area is located within census tract number 37.01. Persons aged 18 years and over account for 191,719 of the

population of McLennan County, or 75.3 percent. McLennan County's 65 years and older population is approximately 36,663, or 14.4 percent of the County population.

The median household income for the State of Texas in 2018 was $59,570, while the County of McLennan has a median household income of $37,735. The median income for city of Waco was $48,199 (Table 2).

Geographic Unit	Median Household Income
Texas	$59,970
County of McLennan	$37,735
City of Waco	$48,199

U.S. Census Bureau 2020
Table 2. Median Household income of the study area.

The income of approximately 18.9 percent of McLennan County residents are considered as persons of poverty, compared to 14.9 percent for the State. Racial distribution for City of Waco, McLennan County, and the State are provided in Table 3.

Race	% City of Waco	% of McLennan County	% of State of Texas
White	69.4	79.9	78.8
African American	21.6	14.9	12.8
American Indian/Alaska Native	0.5	1.1	1.0
Asian	2.2	1.8	5.2
Native Hawaiian/Pacific Islander	0.1	0.1	0.1
Two or more races	2.4	2.1	2.0
Hispanic or Latino	32.4	26.7	39.6
White/Not Hispanic or Latino	42.6	55.6	41.5

U.S. Census Bureau 2020
Table 3. Racial Distribution of the study area.

5.11.1 Environmental Justice

In order to comply with Executive Order (EO) 1289, ethnicity and poverty status in the study area were examined and compared to regional, state, and national data to determine if any minority or low-income communities could potentially be disproportionately affected by the implementation of the proposed action. No indication

of disproportionately low income or minority specific populations were identified. The data provided in Table 2 and Table 3 above also supports this finding.

5.11.2 Protection of Children

EO 13045 requires that federal actions consider potentially health and safety risks to children resulting from that action. The locations of areas where children may congregate (e.g., child care centers, schools, parks, etc.) were identified within the study area. The study area is primarily comprised of a wastewater treatment plant and river banks where children are not likely to congregate.

5.12 Hazardous, Toxic, and Radioactive Waste

In order to complete a feasibility level HTRW evaluation for the Brazos River, Waco Regional Treatment Plant (RTP) Section 14, a records search was conducted following the rules and guidance of ER 1165-2-132: HTRW Guidance for Civil Works Projects, and ASTM E1527-13: Standard Practice for Environmental Site Assessment: Phase 1 Environmental Site Assessment Process. In the records review, files, maps and other documents that provide environmental information about the project area are obtained and reviewed. To complete the records review, USACE reviewed publicly available databases and sources, using the proposed footprint of the project, along with an approximate 1 mile search distance for each of the sources. The records search revealed four potential HTRW sites in McLennan County although none of these sites have the potential to affect the proposed project. See the future without project, alternatives analysis, and the HTRW appendix (Appendix E) for more information about risks from these sites.

McLennan County has several potential HTRW sites in relative proximity (one mile) to the proposed project footprint, including 2 Resource Conservation and Recovery Act (RCRA) sites, 2 Municipal Solid Waste Landfills, 1 Industrial Hazardous Waste site, 3 Spills Listings, 2 Notice of Violations, 3 National Pollutant Discharge Elimination System sites, 2 Enforcement and Compliance History Sites and a total of 4 locations listed on the Facility Registry System. All results found were located at one of the four locations provided in Figure 1 of the HTRW Appendix (Appendix E), This a fairly small number of instances since the city of Waco is within close proximity and development of the area along the Interstate 35 corridor has increased steadily for the last decade. The proposed project area is situated on the banks of the Brazos River on land that is owned by the City Robinson and the City of Waco, primarily. The City of Waco Municipal Wastewater Treatment Plant sits within the impacted area and is the current land use for project lands. It should be noted that as a wastewater treatment facility, there are potential HTRW contaminants presently used, stored and disposed of, on a daily basis. The wastewater itself is considered a contaminant if it spills out of its allotted areas. Treated water can also have contaminant issues and should continue to be tested and processed per regulations. For this project the main concern is the erosion of the banks of the Brazos

River and the impact to the cities sole wastewater treatment plant. The 4 possible HTRW locations identified in the records review within one mile of the proposed project have an extremely low potential to impact the proposed project.

5.13 Cultural Resources

Section 106 of the National Historic Preservation Act of 1966 as amended requires federal agencies to identify impacts of its undertakings and seek ways to avoid, minimize or mitigate any adverse effects. This first requires identification of any properties on or eligible for the National Register of Historic Places within the Area of Potential Effect (APE), which is defined as the project's footprint, its view shed within the study area plus any non-commercial borrow areas and transportation routes to the project site.

The study area is located within the north-central Texas Archeological Region, specifically the Blackland Prairies physiographic region of Texas that is characterized by low rolling terrain. In general, portions of the study area that have potential for containing prehistoric archeological resources include terraces along the Brazos River and upland drainages/small creeks.

A review of previous archeological investigations, recorded archeological sites, and cemeteries was conducted on May 1, 2020 utilizing the Texas Historical Commission's (THC's) online Texas Archeological Sites Atlas (Atlas).

There are no above-ground historic-age (50 years of age) resources within the APE.

The Atlas search revealed that four previous cultural resources surveys have been conducted within the study area. A 1979 survey of 17.5 acres sponsored by the Environmental Protection Agency resulted in no archeological sites identified. Geoarchaeological excavations conducted in 2001 examined three exposed cutbanks and eight backhoe trenches in the vicinity of the proposed stabilization; no cultural materials were observed. An additional survey performed in 2016 for the proposed LaSalle Transfer Lift Station and associated water lines found that the site had undergone significant disturbance from sand mining.

One previously recorded archaeology site, 41ML231, is located 30 meters from the eroding riverbank. This site was revisited during the 2016 survey and found ineligible for listing in the National Register of Historic Places within that project right of way. Note that the right of way is a narrow strip of land and sites could be located on either side. However, based on data gathered from previous surveys and previous disturbance from construction of the wastewater treatment facility, intact archaeological deposits are not likely to exist within this western portion of the project area.

The fourth survey was conducted immediately east of the study area, where a 28-acre survey in 2007 sponsored by USACE SWF resulted in no archeological sites identified.

Any proposed bank modification, the use of transportation routes to the site or use of non-commercial borrow areas may require cultural resources surveys to determine historic properties present within the APE to meet Section 106 requirements.

5.14 Noise

Noise is generally defined as unwanted sound. Noise can be any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying. Human responses to noise vary depending on the type and characteristics of the noise, distance between the noise source and receptor, receptor sensitivity, and time of day.

Determination of noise levels are based on 1) sound pressure level generated (decibels [dB] scale); 2) distance of listener from source of noise; 3) attenuating and propagating effects of the medium between the source and the listener; and 4) period of exposure.

An A-weighted sound level, measured in dBA, is one measurement of noise. The human ear can perceive sound over a range of frequencies, which varies for individuals. In using the A-weighted scale for measurement, only the frequencies heard by most listeners are considered. This gives a more accurate representation of the perception of noise. The noise measure in a residential area, similar to conditions within the study area, is estimated at approximately 70 dBA. Normal conversational speech at a distance of five to ten feet is approximately 70 dBA. The decibel scale is logarithmic, so, for example, sound at 90 dBA would be perceived to be twice as loud as sound at 80 dBA. Passenger vehicles, motorcycles, and trucks use the roads in the vicinity of the project area. Noise levels generated by vehicles vary based on a number of factors including vehicle type, speed, and level of maintenance. Intensity of noise is attenuated with distance. Some estimates of noise levels from vehicles are listed in Table 4 (Cavanaugh and Tocci, 1998).

Source	Distance (ft)	Noise Level (dba)
Automobile, 40 mph	50	72
Automobile Horn	10	95
Light Automobile Traffic	100	50
Truck, 40 mph	50	84
Heavy Truck or Motorcycle	25	90

Source: Cavanaugh and Tocci, 1998
Table 4. Typical Noise Sources

The EPA has identified a range of yearly day-night sound level (DNL) standards that are sufficient to protect public health and welfare from the effects of environmental noise (EPA, 1977). The EPA has established a goal to reduce exterior environmental noise to a DNL not exceeding 65 dBA and a future goal to further reduce exterior environmental noise to a DNL not exceeding 55 dBA. Additionally, the EPA states that these goals are not intended as regulations as it has no authority to regulate noise levels, but rather they

are intended to be viewed as levels below which the general population will not be at risk from any of the identified effects of noise.

The U.S. Occupational Safety and Health Administration (OSHA) has established acceptable noise levels for workers. Table 5 shows permissible noise levels for varying exposure times.

Duration per day-hours	Sound level dBA slow response
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

Source: OSHA, 2012
Table 5. OSHA Permissible Noise Exposures

The Noise Control Act of 1972 (42 United States Code [U.S.C.] 4901 to 4918) established a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare. To accomplish this, the Act establishes a means for the coordination of Federal research and activities in noise control, authorizes the establishment of Federal noise emissions standards for products distributed in commerce, and provides information to the public respecting the noise emission and noise reduction characteristics of such products (42 U.S.C. 4901). The Act authorizes and directs that Federal agencies, to the fullest extent consistent with their authority under Federal laws administered by them, carry out the programs within their control in such a manner as to further the policy declared in 42 U.S.C. 4901.

Federal workplace standards for protection from hearing loss allow a time-weighted average level of 90 dBA over an 8-hour period, or 85 dBA averaged over a 16-hour period. Noise annoyance is defined by the EPA as any negative subjective reaction on the part of an individual or group (EPA, 1977). For community noise annoyance thresholds, a day-night average of 65 dBA has been established by the United States Department of Housing and Urban Development (HUD) as eligibility for federally guaranteed home loans. (Federal Interagency Committee on Noise, 1992).

The study area is located in a mixed area of agricultural and industrial outside the town of Waco. The noise environment in typical of a more rural area; the setting is dominated by vehicular noise. With the exception of a farmhouse located approximately 0.5 miles from the wastewater treatment plant, no noise receptors are located within a mile of the proposed project area. The proposed project area is not significantly affected by airfield

noise. The closest airfield to the proposed project area is Diamondaire Airport, which is approximately eight miles north-northwest of the proposed project area.

5.15 Visual Aesthetics

Visual resources are defined as the natural and manufactured features that comprise the aesthetic qualities of an area. These features form the overall impressions that an observer receives of an area or its landscape character. Landforms, water surfaces, vegetation, and manufactured features are considered characteristic of an area if they are inherent to the structure and function of a landscape.

The study area is predominately agricultural. Relatively undeveloped are found in the areas adjacent to the study area with increasing development towards the town of Waco. The visual aesthetics of these areas is typical of rural and riverine environments.

5.16 Recreation

This area of the Brazos River is not known for being a major area for paddling or kayaking. This segment of the river is not included among the Texas Paddling Trail list of Inland Trails. Swimming is not recommended due to high currents and muddy water.

6 Environmental Consequences

The environmental consequences chapter describes the probable effects or impacts of implementing any of the action alternatives (the Future with Project condition or FWP). Effects can be either beneficial or adverse, and are considered over a 50-year period of analysis (2022-2072).

Environmental impacts will be assessed according to state environmental regulations (HRS 343 and HAR 11-200), as well as federal guidelines (NEPA). Descriptions of the assessment criteria under both state and federal guidelines are presented below.

6.1 Federal Environmental Guidelines

The CEQ regulations (40 CFR 1508.7 and 1508.8) define the impacts that must be addressed and considered by Federal agencies in satisfying the requirements of the NEPA process, which includes direct, indirect and cumulative impacts.

Direct impacts are caused by the action and occur at the same time and place. Indirect impacts are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect impacts may include growth inducing impacts and other impacts related to induced changes in the pattern of land use, population density or growth rate, and related effects on air, water and other natural systems, including ecosystems.

Impacts include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historical, cultural, economic, social, or health, whether direct, indirect, or cumulative. Impacts may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial (40 CFR 1508.8).

According to the CEQ regulations (40 CFR 1500-1508), the determination of a significant impact is a function of both context and intensity. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the Proposed Action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

Intensity refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:

1. Impacts that may be both beneficial and adverse. A significant impact may exist even if the Federal agency believes that on balance the effect will be beneficial.
2. The degree to which the Proposed Action affects public health or safety.
3. Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.
4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.
5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
6. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.
8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of

Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.
10. Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment (40 CFR 1508.27).

To determine significance, the severity of the impact must be examined in terms of the type, quality and sensitivity of the resource involved; the location of the proposed project; the duration of the effect (short or long-term) and other consideration of context. Significance of the impact will vary with the setting of the Proposed Action and the surrounding area (including residential, industrial, commercial, and natural sites).

6.2 Alternatives Considered

The No Action Alternative and three action alternatives, as described in the Plan Formulation section of the study's Integrated Feasibility Report/Environmental Assessment (IFR/EA) were considered in analyzing impacts from the implementation of any beneficial use of dredged material measures:

1. No Action Alternative
2. Longitudinal Peaked Stone Dike and Tie Back
3. Stone Rip Rap Toe Protection
4. Longitudinal Peaked Stone Toe Protection with Bendway Weirs

The future without project condition (FWOP), also known as the "No Action Alternative", is the most likely condition expected to occur in the future in the absence of the proposed action or action alternatives. As with the Future with Project Conditions, the impacts to resources are projected over a 50-year window, or the designed life of the proposed project. Therefore, the FWOP conditions project changes that would occur until the year 2072. For the study area, the No Action Alternative means that the riverbank will continue to erode and jeopardize the stability of the land where the wastewater treatment facility sits.

