UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF TEXAS
CORPUS CHRISTI DIVISION

UNITED STATES OF AMERICA, Plaintiff, v. ENERGY TRANSFER (R&M), LLC, et al., Defendants.	Civil Action No. 2:23-CV-214

REMEDIAL DESIGN/REMEDIAL ACTION
PARTIAL CONSENT DECREE

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WHEREAS, the United States of America ("United States"), on behalf of the Administrator of the United States Environmental Protection Agency ("EPA"), filed a complaint in this matter under sections 107(a) and 113(g)(2) of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. §§ 9607(a) and 9613(g)(2), on August 31, 2023. The United States filed its First Amended Complaint ("Complaint") on January 22, 2024.

WHEREAS, the United States, in its First Amended Complaint, seeks: (1) reimbursement of costs incurred by the United States for response actions at the Brine Service Company, Inc. Superfund Site in Corpus Christi, Texas ("Site"), together with accrued interest; and (2) a declaratory judgment for additional costs incurred by the United States for any future response actions taken at the Site.

WHEREAS, in accordance with the NCP and section 121(f)(1)(F) of CERCLA, EPA notified the State of Texas ("State") on September 30, 2020 and February 28, 2023, of negotiations with potentially responsible parties ("PRPs") regarding the implementation of the remedial design and remedial action ("RD/RA") for the Site, and EPA has provided the State with an opportunity to participate in such negotiations and to be a party to this Consent Decree ("Decree").

WHEREAS, in accordance with section 122(j)(1) of CERCLA, EPA notified the United States Department of the Interior, through the United States Fish & Wildlife Service, and the Department of Commerce, through the National Oceanic & Atmospheric Administration, of negotiations with PRPs regarding the release of hazardous substances that may have resulted in injury to the natural resources under federal trusteeship and encouraged the trustees to participate in the negotiation of this Decree.

WHEREAS, The Goodyear Tire & Rubber Company ("Settling Defendant") does not admit to any findings of fact or to any liability to the United States arising out of the transactions

or occurrences alleged in the Complaint, nor does it acknowledge that the release or threatened release of hazardous substance(s) at or from the Site constitutes an imminent and substantial endangerment to the public health or welfare or the environment.

WHEREAS, in accordance with section 105 of CERCLA, EPA listed the Site on the National Priorities List ("NPL"), set forth at 40 C.F.R. part 300, Appendix B, by publication in the Federal Register on September 5, 2002, 67 Fed. Reg. 56757.

WHEREAS, in response to a release or a threat of a release of hazardous substances at or from the Site, a group of PRPs at the Site completed a Remedial Investigation and a Feasibility Study ("RI/FS") for the Site in 2018, in accordance with 40 C.F.R. § 300.430.

WHEREAS, in accordance with section 117 of CERCLA and 40 C.F.R § 300.430(f), EPA published notice of the completion of the RI/FS and of the proposed plan for remedial action on August 27, 2019, in a major local newspaper of general circulation. EPA held a public meeting regarding the proposed plan on September 10, 2019, and provided an opportunity for written and oral comments from the public. A copy of the transcript of the public meeting and comments received are available to the public as part of the administrative record upon which the Director of the Superfund and Emergency Management Division, EPA Region 6, based the selection of the response action.

WHEREAS, EPA selected a Remedial Action to be implemented at the Site, which is embodied in a final Record of Decision, executed on August 31, 2020. The Record of Decision includes a summary of responses to the public comments. Notice of the final plan was published in accordance with section 117(b) of CERCLA.

WHEREAS, the Remedial Action selected in the Record of Decision requires reducing the amount of contamination in soil and groundwater and addressing sludge and reworked soil/waste at the Site.

WHEREAS, this Decree, pursuant to which Settling Defendant is agreeing to perform certain activities to partially implement the Remedial Action for the Site, is intended as a resolution of the United States' claims against Settling Defendant in connection with the Site, as provided in Section XIII (Covenants by Plaintiff). The activities to be performed under this Decree consist of the Goodyear North Pit Work, as identified in the third bullet on page 74 (Section 19) (Surface Soil Removal (North Pit Area)) of the Record of Decision and in ¶ **1.3** of the Goodyear North Pit SOW. The United States does not, however, waive its position that the harm at the Site is not divisible and that Settling Defendant's liability is not apportionable.

WHEREAS, based on the information currently available, EPA has determined that the Goodyear North Pit Work will be properly and promptly conducted by Settling Defendant if conducted in accordance with this Decree and its appendices.