6.3 Land Use

6.3.1 No Action Alternative

The proposed project area is located at the Waco Wastewater Treatment Plant. The area would remain in control of the wastewater treatment plant; no changes in land use would occur as the result of the No Action Alternative, further erosion of the Brazos River bank would occur, threatening the integrity of the wastewater treatment plant.

6.3.2 Action Alternatives

Under each Action Alternative, the wastewater treatment plant property would be protected and no changes in land use would occur.

6.4 Climate

The proposed project encompasses a relatively small area when compared to the global scale. Therefore, any changes with respect to climate change resulting from the No Action and Action Alternatives would be negligible.

The resiliency of the Action Alternatives to climate change has been addressed in the Engineering Appendix of the Main Report.

6.5 Water Resources

6.5.1 Floodplains

6.5.1.1 No Action Alternative

Under the No Action Alternative, no fill material would be introduced into the proposed project area. The cut bank on the wastewater treatment plant side of the river would continue to migrate and the floodplain would be modified to accommodate the changes in the rivers path.

6.5.1.2 Longitudinal Peaked Stone Dike and Tie Back Alternative

Alternative 1 entails the placement of 31,000 cubic yards of riprap material into the river channel, 26,200 cubic yards of fill material to dress up bank and 9,400 square yards of native vegetation to be placed over a 1,600-foot long section of the Brazos River adjacent to the wastewater treatment plant. To meet the design specifications, portions of the bank would need to be excavated to prepare the site for the placement of the riprap material. The net difference between he excavated material and placed mater would result in negligible impacts to the existing floodplain profile.

6.5.1.3 Stone Riprap Toe Protection Alternative

Alternative 2 consists of the placement of approximately 26,200 cubic yards of fill material to dress up bank, 7,400 cubic yards of riprap material, and 3,700 cubic yards of bedding material to be placed over a 1,600-foot long section of the Brazos River adjacent to the wastewater treatment plant. To meet the design specifications, portions of the bank would need to be excavated to prepare the site for the placement of the riprap material. The net difference between he excavated material and placed mater would result in negligible impacts to the existing floodplain profile.

6.5.1.4 Longitudinal Peaked Stone Toe Protection with Bendway Weirs Alternative

Alternative 3 entails the placement of approximately 25,000 cubic yards of riprap material into the river channel, 26,200 cubic yards of fill material to dress up bank and 10,500 square yards of native vegetation to be placed over a 1,600 foot long section of the Brazos River adjacent to the wastewater treatment plant. To meet the design specifications, portions of the bank would need to be excavated to prepare the site for the placement of the riprap material. The net difference between he excavated material and placed mater would result in negligible impacts to the existing floodplain profile.

6.6 Wetlands

6.6.1 No Action Alternative

Under the No Action Alternative, the Brazos River would continue to migrate into the eroded cut bank extending the R2UBH wetland to the south. Typical of dynamic river systems, the inside bend along the north bank of the river would begin to shoal as the river migrated into the cut bank. As the river migrates into the southern cut bank, the forested palustrine wetland (PFO1A) located at the top of the cut bank downstream of the existing riprap would eventually be lost as the high bank sloughs off into the river. As the southern boundary of these wetlands are bordered by the levee surrounding the wastewater treatment plant, there would be nowhere for these forested wetlands to migrate; therefore, the future without project conditions associated with the No Action Alternative would result in a shift of the riverine wetlands and a net loss of forested wetlands downstream of the existing riprap.

6.6.2 Action Alternatives

Each of the Action Alternatives would result in the placement of riprap (see Sections 5.5.1.2 - 5.5.14 for volumes of riprap to be placed in the river) along the south cut bank 1,300 linear feet upstream and 300 linear feet downstream of the existing wetland. The riprap would stabilize the eroded cut bank keeping the river from migrating into the bank. The placement of the riprap would change the bed material from an unconsolidated bottom to a hardened rocky bottom along the southern outside bend of the river along the 1,600 feet of proposed reinforcement of each of the Action Alternatives.

The three Action Alternatives would also result in impacts to approximately 0.3 acres of palustrine forested wetlands (PFO1A) downstream of the existing riprap as this area would need to be cleared for the construction of the bank stabilization (Figure 5). However, it is anticipated that the future without project condition would result in not only the loss of the 0.3 acres of impacted wetlands, but that the future erosion would continue further downstream into the remaining forested wetlands. Although each of the action alternatives would result in the loss of 0.3 acres of forested wetlands, the stabilization of the bank would protect the remaining wetland habitats downstream of the proposed project area. Therefore, each of the Action Alternatives would result in a net increase of forested wetland habitats (i.e. protection of existing forested wetlands) when compared to the future without project conditions.

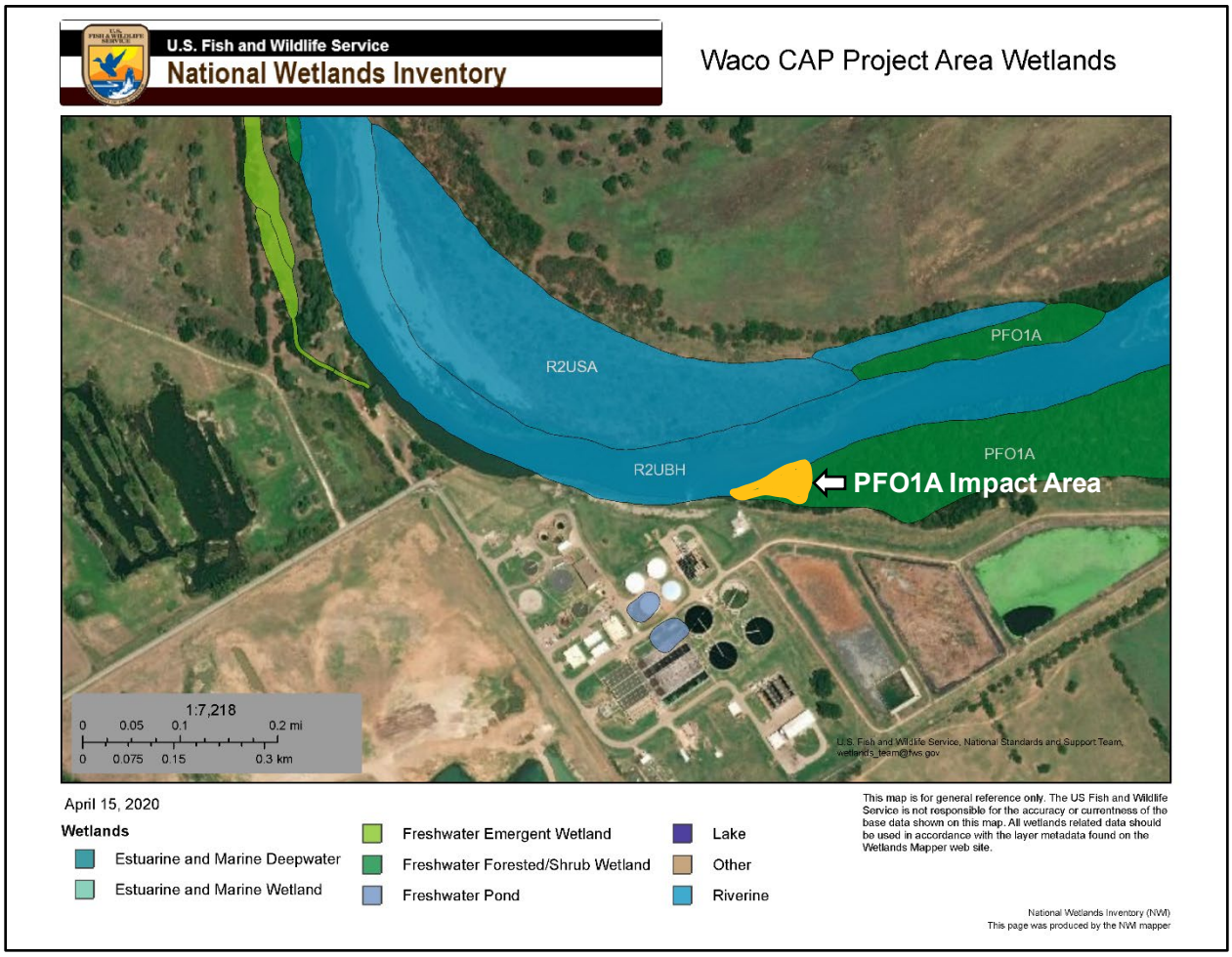

Figure 5. Wetland impacts of the Action Alternatives.

6.7 Ground Water

The No Action and Action Alternatives would not result in any changes to groundwater recharge or withdrawal of groundwater from the Trinity Aquifer.

6.8 Air Quality

6.8.1 No Action Alternative

The No Action Alternative would result in no impacts to air quality in the proposed project area.

6.8.2 Action Alternatives

Each of the Action Alternatives would generate air pollutant emissions as a result of excavation, grading, placement of riprap, and other ancillary activities. These emissions

would be temporary and would not be expected to generate offsite effects or exceed federal air quality standards.

The construction activities would result in short-term emissions of criteria pollutants as combustion products resulting from construction and transportation equipment. Construction activities would also generate particulate matter emissions, such as fugitive dust. Fugitive dust is particulate matter, solid particles that come from the soil, that become suspended in the air by wind and human activities. Fugitive dust emissions would be greatest during initial site preparation activities and would vary daily depending on the construction phase, level of activity, and prevailing weather conditions. The quantity of uncontrolled fugitive dust emissions from a construction site is generally proportional to the area of land being worked and the level of construction activity. Appropriate dust control measures would be employed to suppress emissions, such as using mulch, water sprinkling, temporary enclosures, and other appropriate methods as needed.

The Action Alternatives would generate similar quantities of emissions which would fall below de minimis levels. Waco is classified as an attainment area for all criteria pollutants. Therefore, General Conformity Rule requirements would not be applicable. The construction contractor would be required to use low greenhouse gas-emitting vehicles to the extent possible and available, such as clean diesel technologies.

6.9 Water Quality

6.9.1 No Action Alternative

Under the No Action Alternative, suspended sediments from the eroded banks would continue to enter the water column during channel forming flow events. However, the volume of sediments introduced from the eroded bank would be negligible compared to the volume of sediments being transported by the Brazos River. The No Action Alternative would not result in any temporary impacts to the river as no construction or ground disturbing impacts resulting from bank stabilization would occur.

6.9.2 Action Alternatives

Each of the Action Alternatives would have similar direct water quality impacts resulting from construction activities associated with excavation, grading, and placement of the riprap. During construction, bank and ground disturbing activities would temporarily degrade water quality. Erosion and sedimentation controls would be required during construction, such as silt curtains, silt fencing, sediment traps, and other sediment control methods. Revegetation of disturbed areas would be prompt to reduce and control siltation or erosion impacts. Every construction project poses a potential contamination risk from petroleum or chemical spills. The contractor would be required to prepare and follow a site-specific spill prevention plan to reduce the risk of such contamination. The plan would include best management practices (BMPs) such as proper storage, handling and

emergency preparedness. Anticipated impacts to surface waters during construction would be temporary and minimal with the implementation of appropriate BMPs.

A 404(b)(1) water quality assessment report has been drafted and is being coordinated with TCEQ (Appendix F).

6.10 Geologic Resources

No changes to geologic resources would occur under the No Action and Action Alternatives.

6.11 Soils

The No Action and Action Alternatives would not reduce the acreage of prime farmland, unique farmland, or soils of agricultural importance. The proposed project area is not used for agriculture and the Action Alternatives are in compliance with the Farmland Protection Policy Act of 1981.

6.12 Biological Communities

6.12.1 Vegetation

6.12.1.1 No Action Alternative

Under the No Action Alternative, there would be no clearing of vegetation associated with bank armoring activities. The south cut bank would continue to erode, resulting in the loss of forested habitats up- and downstream of the existing riprap armored bank.

6.12.1.2 Action Alternatives

Each of the Action Alternatives would have a similar impact of vegetation resources in the proposed project area as each alternative would result in the armoring of approximately 1,600 linear feet of shoreline utilizing different methods. The proposed alternatives would result in the removal of approximately 0.4 acres of woodland upstream of the wastewater treatment plant and approximately 0.3 acres of forested wetland downstream of the existing riprap on the south bank. The remaining vegetation within the proposed project area consists of maintained Bermudagrass turf along the wastewater treatment plant levee and adjacent areas. As discussed in Section 5.6.2, the Future without Project Condition of the proposed project area would result in the loss of the forested habitats as the uncontrolled erosion would continue to slough the cut banks. Therefore, the Action Alternatives would protect the forested habitats.

6.12.2 Threatened and Endangered Species

As discussed in Section 4.10.2, the Least Tern, Piping Plover, and Red Knot only need to be assessed for wind-related projects; therefore, the No Action and Action Alternatives

would have “no effect” on these species. The No Action and Action Alternatives would also have “no effect” on the Golden-cheeked Warbler and Whooping Crane as no suitable habitat for these species occur within the proposed project area.

Populations of the Texas fawnsfoot are known to occur in the Brazos River near the proposed project area. As the Texas fawnsfoot is a Candidate species and no effects determinations are required under Section 7 of the ESA, no formal consultation with the USFWS is required. However, discussions with resource agency staff have indicated that there is a high probability of the Texas fawnsfoot being listed as threatened or endangered in the near future. Therefore, USACE will be requesting a Conference Opinion from the USFWS to document avoidance and minimization measures to be implemented if the mussels are listed prior to the completion of the proposed project. Due to the status and ecological importance of the Texas fawnsfoot, USACE will implement mitigation measures where feasible that may include mussel surveys and relocation of the mussels to adjacent areas.

6.12.3 Migratory Birds

6.12.3.1 No Action Alternative

Under the No Action Alternative, habitat for migratory birds would be lost as the forested areas in the proposed project area would be lost due to the uncontrolled erosion of the south bank. The remaining habitat (maintained non-native grasses) provides minimal habitat for migratory birds.

6.12.3.2 Action Alternatives

During construction of the Action Alternatives, there is potential for harm and/or harassment of nesting migratory birds. Attempts will be made to initiate clearing activities outside of the breeding season (September to February) to minimize impacts to migratory birds. If clearing activities must be conducted during the breeding season, nest surveys should be conducted to identify active nests in the planned cleared areas. Coordination with the USFWS should be completed prior to clearing activities if nesting is identified and USFWS guidelines should be followed to avoid adverse impacts to migratory birds.

Each of the proposed Action Alternatives would protect the forested habitats from loss to erosion. Therefore, the Action Alternatives would ensure that this migratory bird nesting habitat would be available in the future.

6.13 Socioeconomics

The proposed project area is not located within any residential area; therefore, there would not be any disproportionate impacts on protected low income or minority populations. In addition, there are no areas where children may congregate near the proposed project area.

6.14 Hazardous, Toxic, and Radioactive Waste

No Oil or Gas wells or pipelines were identified within the project vicinity and no other HTRW implications were found. Refer to the Appendix E for more information and maps of the results.

6.15 Cultural Resources

6.15.1 No Action Alternative

Under the No Action Alternative, no fill material would be introduced into the proposed project area. The cut bank on the wastewater treatment plant side of the river would continue to erode, potentially exposing unknown archeological sites. This would not constitute an undertaking under the National Historic Preservation Act of 1966 as amended.

6.15.2 Longitudinal Peaked Stone Dike and Tie Back Alternative

Alternative 1 entails the placement of riprap material into the river channel, fill material to dress up bank and native vegetation to be placed over a 1,600-foot long section of the Brazos River adjacent to the wastewater treatment plant. No excavation is anticipated and any borrow material will be from commercial sources. The placement of riprap on previously disturbed material has No Potential to Cause Effects to historic properties per 36 CFR §800.3(a)(1).

6.15.3 Stone Riprap Toe Protection Alternative

Alternative 2 consists of the placement of fill material to dress up bank, riprap material, and bedding material to be placed over a 1,600-foot long section of the Brazos River adjacent to the wastewater treatment plant. No excavation is anticipated and any borrow material will be from commercial sources. The placement of riprap on previously disturbed material has No Potential to Cause Effects to historic properties per 36 CFR §800.3(a)(1).

6.15.4 Longitudinal Peaked Stone Toe Protection with Bendway Weirs Alternative

Alternative 3 entails the placement of riprap material into the river channel, fill material to dress up bank and native vegetation to be placed over a 1,600 foot long section of the Brazos River adjacent to the wastewater treatment plant. No excavation is anticipated and any borrow material will be from commercial sources. The placement of riprap on previously disturbed material has No Potential to Cause Effects to historic properties per 36 CFR §800.3(a)(1).

6.16 Noise

6.16.1 No Action Alternative

Under the No Action Alternative, there would be no noise impacts to the surrounding environment.

6.16.2 Action Alternatives

All of the Action Alternatives would require the use of construction equipment such as backhoes, bulldozers, dump trucks, etc. during the construction of the proposed project. The resulting noise impacts would be temporary. As the nearest receptor is located over 0.5 miles from the proposed project area, the temporary noise impacts would be minimal.

6.17 Visual Aesthetics

6.17.1 No Action Alternative

Under the No Action Alternative the visual aesthetics of the proposed project area would remain relatively unchanged. The river bank would continue to erode resulting in a steep, unvegetated cutbank.

6.17.2 Action Alternatives

All of the Action Alternatives would modify the aesthetics of the river bank by the placement of stone riprap along the river bank. The exposed bank would then be planted with native vegetation. Therefore, the aesthetics of the proposed project area would change from an exposed, eroded, unvegetated cut bank to a vegetated shoreline with stone riprap.

6.18 Recreation

6.18.1 No Action Alternative

Under the No Action Alternative, there would be no impacts to recreational fishing from boats in the proposed project area.

6.18.2 Action Alternatives

All of the Action Alternatives would result in temporary impacts to recreational fishing from boats as construction activities would alter the behavior of aquatic life. In addition, safety concerns would prohibit the encroachment of boats during active construction. There are no other potential recreation opportunities within the project area.

6.0 References

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HTRW Appendix E
Integrated Planning and Design Analysis and Environmental Assessment
Waco Metropolitan Area Regional Sewerage System Treatment Plant
Waco and McLennan County, Texas
Brazos River
Section 14 Emergency Streambank and Shoreline Protection

May 2021

US Army Corps of Engineers®
Fort Worth District

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List of Acronyms

AE	Architectural and Engineering
AFB	Alternative F01mulation Briefing
ATR	Agency Technical Review
ATRT	Agency Technical Review Team
CAR	Corrective Action Request
CCIR	Commander's Critical Information Requirement
CE/ICA	Cost Effectiveness/Incremental Cost Analysis
Corps	U.S. Army Corps of Engineers
CMI	Corporate Management Information
CMP	Cost Management Plan
DQC	District Quality Control
DX	Directorate of Expertise
EC	Engineer Circular
EIS	Environmental Impact Statement
EM	Engineer Manual
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
EVM	Earned Value Management
FCSA	Feasibility Cost Share Agreement
FGDC	Federal Geographic Data Committee
FRA	Flood Risk Assessment
FRM	Flood Risk Management
FWOP	Future without Project
FWS	Fish and Wildlife Service
FY	Fiscal Year
GDM	General Design Memorandum
GIS	Geographic Information Systems
HEC	Hydrologic Engineering Center
HEC-FDA	Hydrologic Engineering Center Flood Damage Assessment Model
HEC-FRM	Hydrologic Engineering Center Flood Risk Management Model
HEMP	Hydrologic Engineering Management Plan
H&H	Hydrology and Hydraulics
HQUSACE	Headquarters, U.S. Army Corps of Engineers
HTRW	Hazardous, Toxic and Radioactive Waste Program
IRC	Issue Resolution Conference
IEPR	Independent External Peer Review
IPR	In-Progress Review
IWR	Institute of Water Resources
LAERF	Lewisville Aquatic Ecosystem Research Facility
LERRD	Lands, Easement, Right-of-Way, Relocations, and borrow and dredged or Excavated materials Disposal areas
MIPR	Military Interdepartmental Purchase Request
MSC	Major Subordinate Command

MFR	Memorandum for Record
NED	National Economic Development
NEPA	Nation Environmental Protection Act
NER	National Ecosystem Restoration
NOA	Notice of Availability
NWP	Nationwide Permit
O&M	Operations and Maintenance
OMB	Office of Management and Budget
P2	Scheduling software database
PCX	Planning Center of Expertise
PDT	Project Delivery Team
PED	Pre Engineering and Design
PES	Project Executive Summary
PL	Lead Planner
PM	Project Manager
PMBP	Project Management Business Process
PMP	Project Management Plan
PROC	Process
QMS	Quality Management System
RIT	Regional Integration Team
RMO	Resource Management Office
SAWS	San Antonio Water System
SDSFIE	Set of data standards that define the content of the database
SMART	Specific, Measurable, Attainable, Risk Informed and Timely
SMT	Study Management Team
SWD	Southwest Division
SWF	Fort Worth District
TCEQ	Texas Commission on Environmental Quality
TPWD	Texas Parks and Wildlife Department
TSP	Tentative Selected Plan
TX SHPO	Texas State Historical Preservation Officer
USFWS	US Fish and Wildlife Services
VT	Vertical Team
WBS	Work Breakdown Structure
WIK	Work-In-Kind
WRDA	Water Resources Development Act

1 Background

1.1 Introduction

In order to complete a feasibility level HTRW evaluation for Waco WMARSS Treatment Plant CAP 14, a report was completed following the rules and guidance of ER 1165-2-132: *HTRW Guidance for Civil Works Projects*, and ASTM E1527-13: *Standard Practice for Environmental Site Assessment: Phase 1 Environmental Site Assessment Process*. These two documents outline a process which has three main components (excluding the report itself): the records review, site reconnaissance, and interviews.

1.2 Records Review

Perhaps the most critical part of the feasibility level HTRW evaluation is the records review. In this, records, maps and other documents that provide environmental information about the project area are obtained and reviewed. To complete the records review, USACE used a commercially available vendor of environmental database searches called GeoSearch, of Austin, TX. This records review was completed using the proposed footprint of the project, and the standard ASTM environmental record sources, along with an approximate 1 mile search distance for each of the sources shown in the below Table 1. Due to the size of the record search results, the GeoSearch report will not be included here. Once the database searches were complete, USACE analyzed the results for recognized environmental conditions (RECs) that could affect the proposed project or need further investigation, given the proposed project measures. Due to the conservative search distances and specifics of the proposed project, many of the record search results can be dismissed from further consideration in this study. The results of that analysis, specifics of the REC (where applicable), and justification for dismissal from further evaluation (where applicable) are discussed below.

Table 2: Standard ASTM Search Distances and Records Review Results

ASTM Source	ASTM Distance (miles)	Searched Distance (miles)	Number of Results
Federal National Priorities List (NPL) site list	1.0	1.0	0
Federal Delisted NPL site list	0.5	1.0	0
Federal CERCLIS (SEMS) list	0.5	1.0	0
Federal NFRAP (SEMS archive) site list	0.5	1.0	0
Federal RCRA Corrective Action facilities list	1.0	1.0	0
Federal RCRA TSDF facilities list	0.5	1.0	1
Federal RCRA generators list	Property and adjacent properties only	1.0	1
Federal ICs/Engineering Control registry	Property only	1.0	0
Federal ERNS list	Property only	1.0	0
State and tribal equivalent NPL list	1.0	1.0	0
State and tribal equivalent CERCLIS	0.5	1.0	0
State and tribal landfill and/or solid waste disposal sites	0.5	1.0	2
State and tribal leaking AST/UST sites	0.5	1.0	0
State and tribal registered storage tank list	Property and adjacent properties only	1.0	0
State and tribal ICs/Engineering Control registry	Property only	1.0	0
State and tribal voluntary cleanup sites	0.5	1.0	0
Federal, State and tribal Brownfields site list	0.5	1.0	0

Federal NFRAP (SEMS archive) List – The Federal NFRAP list (now known as the SEMS archive list) tracks sites where no further remedial action is planned, based on available assessments and information. The list also represent sites that were not chosen for the NPL. Further EPA assessment could possibly be ongoing, and hazardous environmental conditions may still exist; however, in the absence of remedial action and assessment data, no determination about environmental hazards can be made. The records search did not find any sites on the e CERCLIS NFRAP (SEMS archive) database.

Federal RCRA TSDF List – The Federal RCRA TSD0F list contains sites that are designated as Treatment, Storage, and Disposal facilities. These sites typically handle large amounts of hazardous waste, and are permitted under RCRA to do so. As such, one RCRA TSDFs is located on the subject property but it has closed. Additionally, the presence of a TSDF is not sufficient to believe that contamination is likely to be generated, as long as the facility is permitted. As a result, no TSDF sites will be carried forward as REC's.

Federal RCRA Generators List – Similar to the TSDF list, the RCRA generators list identifies sites that generate quantities of waste classified as hazardous under RCRA. One site was identified at the target property or adjacent property but is also listed as closed.

State and Tribal Leaking AST/UST Sites – This database is a list of leaking petroleum storage tank incidents, maintained by the State of Texas. A search of this database did not identify any sites within a one mile radius of the target property.

State and Tribal Registered Storage Tanks – This list is a combination of the State of Texas registered UST and AST databases, representing sites with storage tanks registered with the State of Texas. None were identified. Additionally, the existence of a registered storage tank (UST or AST) is not sufficient to believe that contamination is likely to be generated.

Federal Institutional Controls (IC)/Engineering Controls Registry – Engineering controls and ICs are both methods of preventing exposure to contaminants on a particular site. This database is a listing of sites where one or both of those controls are in place. There weren't any sites with these measures in place that were identified within a one mile radius of Waco RTP. However, the ASTM standard only requires that the proposed project property be searched for ICs or engineering controls.

State and Tribal Solid Waste Facilities/Landfill Sites – This search is designed to check any state or tribal databases for solid waste handling facilities or landfills in the project vicinity. Two results were found within the search area; one was a composting facility and the other, a sand and gravel landfill. Both listings have a current status of closed and therefore, neither will impact the proposed project.

State and Tribal Registered Storage Tanks – This list is a combination of the State of Texas registered UST and AST databases, representing sites with storage tanks registered with the

State of Texas. Within a mile radius there weren't any tanks identified. The existence of a registered storage tank (UST or AST) is not sufficient to believe that contamination is likely to be generated.

State and Tribal Voluntary Cleanup Sites – This database identifies sites where the responsible party chooses to clean up the site themselves with TCEQ oversight. No VCP sites were identified and none will be carried forward as REC's.

Brownfields List – The Brownfields database is a list of sites where information has been reported back to EPA Brownfields Assessment office. This does not mean these sites were selected as Brownfields for redevelopment. None were located within the project area.

Other State Sites:

National Pollutant Discharge Elimination System- Authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. The NPDES database returned 3 separate locations with permits within the project area but none are out of compliance and will not be carried forward as REC's.

Notice of Violations- The database containing Notice of Violations (NOV) is maintained by the Texas Commission on Environmental Quality. An NOV is a written notification that documents and communicates violations observed during an inspection to the business or individual inspected. The NOV's found in this records review have been closed and will not be listed as a REC.