WHEREAS, the Parties recognize, and the Court by entering this Decree finds, that this Decree has been negotiated by the Parties in good faith, that implementation of this Decree will expedite the cleanup of the Site and will avoid prolonged and complicated litigation between the Parties, and that this Decree is fair, reasonable, in the public interest, and consistent with CERCLA.

NOW, THEREFORE, it is hereby **ORDERED** and **DECREED** as follows:

I. JURISDICTION AND VENUE

1. This Court has jurisdiction over the subject matter of this action under 28 U.S.C. §§ 1331 and 1345, and sections 106, 107 and 113(b) of CERCLA, and personal jurisdiction over the Parties. Venue lies in this District under section 113(b) of CERCLA and 28 U.S.C. §§ 1391(b), and 1395(a), because the Site is located in this judicial district. This Court retains jurisdiction over

the subject matter of this action and over the Parties for the purpose of resolving disputes arising under this Decree, entering orders modifying this Decree, or effectuating or enforcing compliance with this Decree. Settling Defendant may not challenge the terms of this Decree or this Court's jurisdiction to enter and enforce this Decree.

II. PARTIES BOUND

2. This Decree is binding upon the United States and upon Settling Defendant and its successors. Unless the United States consents, (a) any change in ownership or corporate or other legal status of Settling Defendant, including any transfer of assets, or (b) any Transfer of the Site or any portion thereof, does not alter Settling Defendant's obligations under this Decree. Settling Defendant's responsibilities under this Decree cannot be assigned except under a modification executed in accordance with ¶ 62.

3. In any action to enforce this Decree, Settling Defendant may not raise as a defense the failure of any of its officers, directors, employees, agents, contractors, subcontractors, or any person representing Settling Defendant to take any action necessary to comply with this Decree. Settling Defendant shall provide notice of this Decree to each person representing Settling Defendant with respect to the Site. Settling Defendant shall provide notice of this Decree to each contractor performing any Goodyear North Pit Work and shall ensure that notice of the Decree is provided to each subcontractor performing any Goodyear North Pit Work.

III. DEFINITIONS

4. Subject to the next sentence, terms used in this Decree that are defined in CERCLA or the regulations promulgated under CERCLA have the meanings assigned to them in CERCLA and the regulations promulgated under CERCLA. Whenever the terms set forth below are used in this Decree, the following definitions apply:

a. "CERCLA" means the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §§ 9601-9675.

b. "Consent Decree" or "Decree" means this consent decree, all appendices attached hereto (listed in Section XVIII), and all deliverables incorporated into the Decree under ¶ **7.7** of the Goodyear North Pit SOW. If there is a conflict between a provision in Sections I through XXIII and a provision in any appendix or deliverable, the provision in Sections I through XXIII controls.

c. "Day" or "day" means a calendar day. In computing any period under this Decree, the day of the event that triggers the period is not counted and, where the last day is not a working day, the period runs until the close of business of the next working day. "Working day" means any day other than a Saturday, Sunday, or federal or State holiday.

d. "DOJ" means the United States Department of Justice.

e. "Effective Date" means the date upon which the Court's approval of this Decree is recorded on its docket.

f. "EPA" means the United States Environmental Protection Agency.

g. "Fund" means the Hazardous Substance Superfund established under section 9507 of the Internal Revenue Code, 26 I.R.C. § 9507.

h. "Including" or "including" means "including but not limited to."

i. "Interest" means interest at the rate specified for interest on investments of the Fund, as provided under section 107(a) of CERCLA, compounded annually on October 1 of each year. The applicable rate of interest will be the rate in effect at the time the interest accrues. The rate of interest is subject to change on October 1 of each year. As of the date of lodging of this Decree, rates are available online at https://www.epa.gov/superfund/superfund-interest-rates.

j. "Goodyear North Pit Remedial Design" or "Goodyear North Pit RD" means the technical plans and specifications for implementation of the Goodyear North Pit Work as set forth in the Goodyear North Pit SOW.

k. "Goodyear North Pit Scope of the Remedy" means the scope of the remedy to be undertaken by Settling Defendant in accordance with this Decree and as set forth in ¶ **1.3** of the Goodyear North Pit SOW.

l. "Goodyear North Pit Work" shall mean the activities to be undertaken by Settling Defendant in accordance with this Decree and the Goodyear North Pit SOW to implement the portion of the Remedial Action listed in the third bullet on page 74 (Section 19) (Surface Soil Removal (North Pit Area)) in the Record of Decision for the Site. The Goodyear North Pit Work includes all requirements of this Decree associated with the Goodyear North Pit Work, including all obligations of Settling Defendant under Sections V (Performance of the Goodyear North Pit Work) through VIII (Indemnification and Insurance).