Spills Listing -This Texas Commission on Environmental Quality database includes releases of hazardous or potentially hazardous materials into the environment. The incidents found in this search have been closed and cleared.

1.3 Site Visit

The site visit in environmental investigations is designed to identify environmental conditions that would otherwise not be identified in the records search. The site visit also is used to look at indoor areas and area usages on the subject property (when applicable). A Site visit was conducted on February 20th, 2020 and observations were made to verify that there wasn't additional HTRW concerns, aside from those already addressed.

1.4 Interviews

The objective of the interviews is to discover environmental conditions that could not be obtained in the records search, as well as to determine past uses of the subject property. Due to the nature of the proposed project and its ownership, it is expected that the subjects and scope

of the interviews for this project are limited. During the site visit, USACE was escorted by City of Robinson, City of Waco, and WWTP personnel and answers to questions were provided.

1.5 Conclusion of Background Records Review

In order to complete a feasibility level HTRW evaluation for Waco RTP, this report was completed following the rules and guidance of ER 1165-2-132: *HTRW Guidance for Civil Works Projects*, and ASTM E1527-13: *Standard Practice for Environmental Site Assessment: Phase 1 Environmental Site Assessment Process*. No sites were found that had recognized environmental conditions.

Figure 2: Map of Waco RTP HTRW Sites

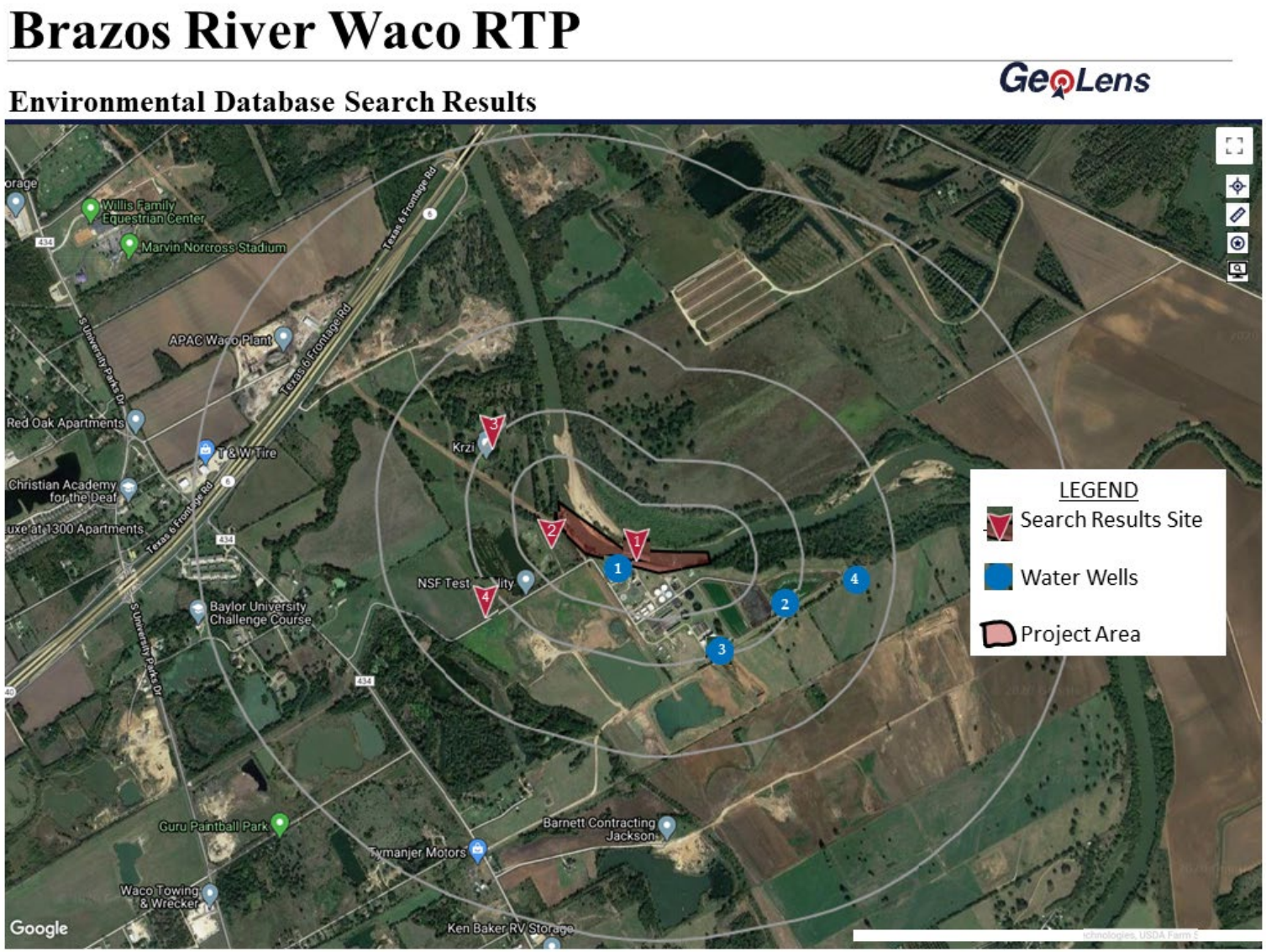
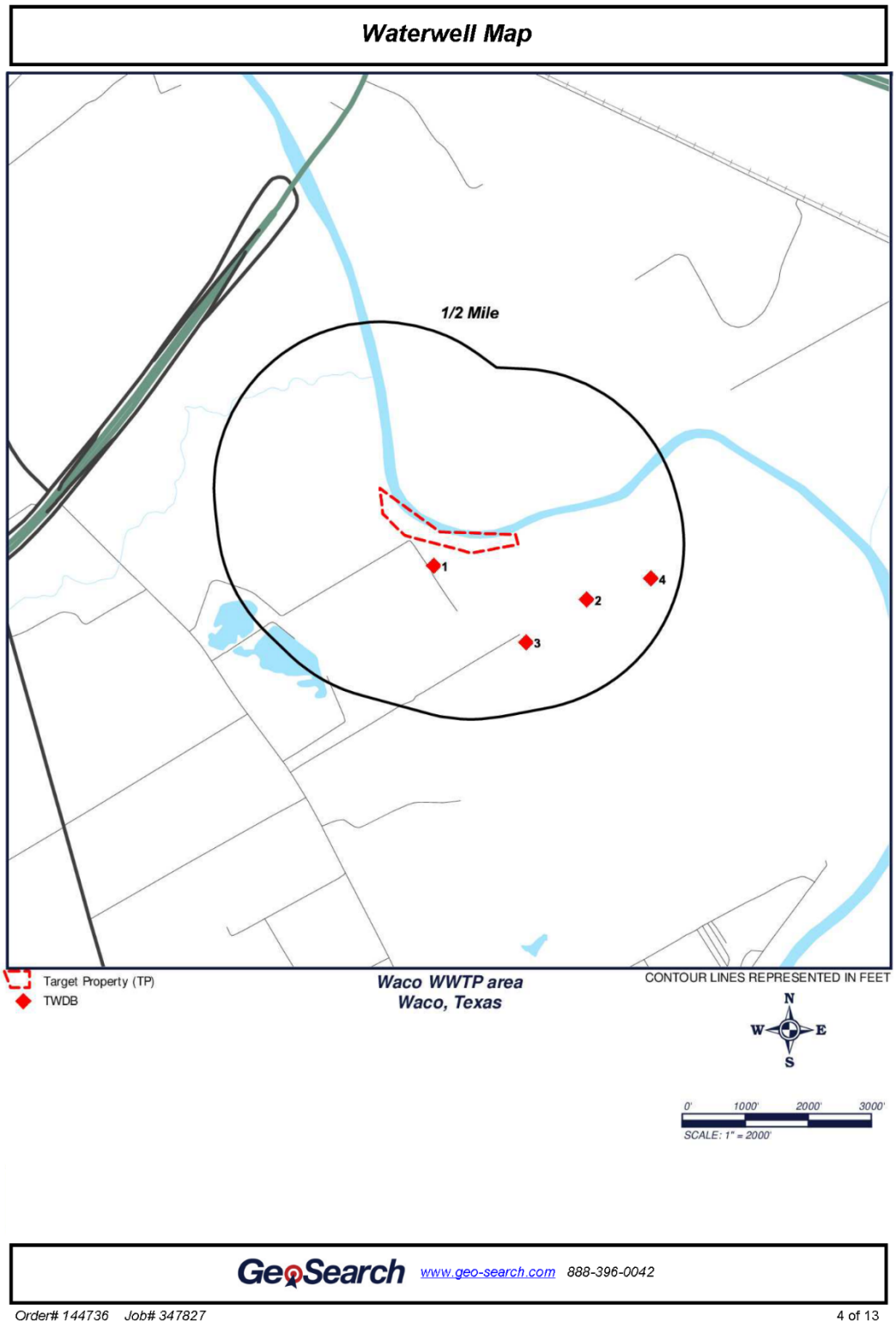


Table 2: Results of Environmental Database Search

Map ID#	Database Name	Site ID#	Relative Elevation	Distance From Site	Site Name	Address
1	ECHOR06	1.10001E+11	Higher (383 ft.)	0.004 mi. SSW (21 ft.)	WACO METROPOLITAN AREA REGIONAL SEWERAGE SYSTEM	1147 TREATMENT PLANT ROAD, WACO, TX 76706
1	ECHOR06	1.10065E+11	Higher (383 ft.)	0.004 mi. SSW (21 ft.)	METROPOLITAN AREA REGIONAL SEWARGE SYSTEM WWTF	1147 TREATMENT PLANT RD, WACO, TX 76706
1	FRSTX	1.10001E+11	Higher (383 ft.)	0.004 mi. SSW (21 ft.)	WACO METROPOLITAN AREA REGIONAL SEWERAGE SYSTEM	1147 TREATMENT PLANT ROAD, WACO, TX 76706
1	FRSTX	1.10042E+11	Higher (383 ft.)	0.004 mi. SSW (21 ft.)	CENTRAL WASTEWATER TREATMENT PLANT CAPACITY EXPANSION	1147 TREATMENT PLANT RD, WACO, TX 76706
1	FRSTX	1.10042E+11	Higher (383 ft.)	0.004 mi. SSW (21 ft.)	WACO METROPOLITAN AREA REGIONAL SEWERAGE SYSTEM WMARSS	LOCATED ON THE SW BANK OF THE BRAZOS RIVER APPROX, WACO, TX 76706
1	FRSTX	1.10065E+11	Higher (383 ft.)	0.004 mi. SSW (21 ft.)	METROPOLITAN AREA REGIONAL SEWARGE SYSTEM WWTF	1147 TREATMENT PLANT RD, WACO, TX 76706
1	ICIS	1.10001E+11	Higher (383 ft.)	0.004 mi. SSW (21 ft.)	METROPOLITAN AREA REGIONAL SEWARGE SYSTEM WWTF	1147 TREATMENT PLANT RD, WACO, TX 76706
1	ICIS	1.10065E+11	Higher (383 ft.)	0.004 mi. SSW (21 ft.)	METROPOLITAN AREA REGIONAL SEWARGE SYSTEM WWTF	1147 TREATMENT PLANT RD, WACO, TX 76706
1	ICISNPDES	TX0026506INP DES	Higher (383 ft.)	0.004 mi. SSW (21 ft.)	METROPOLITAN AREA REGIONAL SEWARGE SYSTEM WWTF	1147 TREATMENT PLANT RD, WACO, TX 76706
1	ICISNPDES	TXR05Y207INP DES	Higher (383 ft.)	0.004 mi. SSW (21 ft.)	WACO METROPOLITAN AREA REGIONAL SEWERAGE SYSTEM WMARSS	1147 TREATMENT PLANT RD, WACO, TX 76706
1	NOV	RN102097235	Higher (383 ft.)	0.004 mi. SSW (21 ft.)	WACO METROPOLITAN AREA REGIONAL SEWERAGE SYSTEM WMARSS	LOCATED ON THE SW BANK OF THE BRAZOS RIVER APPROX 4.5 MI DOWNSTREAM FROM THE CRO, WACO, TX
1	NOV	RN102610821	Higher (383 ft.)	0.004 mi. SSW (21 ft.)	WACO METROPOLITAN AREA REGIONAL SEWERAGE SYSTEM DRYING FACILITY	FM 434 1/2 MI SOUTH OF LOOP 340, WACO, TX
1	NPDESR06	TX0129437	Higher (383 ft.)	0.004 mi. SSW (21 ft.)	WACO METROPOLITAN REGIONAL SEWERAGE SYSTEM	LOCATED APPROX 1.25 MILES NE O F THE INTERX OF I-35 & COOKSEY, WACO, TX
1	SPILLS	72502	Higher (383 ft.)	0.004 mi. SSW (21 ft.)		ON 1147 TREATMENT PLANT ROAD WACO TX 76706, WACO, TX 76706
1	SPILLS	89316	Higher (383 ft.)	0.004 mi. SSW (21 ft.)		ON 1147 TREATMENT PLANT ROAD WACO TX 76706, WACO, TX 76706
1	SPILLS	98261	Higher (383 ft.)	0.004 mi. SSW (21 ft.)		ON 1147 TREATMENT PLANT ROAD WACO TX 76706, WACO, TX 76706
1	TIERII	4YDAW7006G6 E	Higher (383 ft.)	0.004 mi. SSW (21 ft.)	WACO METROPOLITAN AREA REGIONAL SEWAGE SYSTEM	1147 TREATMENT PLANT ROAD, WACO, TX 76706
2	IHW	34452	Higher (374 ft.)	0.051 mi. SW (269 ft.)	ASKCORP	700 S LOOP 340, WACO, TX 76706
2	**RCRAGR06**	**TX0000918821**	**Higher (374 ft.)**	**0.051 mi. SW (269 ft.)**	**WACO SERVICE CENTER HHWCS**	**700 S LOOP 340, WACO, TX 76710**
2	**RCRANGR06**	**TXD040401788**	**Higher (374 ft.)**	**0.051 mi. SW (269 ft.)**	**ASKCORP**	**700 S LOOP 340, WACO, TX 76706**
3	**MSWLF**	**1852**	**Higher (359 ft.)**	**0.227 mi. NW (1199 ft.)**	**DONALDSON SAND AND GRAVEL LANDFILL**	**.75 MILE NE OF FM 434 .75 MILE S OF STATE HIGHWAY 6 EAST, N/A, TX**
4	**MSWLF**	**42031**	**Higher (383 ft.)**	**0.325 mi. SW (1716 ft.)**	**WACO REGIONAL COMPOST FACILITY**	**3500 FT E OF INTX OF S LOOP 340/HWY 6 & S 3RD ST, & 2500 FT NE OF INTX OF S 3RD, WACO, TX**

Figure 2: Map of Waco RTP Wells



2 Existing Conditions

2.1 General Description

In order to complete a feasibility level HTRW evaluation for the Waco RTP, a records search was conducted following the rules and guidance of ER 1165-2-132: HTRW Guidance for Civil Works Projects, and ASTM E1527-13: Standard Practice for Environmental Site Assessment: Phase 1 Environmental Site Assessment Process. In the records review, files, maps and other documents that provide environmental information about the project area are obtained and reviewed. To complete the records review, USACE reviewed publicly available databases and sources, using the proposed footprint of the project, along with an approximate 1 mile search distance for each of the sources. The records search revealed several potential HTRW sites in McLennan County, although none of these sites have the potential to affect the proposed project. See the HTRW appendix for more information about risks from these sites.

The Brazos River at Waco RTP is heavily eroded with lots of sedimentation. The river has the potential to disturb adjacent soils and receive discharges from surrounding sites. There are several listed HTRW sites in relative proximity (one mile) to the proposed project footprint, including, 2 Resource Conservation and Recovery Act (RCRA) sites, 2 Municipal Solid Waste Landfills, 1 Industrial Hazardous Waste site, 3 Spills Listings, 2 Notice of Violations, 3 National Pollutant Discharge Elimination System sites, 2 Enforcement and Compliance History Sites and a total of 4 locations listed on the Facility Registry System. This a fairly small number of instances since there the city of Waco is within close proximity and development of the area along the Interstate 35 corridor has increased steadily for the last decade. The proposed project area is situated on the banks of the Brazos River on land that is owned by the City Robinson and the City of Waco, primarily. The City of Waco Municipal Wastewater Treatment Plant sits within the impacted area and is the current land use for project lands. With the main concern being the erosion of the banks of the Brazos river and the impact to the cities sole wastewater treatment plant, the 4 possible HTRW locations identified in the records review within one mile of the proposed project have an extremely low potential to impact the proposed project..

Although not classified as HTRW, wells and other infrastructure within the immediate area are contributing factors to existing conditions. Within 1 mile of the study area there are only 4 water wells listed on the state database. Figure 2 displays these underground features along with additional related information. Going forward, it is important to note that disruptions to the water table (and its depth) could affect overall groundwater flow, which is a key mechanism in spreading HTRW contaminants, if any were found.

3 Expected Future Without-Project Conditions

The HTRW situation in and around Waco RTP will most likely stay the same in the future without project condition. This would mean that erosion of the banks on the Brazos River would continue and the Wastewater treatment plant would become increasingly impacted. The raw sewerage flowing through the sewer system on the river bank, will eventually be breached. This will contaminate the Brazos River and tributaries and decrease water quality throughout. The

land directly adjacent to the subject property is primarily used for agriculture, residential, and commercial industry. Development of the area can reasonably be expected to grow in conjunction with the developing metropolis, Waco and along with it, the demand on the wastewater treatment plant. More development would increase the likelihood of future HTRW issues. The use of petroleum, chemicals, and other hazardous materials will continue in the project vicinity with or without the implementation of the proposed project. The extent to which HTRW sites continue to be created and discovered is impossible to predict, although currently existing HTRW concerns can be expected to be remediated over time.

4 Future With-Project Conditions

In order to complete a feasibility level HTRW evaluation for the Waco RTP Project, a records search was conducted following the rules and guidance of ER 1165-2-132: *HTRW Guidance for Civil Works Projects,* and ASTM E1527-13: Standard Practice for Environmental Site Assessment: Phase 1 Environmental Site Assessment Process. The purpose of this search was to identify any sites where hazardous substances or petroleum products have been released or are likely to have been released to soil, groundwater, or surface water in the proposed project area. In order to conduct the records search, an environmental database search from Geo-Search was purchased in March 2020.

Although not classified as HTRW, underground wells play an important role in the overall existing conditions in and around the Waco RTP study area. Four water wells are located within 1.0 mile of the Waco RTP study area and they may have the potential to interact in some way with underground infrastructure. Refer to the HTRW Appendix for a map of known water wells in the study area vicinity.

As discussed in the HTRW appendix, the governmental records search yielded multiple results within 1.0 mile of the Waco RTP study area, although none of these sites has the potential to affect the proposed project. This is due to the extended period of time since most of the cases were closed, as well as their relative distance from the proposed project area. If a site is discovered during construction, activities would be stopped until the hazardous and toxic waste material is properly contained and disposed of in compliance with applicable Federal, state and local regulations.

5 *References

2020. EDR Report. GeoSearch, Austin, TX. Http://geo-search.com

2020. Environmental Protection Agency. Envirofacts Web-Mapper. https://enviro.epa.gov/facts/multisystem.html

2020. Environmental Protection Agency. Cleanups in my Community Web-Mapper. https://19january2017snapshot.epa.gov/cleanups/cleanups-my-community_.html

*Sections that fulfill NEPA requirements for an EA

Section 404(b)(1) Analysis Appendix F
Integrated Planning and Design Analysis and Environmental Assessment
Waco Metropolitan Area Regional Sewerage System Treatment Plant
Waco and McLennan County, Texas
Brazos River
Section 14 Emergency Streambank and Shoreline Protection

May 2021

US Army Corps of Engineers®
Fort Worth District

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Table of Contents

1 Project Description

The Waco WMARSS Treatment Plant services both the cities of Waco and Robinson in Texas. It is located on the Brazos River, a river that meanders as the riverbanks erode. The erosion has been encroaching on the plant over the last ten years due to high flows in the river from various storm events within the watershed causing an approximate erosion rate of 7 ft per year. In the last flood event in 2016, the City reported a loss of 50' feet of bank. The power company had to relocate 4 power poles. The loss caused power poles, guy wire anchors, and security fencing to fall into the river. Currently only 100' of bank remains until the access road is damaged and only 200' until holding tanks are damaged.

The goal of this study is to provide emergency streambank protection at the Waco WMARSS Treatment Plant in the City of Waco, Texas. This study is conducted under the authority of the USACE Continuing Authorities Program, Section 14 of the Flood Control Act of 1946, as amended, which provides authority for the USACE to provide emergency stream bank protection for public facilities and services.

1.1 Location

The study area is located southeast of the city center of Waco, Texas on the Brazos River. The Brazos is a winding river that bends as it travels through the area. At one of the bends is the Waco Wastewater Treatment Plant. Figure 1 is a map of the study area.

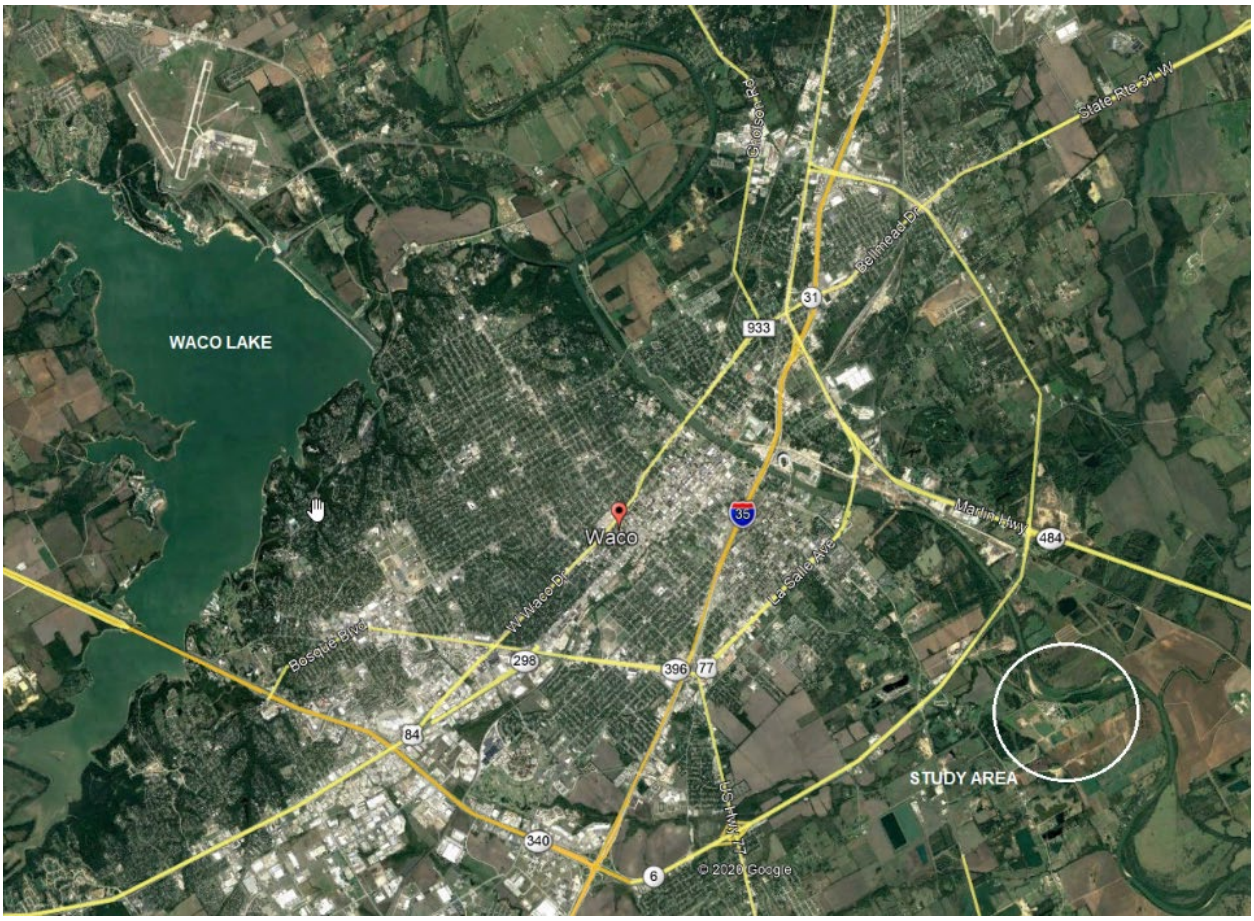

Figure 1. Waco WMARSS Treatment Plant Study Area

Figure 2. Waco WMARSS Treatment Plant Location

1.2 Purpose, Need, and Authority for the Action

The Waco Wastewater Treatment Plant services both the cities of Waco and Robinson in Texas. It is located on the Brazos River, a river that meanders as the riverbanks erode. The erosion has been encroaching on the plant over the last ten years due to high flows in the river from various storm events within the watershed causing an approximate erosion rate of 7 ft per year. In the last flood event in 2016, the City reported a loss of 50' feet of bank. The power company had to relocate 4 power poles. The loss caused power poles, guy wire anchors, and security fencing to fall into the river. Currently only 100' of bank remains until the access road is damaged and only 200' until holding tanks are damaged.

The right bank of the Brazos River, adjacent to the Waco Regional Treatment Plant, has been steadily eroding during the past several years. The erosion, if allowed to continue, will impact three critical infrastructure facilities: Waco Regional Treatment Plant, city of Richardson water intake (located about 1,000 feet upstream), and the Sandy Creek power plant intake structure (located within the Waco Regional Treatment Plant facility). A chronological display of the erosion from 1995 – 2019 is shown in Figure 3. A ground view of the erosion is shown in Figure 4.