m. "Goodyear North Pit Statement of Work" or "Goodyear North Pit SOW" means the document attached as Appendix B, which describes the activities Settling Defendant must perform to implement the Goodyear North Pit Work.

n. "National Contingency Plan" or "NCP" means the National Oil and Hazardous Substances Pollution Contingency Plan promulgated under section 105 of CERCLA, codified at 40 C.F.R. part 300, and any amendments thereto.

o. "North Pit" means the area of the Site that occupies portions of Lots 2-4, and a portion of Lot 8B of Block 1, Goldston Addition, in Corpus Christi, Nueces County, Texas, and which is depicted generally on the map attached as Appendix C.

p. "Paragraph" or "¶" means a portion of this Decree identified by an Arabic numeral or an upper- or lower-case letter.

q. "Parties" means the United States and Settling Defendant.

r. "Plaintiff" means the United States.

s. "RCRA" means the Solid Waste Disposal Act, 42 U.S.C. §§ 6901-6992k, (also known as the Resource Conservation and Recovery Act).

t. "Record of Decision" or "ROD" means the EPA decision document that memorializes the selection of the Remedial Action relating to the Site signed on August 31, 2020, by Director of the Superfund and Emergency Management Division, EPA Region 6, and all attachments thereto. The Record of Decision is attached as Appendix A.

u. "Remedial Action" means the remedy selected in the Record of Decision for the Site.

v. "Response Costs" means all costs (including direct, indirect, payroll, contractor, travel, and laboratory costs) that the United States pays after the Effective Date in implementing and overseeing the Goodyear North Pit Work, or enforcing this Decree, including: (i) in developing, reviewing and approving deliverables generated under this Decree; (ii) in overseeing Settling Defendant's performance of the Goodyear North Pit Work; (iii) in assisting or taking action to obtain access or use restrictions under ¶ 10; (iv) in taking action under ¶ 17 (Access to Financial Assurance) under this Decree; (v) in taking response action described in ¶ 45 because of Settling Defendant's failure to take emergency action under ¶ **5.3** of the Goodyear North Pit SOW; (vi) in implementing a Work Takeover under ¶ 9; (vii) in implementing community involvement activities focused on the North Pit, including the cost of any technical assistance grant provided

under section 117(e) of CERCLA relating to the Goodyear North Pit Work; and (viii) in enforcing this Decree, including all costs paid under Section XI (Dispute Resolution) and all litigation costs.

w. "Response Costs Special Account" means the special account, within the Fund, established for the Brine Service Company Superfund Site Response Costs by EPA under section 122(b)(3) of CERCLA.

x. "Section" means a portion of this Decree identified by a Roman numeral.

y. "Settling Defendant" means The Goodyear Tire & Rubber Company.

z. "Site" means the Brine Service Company, Inc. Superfund Site, comprising approximately sixteen (16) acres, located northeast of the intersection of Interstate Highway 37 and Goldston Road in Corpus Christi, Nueces County, Texas, and depicted generally on the map attached as Appendix C. For purposes of this Decree, the term "Site" also refers to any area where Waste Material has come to be located.

aa. "State" means the State of Texas.

bb. "Transfer" means to sell, assign, convey, lease, mortgage, or grant a security interest in, or where used as a noun, a sale, assignment, conveyance, or other disposition of any interest by operation of law or otherwise.

cc. "United States" means the United States of America and each department, agency, and instrumentality of the United States, including EPA.

dd. "Waste Material" means (a) any "hazardous substance" under Section 101(14) of CERCLA; (b) any pollutant or contaminant under section 101(33) of CERCLA; and (c) any "solid waste" under section 1004(27) of RCRA.

ee. "Work Takeover" means EPA's assumption of the performance of any of the Goodyear North Pit Work in accordance with ¶ 9.

IV. OBJECTIVES

5. The objectives of the Parties in entering into this Decree are to protect public health, welfare, and the environment through the design and implementation of a response action at the Site by Settling Defendant, to pay Response Costs of Plaintiff under this Decree, and to resolve and settle the claims of Plaintiff against Settling Defendant as provided in this Decree.

V. PERFORMANCE OF THE GOODYEAR NORTH PIT WORK

6. Settling Defendant shall finance, develop, and implement the Goodyear North Pit Work in accordance with the Goodyear North Pit SOW, any modified Goodyear North Pit SOW, and all EPA-approved, conditionally approved, or modified deliverables as required by the Goodyear North Pit SOW or modified Goodyear North Pit SOW.