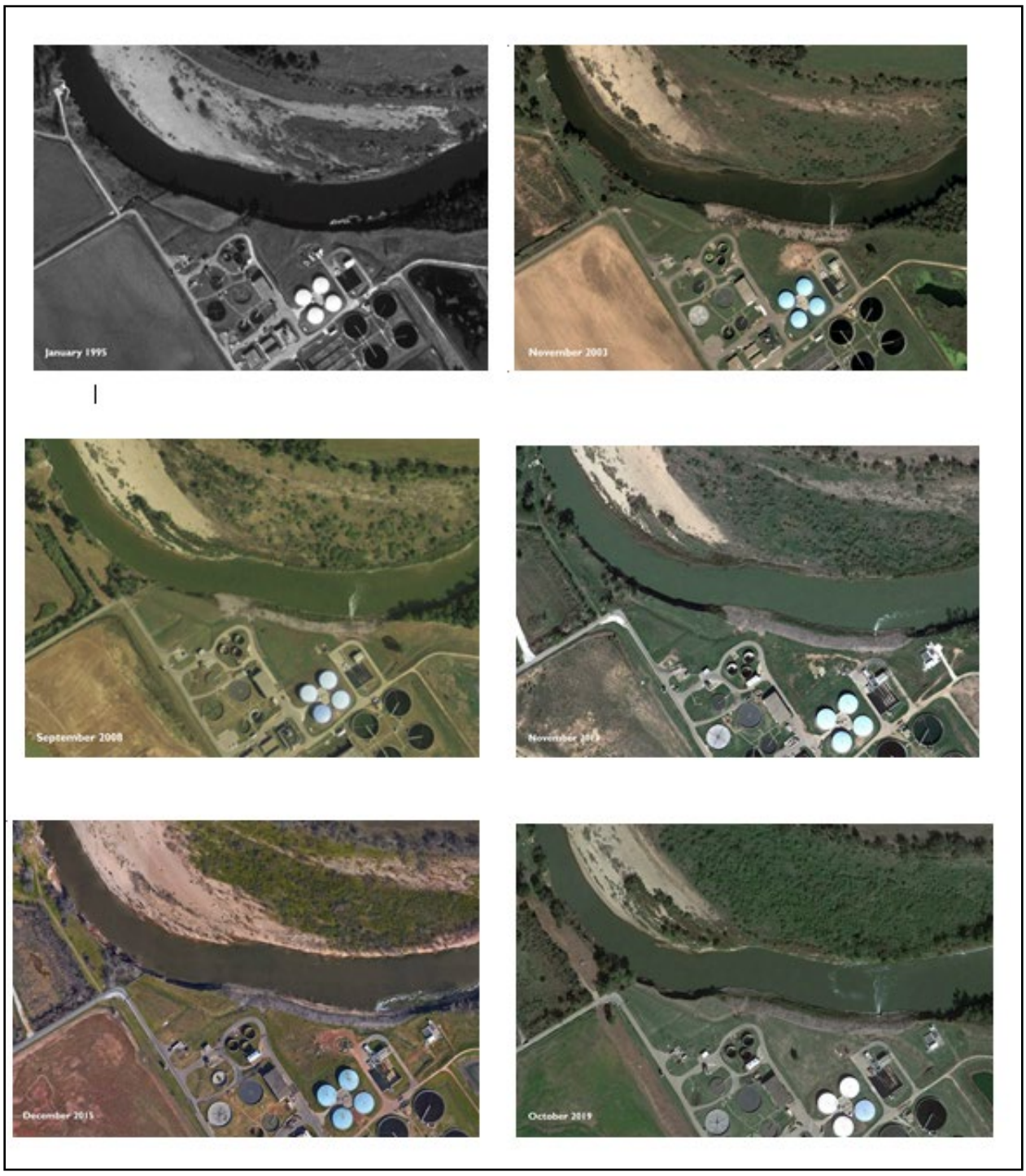

Figure 3. Study Area Erosion 1995-2019

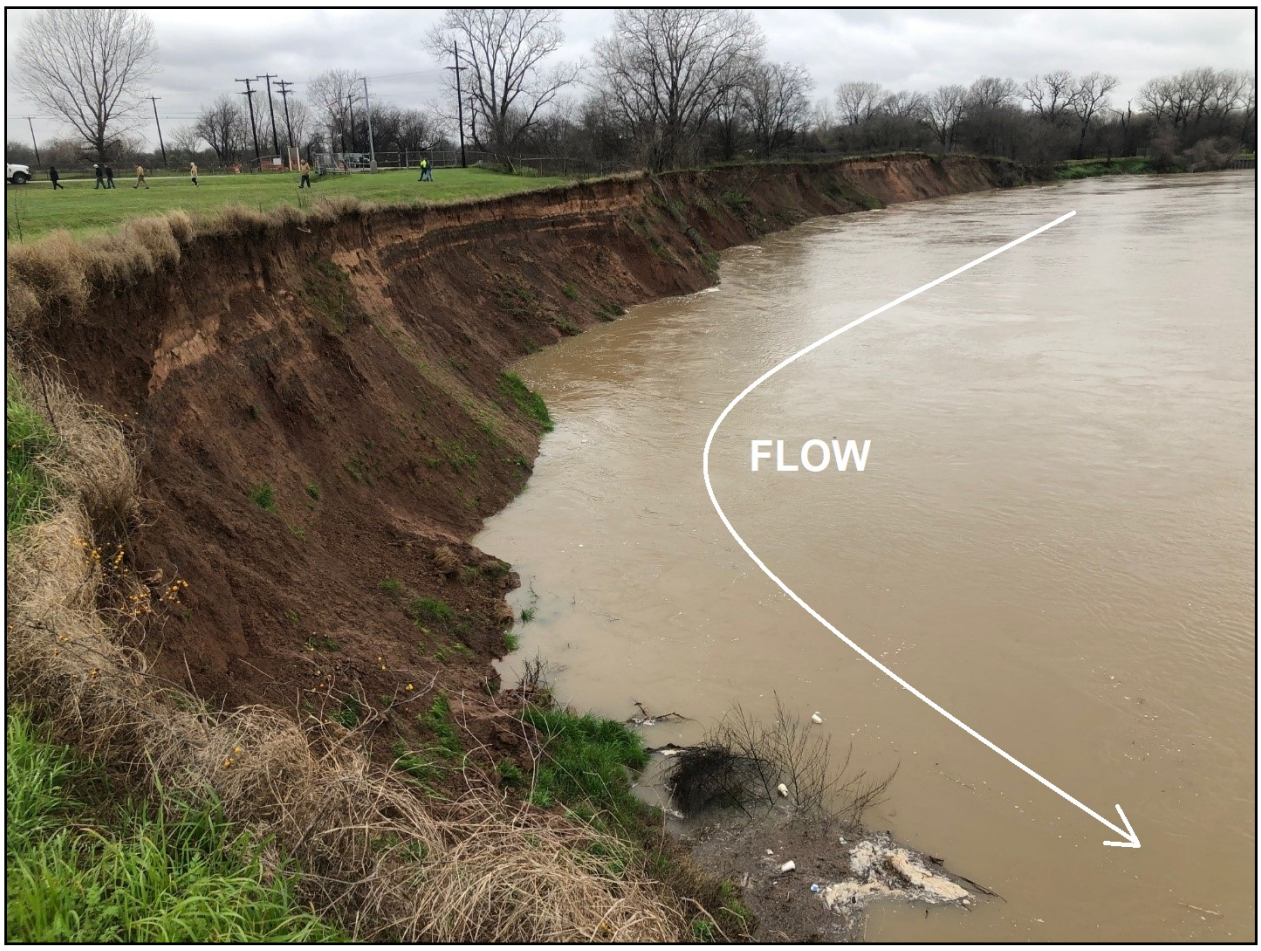

Figure 4. Study Area Erosion February 2020

There is an existing U. S. Army Corps of Engineers Section 14 civil works project located at the Waco Regional Treatment Plant. The project consists of about 900 feet of streambank protection (24-inches of stone riprap over 9-inches of bedding). The project was completed in 2002. The project was constructed to repair erosion along the right bank of the Brazos River. The project is annually inspected by the Fort Worth District. The City of Waco is the Local Sponsor. Figure 5 to Figure 7 show the existing project.

Figure 5. Existing Streambank Protection Project

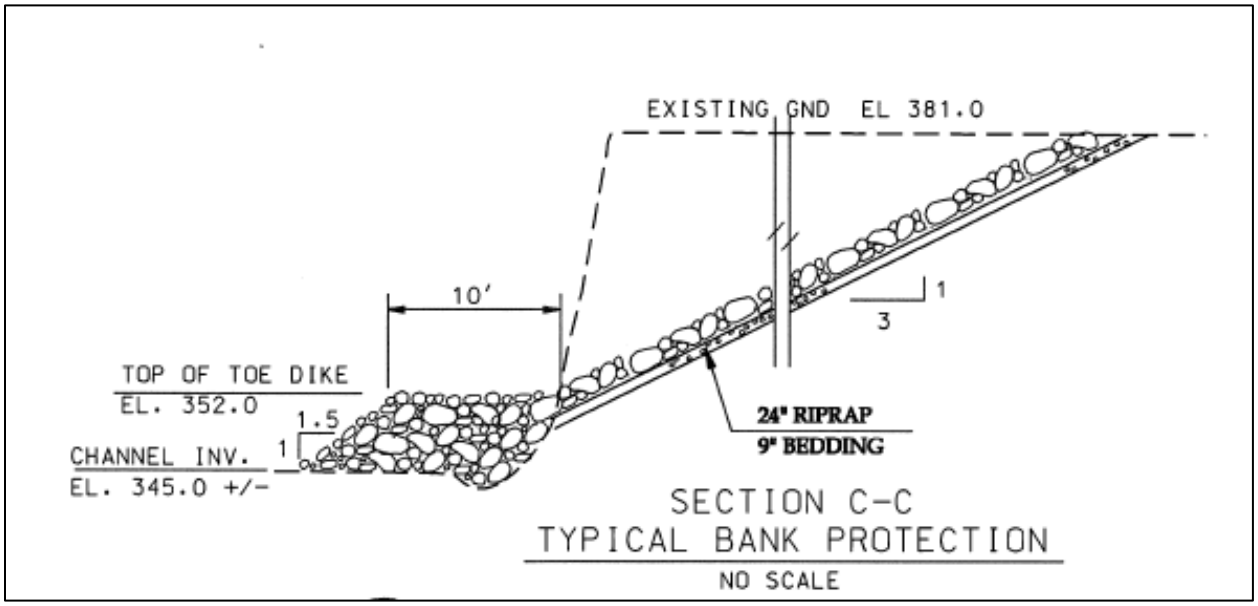

Figure 6. Existing Streambank Protection Typical Cross-Section

Figure 7. Existing Stream Bank Protection

1.3 Project Goals

Planning objectives reflect an expression of public and professional issues or concerns aboutthe use of water and related land resources resulting from the analysis of existing and future conditions in the study area. These planning objectives were used in guiding the development of alternative plans and their evaluation for the period of analysis.

- Reduce the risk of erosion overtaking the City of Columbus wastewater treatment plant to avoid or minimize the cost associated with the wastewater treatment facility not operating as designed due to the effects of the nearby stream bank erosion
- Provide an economically efficient solution
- Minimize environmental impacts

2 Plan Evaluation

2.1 Array of Alternatives

A total of four alternatives were assessed, including the no-action alternative, also known as the Future without Project (FWOP) condition.

2.1.1 No Action Alternative

Under the No-Action Alternative the banks of the river along the project site would continue to erode further jeopardizing the stability of the land upon which the wastewater treatment plant sits.

2.1.2 Longitudinal Peaked Stone Dike and Tie Back

Alternative 1 consists of a longitudinal peaked stone toe dike placed at the toe along a 1,300-feet section upstream of exiting riprap bank protection and 300 feet section downstream of existing riprap on the right bank of the Brazos River. The upstream reach of the stone toe dike would begin at Station 0+00, north of The City of Robinson intake structure. The downstream reach of the stone dike would run adjacent to the Sandy Creek Pump Station. The existing bank should be dressed up by placing fill material at a slope of 1V:2H. The longitudinal stone toe dike would have a triangular cross section with an approximate height of eight feet, a base width of about 48-feet, and 3H:1V side slopes. The entire 1,600-foot reach of the longitudinal stone toe dike would have stone tie-back dikes extending out perpendicularly from the crest of the longitudinal stone dike to the bank and would be spaced every 100-feet along the longitudinal stone dike. The crest height of the tie-back dikes would match the crest height of the longitudinal stone dike at the juncture of the two and would slope up toward the bank on a slope of 5H:1V. The tie-back dikes would be keyed into the bank three feet below the existing ground. The exposed embankment would be planted with native vegetation. This alternative would require approximately 31,200 cubic yards of riprap material into the river channel, 26,200 cubic yards of fill material to dress up bank and 9,400 square yards of native vegetation.

Alternative 2A would follow the same trend as Alternatives 1A and 1B, but for 10.16 acres of emergent wetland habitat. Alternative 2B would enact those measures on 18.37 acres of emergent and upland/shrubland habitat.

2.1.3 Stone Riprap Toe Protection

Alternative 2 consists of stone riprap placed at the toe along approximately 1,300-feet upstream of existing riprap bank protection and 300 feet downstream of existing riprap on the right bank of the Brazos River. The upstream reach of the riprap would begin at Station 0+00, north of The City of Robinson intake structure. The downstream reach of the riprap would run adjacent to the

Sandy Creek Pump Station. The existing bank should be dressed up by placing fill material at a slope of 1V:2H. An 18-inch thick stone riprap layer will be placed along the toe of the dressed-up bank and extend to the top of bank to provide erosion protection to the toe of the bank from river scour. This alternative would require approximately 26,200 cubic yards of fill material to dress up bank, 7,400 cubic yards of riprap material, and 3,700 cubic yards of bedding material into the river channel.

2.1.4 Longitudinal Peaked Stone Toe Protection with Bendway Weirs

Alternative 3 consists of bendway weirs constructed of stone in combination with a longitudinal peaked stone toe dike placed at the toe along approximately 1,300-feet section upstream of exiting riprap bank protection and 300 feet section downstream of existing riprap on the right bank of the Brazos River. The upstream reach of the stone toe dike would begin at Station 0+00, north of The City of Robinson intake structure. The downstream reach of the stone dike would run adjacent to the Sandy Creek Pump Station. The existing bank should be dressed up by placing fill material at a slope of 1V:2H. The weirs have a trapezoidal cross-section about 4 feet in height, a five-foot crest width, 2H:1V side slopes and would slope downward toward the center of the riverbed on a 20H:1V slope. The weirs would be spaced every 100 feet and would extend out toward the centerline of the riverbed 15 feet from the longitudinal stone toe dike. The weirs are angled upstream approximately 10 to 15 degrees from the radius of the bend to direct flow away from the bank toward the center of the riverbed. The bendway weirs would extend up the bank on a 3H:1V slope to intersect bank, continuing up the slope at 2H:1V, with a key-in 3 feet below top of bank. This alternative would require approximately 25,000 cubic yards of riprap material into the river channel, 26,200 cubic yards of fill material to dress up bank and 10,500 square yards of native vegetation.