7. **Modifications to the Goodyear North Pit Work and Further Response Actions**

a. Nothing in this Decree limits EPA's authority to modify the Remedial Action or to select further response actions for the Site in accordance with the requirements of CERCLA and the NCP. Nothing in this Decree limits Settling Defendant's rights, under sections 113(k)(2) or 117 of CERCLA, to comment on any modified or further response actions proposed by EPA.

b. If EPA modifies the Goodyear North Pit Work, and the modification is consistent with the Goodyear North Pit Scope of the Remedy, then Settling Defendant shall implement any modifications to the Goodyear North Pit Work as provided in ¶ 7.d.

c. If EPA selects a further response action because a reopener condition in ¶ 43 is satisfied, then, subject to ¶¶ 7.e and 62, Settling Defendant shall implement the further response action as provided in ¶ 7.d.

d. Upon receipt of notice from EPA that it has modified the Goodyear North Pit Work as provided in ¶ 7.b or selected a further response action as provided in Paragraph 7.c and is requesting that Settling Defendant implement the modified Goodyear North Pit Work or

further response action, Settling Defendant shall implement the modification or further response action, subject to its right to initiate dispute resolution under Section XI within thirty (30) days after receipt of EPA's notice. Settling Defendant shall modify the Goodyear North Pit SOW, or related work plans, or both in accordance with the Goodyear North Pit Work modification or further response action or, if Settling Defendant invokes dispute resolution, in accordance with the final resolution of the dispute. The Goodyear North Pit Work modification or further response action, the approved modified Goodyear North Pit SOW, and any related work plans will be deemed to be incorporated into and enforceable under this Decree.

e. Notwithstanding any other provision in ¶ 7, any modification or further response action to implement an amendment to the Record of Decision that "fundamentally alters the basic features" of the Goodyear North Pit Work within the meaning of 40 C.F.R. § 300.435(c)(2)(ii) shall be considered a material modification under, and may only be implemented in accordance with, ¶ 62.

8. **Compliance with Applicable Law**. Nothing in this Decree affects Settling Defendant's obligations to comply with all applicable federal and state laws and regulations. Settling Defendant must also comply with all applicable or relevant and appropriate requirements of all federal and state environmental laws as set forth in the Record of Decision and the Goodyear North Pit SOW. The activities conducted in accordance with this Decree, if approved by EPA, will be deemed to be consistent with the NCP as provided under section 300.700(c)(3)(ii).

9. **Work Takeover**

a. If EPA determines that Settling Defendant (i) has ceased to perform any of the Goodyear North Pit Work required under this Section; (ii) is seriously or repeatedly deficient or late in performing the Goodyear North Pit Work required under this Section; or (iii) is performing the Goodyear North Pit Work required under this Section in a manner that may cause

an endangerment to human health or the environment, EPA may issue a notice of Work Takeover to Settling Defendant, including a description of the grounds for the notice and a period of time ("Remedy Period") within which Settling Defendant must remedy the circumstances giving rise to the notice. The Remedy Period will be twenty (20) days, unless EPA determines in its unreviewable discretion that there may be an endangerment, in which case the Remedy Period will be ten (10) days.

b. If, by the end of the Remedy Period, Settling Defendant does not remedy to EPA's satisfaction the circumstances giving rise to the notice of Work Takeover, EPA may notify Settling Defendant and, as it deems necessary, commence a Work Takeover.

c. EPA may conduct the Work Takeover during the pendency of any dispute under Section XI but shall terminate the Work Takeover if and when: (i) Settling Defendant remedies, to EPA's satisfaction, the circumstances giving rise to the notice of Work Takeover; or (ii) upon the issuance of a final determination under Section XI (Dispute Resolution) that EPA is required to terminate the Work Takeover.

VI. PROPERTY REQUIREMENTS

10. **Agreements Regarding Access and Noninterference**

a. As used in this Section, "Affected Property" means any real property, including the Site, where EPA determines, at any time, that access is needed to implement the Goodyear North Pit Work.

b. Settling Defendant shall use best efforts to secure from the owner(s) of all Affected Property, an agreement, enforceable by Settling Defendant and by Plaintiff, requiring such owner to provide Plaintiff and Settling Defendant, and their respective representatives, contractors, and subcontractors with access at all reasonable times to such owner's property to conduct any activity regarding the Decree, including the following:

(1) implementing the Goodyear North Pit Work and overseeing compliance with the Decree

(2) conducting investigations of contamination at or near the North Pit;

(3) assessing the need for, planning, or implementing additional response actions at or near the North Pit; and