2.2 Alternative Plans Considered

In accordance with the guidelines outlined in ER 1105-2-100, the development and evaluation of alternatives reflected the magnitude and scope of a Section 14 study. A non-structural solution, vegetation and/or slope grading, was considered but discounted based on engineering experience and judgment. The lack of available land to cut back the slope, and the inability to establish vegetation, eliminated any type of "soft" erosion protection project from further consideration. The alternatives for addressing the imminent threat to the remainder of the outfall pipe at the wastewater treatment facility considered typical structural solutions using the following steps:

- Identify the slope instability problem
- Identify the cause(s) of the slope instability problem
- Develop alternatives based on engineering judgment and experience that address the slope instability problem threatening the wastewater treatment plant
- Based on engineering judgment and experience, decide on the alternative that would address the slope instability problem in the least costly manner

<u>No Action</u>

If no action is taken, erosion of the stream bank would continue. If the erosion continues, the wastewater treatment plant function will be interrupted. If the water treatment structure were to be undermined, the City of Columbus could no longer use this facility to treat wastewater for residents and businesses. Furthermore, this area could become a public safety hazard because of the highly

eroded stream bank. Eventually, this “no action” alternative would lead to the City of Columbus undertaking more frequent, temporary repairs until there is an interruption in service.

Alternative 1 - Longitudinal Peaked Stone Dike and Tie Back

Alternative 1 consists of a longitudinal peaked stone toe dike placed at the toe along a 1,300-feet section upstream of exiting riprap bank protection and 300 feet section downstream of existing riprap on the right bank of the Brazos River. The upstream reach of the stone toe dike would begin at Station 0+00, north of The City of Robinson intake structure. The downstream reach of the stone dike would run adjacent to the Sandy Creek Pump Station. The existing bank should be dressed up by placing fill material at a slope of 1V:2H. The longitudinal stone toe dike would have a triangular cross section with an approximate height of eight feet, a base width of about 48-feet, and 3H:1V side slopes. The entire 1,600-foot reach of the longitudinal stone toe dike would have stone tie-back dikes extending out perpendicularly from the crest of the longitudinal stone dike to the bank and would be spaced every 100-feet along the longitudinal stone dike. The crest height of the tie-back dikes would match the crest height of the longitudinal stone dike at the juncture of the two and would slope up toward the bank on a slope of 5H:1V. The tie-back dikes would be keyed into the bank three feet below the existing ground. The exposed embankment would be planted with native vegetation. This alternative would require approximately 31,200 cubic yards of riprap material into the river channel, 26,200 cubic yards of fill material to dress up bank and 9,400 square yards of native vegetation.

Alternative 2 – Stone Riprap Toe Protection

Alternative 2 consists of stone riprap placed at the toe along approximately 1,300-feet upstream of existing riprap bank protection and 300 feet downstream of existing riprap on the right bank of the Brazos River. The upstream reach of the riprap would begin at Station 0+00, north of The City of Robinson intake structure. The downstream reach of the riprap would run adjacent to the Sandy Creek Pump Station. The existing bank should be dressed up by placing fill material at a slope of 1V:2H. An 18-inch thick stone riprap layer will be placed along the toe of the dressed-up bank and extend to the top of bank to provide erosion protection to the toe of the bank from river scour. This alternative would require approximately 26,200 cubic yards of fill material to dress up bank, 7,400 cubic yards of riprap material, 3,700 cubic yards of bedding material into the river channel.

Alternative 3–Longitudinal Peaked Stone Toe Protection with Bendway Weirs

Alternative 3 consists of bendway weirs constructed of stone in combination with a longitudinal peaked stone toe dike placed at the toe along approximately 1,300-feet section upstream of exiting riprap bank protection and 300 feet section downstream of existing riprap on the right bank of the Brazos River. The upstream reach of the stone toe dike would begin at Station 0+00, north of The City of Robinson intake structure. The downstream reach of the stone dike would run adjacent to the Sandy Creek Pump Station. The existing bank should be dressed up by placing fill material at a slope of 1V:2H. The weirs have a trapezoidal cross-section about 4 feet in height, a five-foot crest width, 2H:1V side slopes and would slope downward toward the center of the riverbed on a 20H:1V slope. The weirs would be spaced every 100 feet and would

extend out toward the centerline of the riverbed 15 feet from the longitudinal stone toe dike. The weirs are angled upstream approximately 10 to 15 degrees from the radius of the bend to direct flow away from the bank toward the center of the riverbed. The bendway weirs would extend up the bank on a 3H:1V slope to intersect bank, continuing up the slope at 2H:1V, with a key-in 3 feet below top of bank. This alternative would require approximately 25,000 cubic yards of riprap material into the river channel, 26,200 cubic yards of fill material to dress up bank and 10,500 square yards of native vegetation.

Screened Alternatives

Alternative 4 – Reinforced Earth Fill with a Gabion Face

Alternative 4 consists of a reinforced earth wall with a gabion face that begins at an invert elevation 3 feet below the river flowline and rises to elevation where the top of the structure is approximately halfway up the riverbank. Reinforcing strips attached to each gabion basket are estimated to be 12 feet long. The foundation for the earth wall would consist of 4 feet of rock. The toe of the wall would also be protected by mounding a layer of rock approximately 15 feet wide and 10 feet high in front, and covering, the first two layers of baskets. The ground at the top of the earth wall would be sloped back on a 3H:1V slope. The estimated length of protection is 1,100 feet. This alternative would require approximately 27,540 cubic yards of combined fill material into the river channel.

Alternative 5 – Dressed up Slope with Articulated Concrete Block Face

Alternative 5 consists of stone riprap placed at the toe along approximately 1,100-feet of the right bank of the Brazos River to a height of 5 feet above the river flowline then placing a granular backfill material with a articulated concrete block face on a 1V:2H slope. The top will be keyed into the bank slope and the finished face will be filled with topsoil and vegetated with native grasses. This alternative would require the placement of approximately 24,450 cubic yards of combined fill material into the river channel.

Alternative 6 – Relocation of Wastewater Treatment Plant Facility

Alternative 6 consists of locating a site of approximate size that would be able to serve the same areas. The facilities would need to be rebuilt as wastewater treatment plants are designed to be site specific and many of the facilities are unable to be relocated. Rebuilding the WMARSS Treatment Plant would include the buildings, pipes, storage facilities, and land acquisition. This alternative has an estimated cost of $350,000,000 to $400,000,000. This cost does not include the removal and required HTRW remediation of the current WMARSS Treatment Plant site.

2.3 Impacts to Jurisdictional Wetlands/Waters of the U.S. Department of Defense

As part of the alternatives evaluation process, a semi-quantitative assessment of permanent impacts to jurisdictional wetlands and water of the U.S. was conducted for the No Action and three action alternatives to allow for a relative comparison of impacts. The impacts to jurisdictional waters entail the placement of fill and rock riprap along the shoreline of the Brazos

River adjacent to the Waco WMARSS Treatment Plant. Impacts that were considered included berm construction and the clearing/excavation of existing wetland areas.

The placement of the fill material and riprap would cover an area of approximately 4.5 acres. Approximately 5-percent of the fill and riprap would be placed below the ordinary high-water mark resulting in impacts to approximately 0.2 acres of the river.

Table 1. Amount of Material Required for Excavation, Ditches, Trenches, and Berms

Alternatives		Length of Shoreline Impact	Fill Material (CY)	18" Rock Riprap (CY)	9" Bedding (CY)
No Action	No Action	0	0	0	0
1	Longitudinal Peaked Stone Dike and Tie Back	1,600'	26,200	31,200	3,700
2	Stone Riprap Toe Protection	1,600	26,200	7,400	3,700
3	Longitudinal Peaked Stone Toe Protection with Bendway Weirs	1,600	26,200	25,000	3,700

2.4 Least Environmentally Damaging Practicable Alternative (LEDPA) Analysis

Although there were three alternatives that could be considered economically, Alternative 2 was determined by the Project Delivery Team (PDT) to represent the least environmentally damaging practicable alternative, as it would require the placement 17,600 and 23,800 cubic yards less riprap into the Brazos River.

Plans were screened and compared based on how well an Alternative 1) accounts for all the required work in order to meet project objectives and projected benefits (Completeness); 2) achieves the planning objectives (Effectiveness); 3) complies with laws, regulation, and public policy (Acceptability); and 4) achieves the planning objectives in relation to costs (Efficiency). All three action alternatives meet the criteria for completeness, effectiveness, acceptability, and efficiency. However, Alternative 2 meets the LEDPA criteria and is the most cost-effective means of achieving the objectives of all the study's alternatives.

3 Recommended Plan

3.1 Project Description

The Recommended Plan is Alternative 2, the placement of stone riprap toe protection along 1,600 linear feet of the Brazos River shoreline adjacent to the Waco WMARSS Treatment Plant (Figure 8). This Alternative would include the construction of the following measures described in Chapter 2.1:

- Placement of 26,200 CY of fill material to dress the bank
- Placement of 7,400 CY of 18" stone riprap

- Placement of 3,700 CY of 9” bedding

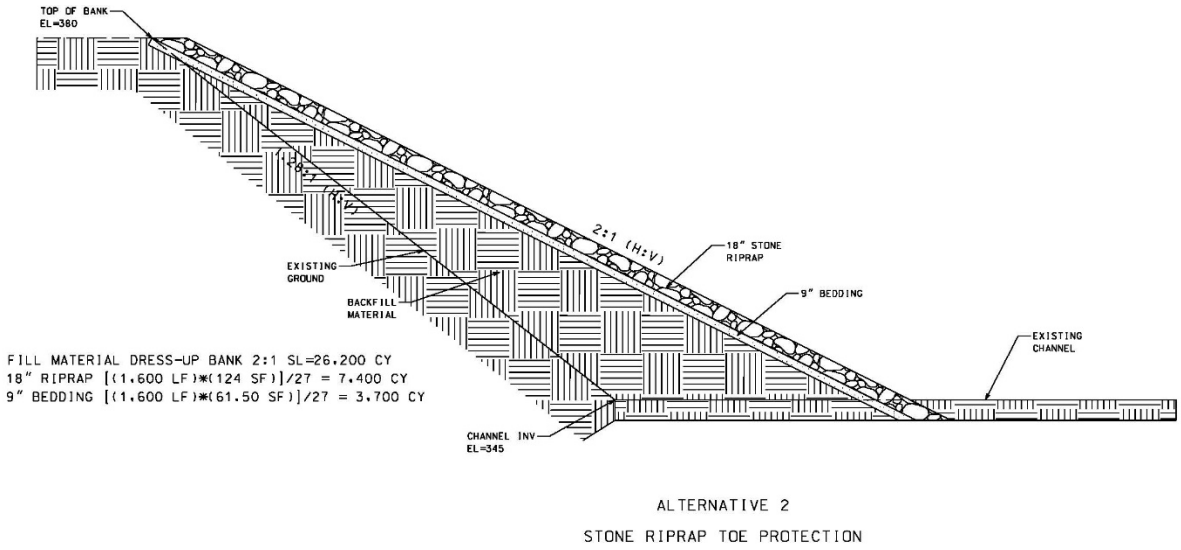

Figure 8. Alternative 2 – Cross Section of Streambank Erosion Protection

3.2 General Description of Dredged or Fill Material

3.2.1 General Characteristics of Material

Fill material to prepare the bank of the river for the placement of the rock riprap will consist of clean soil material that meets the specifications for the base material required for the erosion protection. The rock riprap will consist of 18” granite stone and the bedding material will consist of 9” stone. Heavy construction vehicles and equipment would be needed to place the fill and riprap along the eroding shoreline. The vehicles and equipment would operate outside of existing wetlands and the placement of material would occur from the land side of the shoreline.

3.2.2 Quantity of Material

Alternative 2 would require the placement of 26,200 CY material fill material, 7,400 CY of 18” rock riprap, and 3,700 CY of 9” bedding material along the bank of the Brazos River. However, the majority of the material would be placed above the ordinary high-water mark, with less than 5-percent placed in the river.

3.2.3 Source of Material

The source of material for the Alternative 2 would be obtained from an offsite provider. The materials would be tested by USACE field construction engineers to verify it meets the specifications as required by the design specifications in the construction contract prior to it being used in the placement of the material.

3.2.4 Size

The bank erosion protection would be placed along 1,600 linear feet of shoreline. Of the 26,200 CY of fill material, 7,400 CY of 18" rock riprap, and 3,700 CY of 9" bedding material, approximately 5% would be placed below the Brazos Rivers ordinary high-water mark.

3.2.5 Type(s) of Sites

The Recommended Plan would be located on the Brazos River bank and the open water of the Brazos River.

3.2.6 Type(s) of Habitat

The habitats associated with the proposed project area include the open water riverine habitat of the Brazos River, the exposed soil of the eroded cut-bank, and upland habitat on the top of the bank. The soil type on the top of the bank reflects a habitat that is rarely flooded by the Brazos River. The aquatic habitat is consistent with the deeper outside bends of rivers with higher velocity flows. Little habitat is provided for the steep exposed riverbank. The top of the bank is vegetated with sparse woody vegetation on the eastern and western ends of the project, with most of the area vegetated with non-native Bermudagrass.