(4) determining whether the North Pit area is being used in a manner that is prohibited or restricted, or that may need to be prohibited or restricted under the Decree.

c. Further, each agreement required under ¶ 10.b must commit the owner to refrain from using its property in any manner that EPA determines will pose an unacceptable risk to human health or to the environment as a result of exposure to Waste Material, or will interfere with or adversely affect the implementation, integrity, or protectiveness of the Goodyear North Pit Work, including the following:

(1) engaging in any of the following activities that could interfere with the Goodyear North Pit Work or that could result in human exposure to contaminants in soil: digging; installation or repair of below ground plumbing, sewage or water lines (except in case of emergency); installation of asphalt or concrete parking areas; and/or installation of a fence or fencing without prior written authorization from the EPA Project Coordinator; and

(2) constructing or installing new structures that may interfere with the Goodyear North Pit Work or that may cause an increased risk of inhalation of contaminants.

d. As used in this Section, "best efforts" means the efforts that a reasonable person in the position of Settling Defendant would use to achieve the goal in a timely manner, including the cost of employing professional assistance and the payment of reasonable sums of money to secure access and/or use restriction agreements.

e. Settling Defendant shall provide to EPA a copy of each agreement required under ¶ 10.b. If Settling Defendant cannot accomplish what is required under ¶ 10.b through best efforts in a timely manner, it shall notify EPA, and include a description of the steps taken to achieve the requirements. If the United States deems it appropriate, it may assist Settling Defendant, or take independent action, to obtain such access or use restrictions.

11. Notwithstanding any provision of the Decree, EPA retains all access authorities and rights, as well as all of its rights to require land, water, or other resource use restrictions and institutional controls, including related enforcement authorities, under CERCLA, RCRA, and any other applicable statute or regulations.

VII. FINANCIAL ASSURANCE

12. To ensure completion of the Goodyear North Pit Work required under Section V, Settling Defendant shall secure financial assurance, initially in the amount of $1,300,000 ("Estimated Cost of the Goodyear North Pit Work"), for the benefit of EPA. The financial assurance must: (i) be one or more of the mechanisms listed below, in a form substantially identical to the relevant sample documents available from EPA; and (ii) be satisfactory to EPA. As of the date of lodging of this Decree, the sample documents can be found under the "Financial Assurance - Settlements" category on the Cleanup Enforcement Model Language and Sample Documents Database at https://cfpub.epa.gov/compliance/models/. Settling Defendant may use multiple mechanisms if they are limited to surety bonds guaranteeing payment, letters of credit, trust funds, insurance policies, or some combination thereof. The following are acceptable mechanisms:

a. a surety bond guaranteeing payment, performance of the Goodyear North Pit Work, or both, that is issued by a surety company among those listed as acceptable sureties on federal bonds as set forth in Circular 570 of the U.S. Department of the Treasury;

b. an irrevocable letter of credit, payable to EPA or at the direction of EPA, that is issued by an entity that has the authority to issue letters of credit and whose letter-of-credit operations are regulated and examined by a federal or state agency;

c. a trust fund established for the benefit of EPA that is administered by a trustee that has the authority to act as a trustee and whose trust operations are regulated and examined by a federal or state agency;

d. a policy of insurance that provides EPA with acceptable rights as a beneficiary thereof and that is issued by an insurance carrier that has the authority to issue insurance policies in the applicable jurisdiction(s) and whose insurance operations are regulated and examined by a federal or state agency;

e. a demonstration by Settling Defendant that it meets the relevant test criteria of ¶ 13, accompanied by a standby funding commitment that requires Settling Defendant to pay funds to or at the direction of EPA, up to the amount financially assured through the use of this demonstration in the event of a Work Takeover; or

f. a guarantee to fund or perform the Goodyear North Pit Work executed in favor of EPA by a company: (1) that is a direct or indirect parent company of Settling Defendant or has a "substantial business relationship" (as defined in 40 C.F.R. § 264.141(h)) with Settling Defendant; and (2) demonstrates to EPA's satisfaction that it meets the financial test criteria of ¶13.

13. If Settling Defendant seeks to provide financial assurance by means of a demonstration or guarantee under ¶ 12.e or 12.f, it must, within 30 days after the Effective Date:

a. demonstrate that:

(1) Settling Defendant or guarantor has:

i. two of the following three ratios: a ratio of total liabilities to net worth less than 2.0; a ratio of the sum of net income plus depreciation, depletion, and amortization to total liabilities greater than 0.1; and a ratio of current assets to current liabilities greater than 1.5; and

ii. net working capital and tangible net worth each at least six times the sum of the Estimated Cost of the Goodyear North Pit Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; and

iii. tangible net worth of at least $10 million; and

iv. assets located in the United States amounting to at least 90 percent of total assets or at least six times the sum of the Estimated Cost of the Goodyear North Pit Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; or

(2) Settling Defendant or guarantor has:

i. a current rating for its senior unsecured debt of AAA, AA, A, or BBB as issued by Standard and Poor's or Aaa, Aa, A or Baa as issued by Moody's; and

ii. tangible net worth at least six times the sum of the Estimated Cost of the Goodyear North Pit Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; and

iii. tangible net worth of at least $10 million; and

iv. assets located in the United States amounting to at least 90 percent of total assets or at least six times the sum of the Estimated Cost of the Goodyear North Pit Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; and

b. submit to EPA: (1) a copy of an independent certified public accountant's report of the entity's financial statements for the latest completed fiscal year, which must not express an adverse opinion or disclaimer of opinion; and (2) a letter from its chief financial officer and a report from an independent certified public accountant substantially identical to the sample letter and reports available from EPA. As of the date of lodging of this Decree, a sample letter and report are available under the "Financial Assurance - Settlements" subject list category on the Cleanup Enforcement Model Language and Sample Documents Database at https://cfpub.epa.gov/compliance/models/.

14. Settling Defendant providing financial assurance by means of a demonstration or guarantee under ¶ 12.e or 12.f must also:

a. annually resubmit the documents described in ¶ 13.b within 90 days after the close of Settling Defendant's or its guarantor's fiscal year;

b. notify EPA within 30 days after Settling Defendant or its guarantor determines that it no longer satisfies the relevant financial test criteria and requirements set forth in this Section; and

c. provide to EPA, within 30 days of EPA's request, reports of the financial condition of Settling Defendant or its guarantor in addition to those specified in ¶ 13.b; EPA may make such a request at any time based on a belief that Settling Defendant or its guarantor may no longer meet the financial test requirements of this Section.

15. Settling Defendant shall, within thirty (30) days after the Effective Date, seek EPA's approval of the form of Settling Defendant's financial assurance. Within thirty (30) days after such approval, Settling Defendant shall secure all executed or otherwise finalized mechanisms or other documents consistent with the EPA-approved form of financial assurance and shall submit such mechanisms and documents to the Regional Financial Management Officer, to DOJ, and to EPA in accordance with ¶ 60.

16. Settling Defendant shall diligently monitor the adequacy of the financial assurance. If Settling Defendant becomes aware of any information indicating that the financial assurance provided under this Section is inadequate or otherwise no longer satisfies the requirements of this Section, Settling Defendant shall notify EPA of such information within seven (7) days. If EPA determines that the financial assurance provided under this Section is inadequate or otherwise no longer satisfies the requirements of this Section, EPA will notify Settling Defendant of such determination. Settling Defendant shall, within thirty (30) days after notifying EPA or receiving notice from EPA under this Paragraph, secure and submit to EPA for approval a proposal for a

revised or alternative financial assurance mechanism that satisfies the requirements of this Section. EPA may extend this deadline for such time as is reasonably necessary for the affected Settling Defendant, in the exercise of due diligence, to secure and submit to EPA a proposal for a revised or alternative financial assurance mechanism, not to exceed sixty (60) days. Settling Defendant shall follow the procedures of ¶18 in seeking approval of, and submitting documentation for, the revised or alternative financial assurance mechanism. Settling Defendant's inability to secure financial assurance in accordance with this Section does not excuse performance of any other requirement of this Decree.

17. **Access to Financial Assurance**

a. If EPA issues a notice of a Work Takeover under ¶ 9.b, then, in accordance with any applicable financial assurance mechanism, including the related standby funding commitment, EPA may require that any funds guaranteed be paid in accordance with ¶ 17.d.

b. If EPA is notified that the issuer of a financial assurance mechanism intends to cancel the mechanism, and Settling Defendant fails to provide an alternative financial assurance mechanism in accordance with this Section at least thirty (30) days prior to the cancellation date, the funds guaranteed under such mechanism must be paid prior to cancellation in accordance with ¶ 17.d.

c. If, upon issuance of a notice of a Work Takeover under ¶ 9.b, either: (1) EPA is unable for any reason to promptly secure the resources guaranteed under any applicable financial assurance mechanism, whether in cash or in kind, to continue and complete the Goodyear North Pit Work; or (2) the financial assurance is a demonstration or guarantee under ¶ 12.e or 12.f, then EPA is entitled to demand an amount, as determined by EPA, sufficient to cover the cost of the remaining Goodyear North Pit Work to be performed. Settling Defendant shall, within sixty (60) days after such demand, pay the amount demanded as directed by EPA.