3.2.7 Waters and Wetlands

The Brazos River is considered a water of the U.S. No other wetland habitats would be impacted by the proposed project.

3.2.8 Timing and Duration of Discharge

If feasible, the placement of the fill and rock riprap would be timed to occur during low flow periods to minimize impacts to the riverine system. A more detailed schedule would be developed during design and bid stages of implementation.

3.3 Description of Disposal Method

No material will be excavated from the site; therefore, there will be no need to dispose of any material.

3.4 Factual Determinations

3.4.1 Physical Substrate Determinations

3.4.1.1 Substrate Elevation and Slope

The existing substrate elevation for the Brazos River at the Waco WMARSS Treatment Plant is approximately 350' above mean sea level with the top of the near vertical cut-bank at an elevation of 380' above mean sea level.

3.4.1.2 Sediment Type

The substrate of the Brazos River at the Waco WMARSS Treatment Plant consists of an unconsolidated bottom. The soil type on the eroding high bank include soil is Westwood silt loam, rarely flooded.

3.4.1.3 Dredge/Fill Material Movement

The erosion protection would consist of 18" granite rock riprap on a 9" rock bedding. The size of the riprap is required to ensure the rock is not dislodged during flooding events.

3.4.1.4 Physical Effects on Benthos

Under the Recommended Plan, unavoidable impacts to aquatic habitats would be created from the placement of the riprap along the cut-bank of the Brazos River. Once construction is complete, benthos from the surrounding undisturbed sediments would be expected to quickly

colonize the sediments within the gaps in the riprap and the hard structure would provide habitat for additional benthos. During construction, erosion and sedimentation BMPs would be utilized to minimize impacts to benthos within the study area.

3.4.1.5 Other Effects

Temporary impacts to aquatic organisms and fish could occur during construction from the placement of riprap with the potential for temporary sedimentation and water quality degradation in the Brazos River near the placement area.

3.4.1.6 Actions Taken to Minimize Impacts

Actions would be minimized to the extent possible by scheduling construction to coincide with low flow periods. Silt fences and geotextile filters would be placed to minimize sediment transport downstream. Staging and construction access areas would avoid wetlands and aquatic habitats to the extent possible to minimize temporary disturbances and provide distance between aquatic habitats and exposed sediments. BMPs would be detailed as design elements of the Recommended Plan are prepared. Thus, the existing aquatic organisms and fish found at the construction sites would be temporarily affected during construction and expected to then recover post construction.

3.4.2 Water Circulation, Fluctuation, and Salinity Determinations

3.4.2.1 Salinity

The project would not impact the water circulation, fluctuation, or salinity of the Brazos River.

3.4.2.2 Water Chemistry

The project would not affect the water chemistry of the Brazos River.

3.4.2.3 Clarity

Temporary disruption to water clarity is expected during construction. After the riprap is placed, water clarity would return to original conditions.

3.4.2.4 Color

The project would not affect the color of the water of the Brazos River.

3.4.2.5 Odor

The project would not affect the odor of the Brazos River.

3.4.2.6 Taste

Implementation of the Recommended Plan would not affect the water's taste following the completion of construction.

3.4.2.7 Dissolved Gas Levels

No change in dissolved gas levels would occur following construction.

3.4.2.8 Nutrients

The project would not affect nutrients in the Brazos River.

3.4.2.9 Eutrophication

The placement of riprap would not result in the Eutrophication of the Brazos River.

3.4.3 Current Patterns and Circulation

3.4.3.1 Current Patterns and Flow

The Recommended Plan will discourage the erosion into the cut-bank of the Brazos River at the Waco WMARSS Treatment Plant. The armoring will result in the halting of the movement of the river into the WMARSS Treatment Plant. The pattern and flow of the river will remain relatively stable at the existing condition.

3.4.3.2 Velocity

The project may have minor localized impacts on water velocity as the riprap would result in a higher Manning's N value than the current shoreline.

3.4.3.3 Stratification

Stratification does not occur within the project area nor would it occur with implementation of the Recommended Plan.

3.4.3.4 Hydrologic Regime

The Recommended plan would not alter the hydrologic regime of the Brazos River.

3.4.3.5 Normal Water Level Fluctuations

The project would not result in any changes to the normal water level.

3.4.3.6 Salinity Gradients

The project area waters only contain freshwater components. There would be no impacts to salinity gradients.

3.4.3.7 Actions Taken to Minimize Impacts

Appropriate BMPs would be utilized to minimize erosion and sedimentation during construction. Vegetation would be established along the shoreline and at the top of the bank.

3.4.4 Suspended Particulate and Turbidity Determinations

3.4.4.1 Expected Changes in Suspended Particulates/Turbidity Levels in Vicinity of Disposal Site

The proposed project would not require the disposal of materials. Should an unexpected need for the disposal of material be identified, the material would be placed in an upland disposal site.

3.4.4.2 Effects (degree and duration) on Chemical and Physical Properties of the Water Column

Light Penetration: Changes to light penetration would occur during construction associated with minor turbidity increases. Appropriate erosion and sedimentation controls would be implemented to reduce impacts to downstream waters. After project completion and stabilization, the clarity of the polders would return to preconstruction levels.

Dissolved Oxygen: Minor changes to dissolved oxygen could occur during construction; but would be very temporary in both time and extent.

Toxic Metals and Organics: No water testing was conducted in the immediate proposed project area. The proposed project would not result in the introduction of toxicants or organic material into the river.

Pathogens: No pathogens would be added to the water column as a result of this project.

Others as Appropriate: No other effects to the water column are anticipated.

3.4.4.3 Effects on Biota

Displacement of local biota would occur during construction as mobile species would emigrate to adjacent habitats during the placement of the riprap. Although sessile species would be impacted during construction activities, the riprap would provide hard structure for biota to recolonize. Therefore, the existing species composition of the biota may change as a result of the localized, temporary impacts.

Primary Production, Photosynthesis: As the shoreline is constantly eroding, limited vegetation occurs in the placement area. As a result, little aquatic vegetation would be lost from the project site during implementation of the recommended project. Impacts to any existing vegetation loss would be minimized to the extent possible by using BMPs.

Suspension/Filter Feeders: Localize temporary impacts to suspension/filter feeders would occur during the placement of the riprap. However, it is assumed that any organisms would avoid the areas during the placement of the riprap and return once activities ceased for the day.

Sight Feeders: : Localize temporary impacts to sight feeders would occur during the placement of the riprap due to the disturbance of sediment. The movement of suspended sediments from the placement area would be mitigated through the implementation of appropriate BMPs. The impacts would be temporary and limited around the construction hours.

3.4.4.4 Actions Taken to Minimize Impacts

BMPs would be established to control erosion and sedimentation to minimize impacts to biota during construction.

3.4.5 Contaminant Determinations

The recommended project would not result in the introduction of additional toxicants into the Brazos River and adjacent areas over those that currently exist. Although the placement of fill material is not anticipated, the material would be tested and verified for contaminants before use.

3.4.6 Aquatic Ecosystem and Organism Determinations

The Recommended Plan was selected after a review of possible engineering solutions that meet the Project's purpose and need, as well as to be most practicable implementable project. The Recommended Plan included an analysis to minimize impacts to the natural resources as much as possible.

3.4.6.1 Effects on Plankton and Nekton

Plankton and nekton that currently occupy the sediments and water columns at the existing site would be adversely impacted by fill activities, but it is anticipated that the impact would be temporary and short-term as these species would recolonize the sites once construction is complete.

3.4.6.2 Effects on Benthos

No additional effects other than those previously discussed were identified.

3.4.6.3 Effects on Aquatic Food Web

Localized temporary disruptions to the food web may occur during the placement of the riprap. However, following construction it is anticipated that the aquatic food web would return to preconstruction conditions.

3.4.6.4 Effects on Special Aquatic Sites

Sanctuaries and Refuges: No fish and wildlife sanctuaries or refuges occur within the project area.

Wetlands: Aside from the placement of riprap along the eroded shoreline of the Brazos River in the vicinity of the Waco WMARSS Treatment Plant, there would be no impacts to wetlands resources.

Mud Flats: No mudflat habitats occur within the proposed project area.

Vegetated Shallows: The proposed project would place riprap in the deep-water shoreline of the Brazos River. No vegetated shallows occur in the proposed project area.

Coral Reefs: No coral reefs occur within the project area.

Riffle and Pool Complexes: No riffle and pool complexes occur within the project area.

Riverine Sand Bars: The proposed project would place riprap in the deep-water shoreline of the Brazos River. No riverine sand bars occur within the project area.

Threatened and Endangered Species: Impacts to the Least Tern, Piping Plover, and Red Knot only need to be assessed for wind-related projects; therefore, the proposed project would "no effect" on these species. The project would also have "no effect" on the Golden-cheeked Warbler and Whooping Crane as no suitable habitat for these species occur within the proposed project area.

Populations of the Texas fawnsfoot are known to occur in the Brazos River near the proposed project area. As the Texas fawnsfoot is a Candidate species and no effects determinations are required under Section 7 of the ESA, no formal consultation with the USFWS is required. However, discussions with resource agency staff have indicated that there is a high probability of the Texas fawnsfoot being listed as threatened or endangered in the near future. Therefore, USACE will be requesting a Conference Opinion from the USFWS to document avoidance and minimization measures to be implemented if the mussels are listed prior to the completion of the proposed project. Due to the status abd ecological importance of the Texas fawnsfoot, USACE will implement mitigation measures where feasible that may include mussel surveys and relocation of the mussels to adjacent areas.

Other Wildlife: Wildlife inhabiting the aquatic and riparian habitats within the project area may be temporarily displaced during construction. Mobile species would migrate to adjacent habitats. Although sessile species would be impacted during construction activities, they would be expected to return to suitable habitat areas following construction.

3.4.6.5 Other Effects

Land Use: Construction of the recommended project would no effect on the land use within the proposed or project area or adjacent areas.

Transportation: There would be no effects to transportation networks.

Utilities: There would be no effects to utilities.

Cultural Resources: No excavation is proposed for the proposed project. Therefore, the recommended plan would have no effect on cultural resources within the proposed project area.

3.4.7 Recommended Disposal Site Determinations

The proposed project is not anticipated to include disposal of any materials.

4 Determination of Cumulative Effects of the Aquatic Ecosystem

Rivers naturally meander, eroding in certain areas of higher velocity and depositing sediments in areas with lower velocities. Similar localized bank erosion stabilization projects occur at

several locations along the reiver, especially at road crossings. It is anticipated that future erosion protection projects would occur at road crossings, especially in urban areas such as Waco. The cumulative impact of these erosion protection projects would have impacts on the meandering of the river downstream as the river attempts to restore the sediment transport equilibrium of the system. The river would attempt to compensate for the imbalance of sediment transport by eroding the bank in downstream area. If the impacted areas downstream impact infrastructure (roads, housing, utilities, etc.), additional erosion protection efforts would be required to protect that infrastructure. These secondary effects would contribute to the cumulative impact of the erosion protection efforts along the river.

5 Determination of Secondary Effects on the Aquatic Ecosystem

Riverine habitats in Texas naturally meander and migrate through the landscape. The armoring of the riverbank keeps the river from moving into the cut-bank. The sediment transport of the river seeks to achieve an equilibrium to balance the erosion and sedimentation of the river. The hardening of the eroding cut-bank would result in a localized loss of sediment from the bank. This localized sediment deficit would result in increased erosion downstream as the river tries to restore the equilibrium of the system. In effect, the river would try to create a meander somewhere downstream since it would not be able to reduce the energy in the bend at the Waco WMARRS Treatment Plant site.

BMPs to minimize temporary impacts associated with the increased suspended sediment resulting from construction activities. BMPs are expected to include silt curtains, silt fence, and vegetating disturbed areas as soon as possible. BMPs also include treatment requirements, operating procedures, and practices to control construction site runoff, spills or leaks, waste disposal, or drainage from raw material storage areas. Additional erosion control and stabilization practices may include but are not limited to: establishment of temporary or permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of existing vegetation, temporary velocity dissipation devices, flow diversion mechanisms, silt fencing, sediment traps, and the prompt revegetation of disturbed areas. These measures would reduce potential impacts to water quality. Implementation of sediment and erosion controls during construction activities would maintain runoff water quality at levels comparable to existing conditions.

6 Summary of 404(b)(1) Analysis

Section 404 (b)(1) of the Clean Water Act of 1972 requires that any recommended discharge of dredged or fill material into waters of the United States must be evaluated using the guidelines developed by the Administrator of the U.S. Environmental Protection Agency (EPA) in conjunction with the Secretary of the Army. These guidelines are located in Title 40, Part 230 of the Code of Federal Regulations. The Section 404 (b)(1) evaluation in this document analyzes all activities associated with the Recommended Plan that involve the discharge of dredged or fill material into waters of the United States.

Under the 404(b)(1) guidelines, no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the recommended discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes. 40 CFR 230.10(a)(2).

While implementation of the Recommended Plan would involve the placement of fill material within the project footprint and would impact approximately 0.2 acres of waters of the U.S., this disposal would not violate established State water quality standards or the Toxic Effluent Standards of Section 307 of the Clean Water Act of 1977, as amended, nor harm any endangered species or their critical habitat. Implementation of the Recommended Plan would not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. Appropriate steps to minimize potential adverse impacts of discharge in aquatic systems include use of suitable erosion control technologies together with the implementation of procedures to protect against erosion and sedimentation during and after construction.