d. Any amounts required to be paid under this ¶ 17 must be, as directed by EPA: (i) paid to EPA in order to facilitate the completion of the Goodyear North Pit Work by EPA or by another person; or (ii) deposited into an interest-bearing account, established at a duly chartered bank or trust company that is insured by the Federal Deposit Insurance Corporation ("FDIC"), in order to facilitate the completion of the Goodyear North Pit Work by another person. If payment is made to EPA, EPA may deposit the payment into the Fund, or into the Response Costs Special Account to be retained and used to conduct or finance response actions at or in connection with the Site or to be transferred by EPA to the Fund.

18. **Modification of Amount, Form, or Terms of Financial Assurance**. Beginning six months after the Effective Date, and no more than twice per calendar year, Settling Defendant may submit a request to change the form, terms, or amount of the financial assurance mechanism. Any such request must be submitted to EPA in accordance with ¶ 15, and must include an estimate of the cost of the remaining Goodyear North Pit Work, an explanation of the bases for the cost calculation, and a description of the proposed changes, if any, to the form or terms of the financial assurance. EPA will notify Settling Defendant of its decision regarding the request. Settling Defendant may initiate dispute resolution under Section XI regarding EPA's decision within thirty (30) days after receipt of the decision. Settling Defendant may modify the form, terms, or amount of the financial assurance mechanism only: (a) in accordance with EPA's approval; or (b) in accordance with any resolution of a dispute under Section XI. Settling Defendant shall submit to EPA, within thirty (30) days after receipt of EPA's approval or consistent with the terms of the resolution of the dispute, documentation of the change to the form, terms, or amount of the financial assurance instrument.

19. **Release, Cancellation, or Discontinuation of Financial Assurance**. Settling Defendant may release, cancel, or discontinue any financial assurance provided under this Section only: (a) if EPA issues a Notice of Goodyear North Pit Work Completion under ¶ **5.5** of the Goodyear North Pit SOW; (b) in accordance with EPA's approval of such release, cancellation, or discontinuation; or (c) if there is a dispute regarding the release, cancellation or discontinuance of any financial assurance, in accordance with the agreement, final administrative decision, or final judicial decision resolving such dispute under Section XI.

VIII. INDEMNIFICATION AND INSURANCE

20. **Indemnification**

a. Plaintiff does not assume any liability by entering into this Decree or by virtue of any designation of Settling Defendant as EPA's authorized representative under section 104(e)(1) of CERCLA. Settling Defendant shall indemnify and save and hold harmless Plaintiff and its officials, agents, employees, contractors, subcontractors, and representatives for or from any claims or causes of action arising from, or on account of, negligent or other wrongful acts or omissions of Settling Defendant, its officers, directors, employees, agents, contractors, subcontractors, and any persons acting on Settling Defendant's behalf or under its control, in carrying out activities under this Decree, including any claims arising from any designation of Settling Defendant as EPA's authorized representatives under section 104(e)(1) of CERCLA. Further, Settling Defendant agrees to pay Plaintiff all costs it incurs including attorneys' fees and other expenses of litigation and settlement arising from, or on account of, claims made against Plaintiff based on negligent or other wrongful acts or omissions of Settling Defendant, its officers, directors, employees, agents, contractors, subcontractors, and any persons acting on their behalf or under its control in carrying out activities under with this Decree. Plaintiff may not be held out as a party to any contract entered into by or on behalf of Settling Defendant in carrying out

activities under this Decree. The Settling Defendant and any such contractor may not be considered an agent of Plaintiff.

b. Plaintiff shall give Settling Defendant notice of any claim for which Plaintiff plans to seek indemnification in accordance with this ¶ 20, and shall consult with Settling Defendant prior to settling such claim.

21. Settling Defendant covenants not to sue and shall not assert any claim or cause of action against Plaintiff for damages or reimbursement or for set-off of any payments made or to be made to Plaintiff, arising from or on account of any contract, agreement, or arrangement between Settling Defendant and any person for performance of Goodyear North Pit Work or other activities on or relating to the Site, including claims on account of construction delays. In addition, Settling Defendant shall indemnify and save and hold Plaintiff harmless with respect to any claims for damages or reimbursement arising from or on account of any contract, agreement, or arrangement between Settling Defendant and any person for performance of work at or relating to the Site, including claims on account of construction delays.

22. **Insurance**. Settling Defendant shall secure, by no later than fifteen (15) days before commencing any on-site Goodyear North Pit Work, the following insurance: (a) commercial general liability insurance with limits of liability of $1 million per occurrence; (b) automobile liability insurance with limits of liability of $1 million per accident; and (c) umbrella liability insurance with limits of liability of $5 million in excess of the required commercial general liability and automobile liability limits. The insurance policy must name Plaintiff as an additional insured with respect to all liability arising out of the activities performed by or on behalf of Settling Defendant under this Decree. Settling Defendant shall maintain this insurance until the first anniversary after issuance of EPA's Notice of Goodyear North Pit Work Completion under ¶ **5.5**

of the Goodyear North Pit SOW. In addition, for the duration of this Decree, Settling Defendant shall satisfy, or shall ensure that its contractors or subcontractors satisfy, all applicable laws and regulations regarding the provision of worker's compensation insurance for all persons performing the Goodyear North Pit Work on behalf of Settling Defendant in furtherance of this Decree. Prior to commencement of the Goodyear North Pit Work, Settling Defendant shall provide to EPA certificates of such insurance and a copy of each insurance policy. Settling Defendant shall resubmit such certificates and copies of policies each year on the anniversary of the Effective Date. If Settling Defendant demonstrates by evidence satisfactory to EPA that any contractor or subcontractor maintains insurance equivalent to that described above, or insurance covering the same risks but in a lesser amount, then, with respect to that contractor or subcontractor, Settling Defendant need provide only that portion of the insurance described above that is not maintained by the contractor or subcontractor. Settling Defendant shall ensure that all submittals to EPA under this Paragraph identify the Brine Service Company, Inc. Superfund Site, Corpus Christi, Texas and the civil action number of this case (Case No.: 2:23-cv-214).

IX. PAYMENTS FOR RESPONSE COSTS

23. **Payments by Settling Defendant for Response Costs**

a. **Periodic Bills**. On a periodic basis, EPA will send Settling Defendant a bill for Response Costs, including an Itemized Cost Summary listing direct and indirect costs paid by EPA, its contractors, subcontractors, and other federal agencies. Settling Defendant may initiate a dispute under Section XI regarding a Response Cost billing, but only if the dispute relates to one or more of the following issues: (i) whether EPA has made an arithmetical error; (ii) whether EPA has included a cost item that is not within the definition of Response Costs; or (iii) whether EPA has paid excess costs as a direct result of an EPA action that was inconsistent with a specific

provision or provisions of the NCP. Settling Defendant must specify in the Notice of Dispute the contested costs and the basis for the objection.

b. **Payment of Bill**. Settling Defendant shall pay the bill, or if it initiates dispute resolution under Section XI, the uncontested portion of the bill, if any, within thirty (30) days after receipt of the bill. Settling Defendant shall pay the contested portion of the bill determined to be owed, if any, within thirty (30) days after the determination regarding the dispute. Each payment for: (i) the uncontested bill or portion of bill, if late; and (ii) the contested portion of the bill determined to be owed, if any, must include an additional amount for Interest accrued from the date of receipt of the bill through the date of payment. Settling Defendant shall make payment at https://www.pay.gov using the "EPA Miscellaneous Payments Cincinnati Finance Center" link and include references to the Site/Spill ID and DJ numbers listed in ¶ 60 and the purpose of the payment. Settling Defendant shall send notices of this payment to DOJ and EPA in accordance with ¶ 60.

24. D**eposit of Payments**. EPA may, in its unreviewable discretion, deposit the amounts paid under to ¶ 23 in the Fund, in the Response Costs Special Account, or both. EPA may, in its unreviewable discretion, retain and use any amounts deposited in the Response Costs Special Account to conduct or finance response actions at or in connection with the Site, or transfer those amounts to the Fund.

X. FORCE MAJEURE

25. "Force majeure," for purposes of this Decree, means any event arising from causes beyond the control of Settling Defendant, of any entity controlled by Settling Defendant, or of Settling Defendant's contractors that delays or prevents the performance of any obligation under this Decree despite Settling Defendant' best efforts to fulfill the obligation. Given the need to protect public health and welfare and the environment, the requirement that Settling Defendant

exercise "best efforts to fulfill the obligation" includes using best efforts to anticipate any potential force majeure and best efforts to address the effects of any potential force majeure (a) as it is occurring and (b) following the potential force majeure such that the delay and any adverse effects of the delay are minimized to the greatest extent possible. "Force majeure" does not include financial inability to complete the Goodyear North Pit Work.

26. If any event occurs for which Settling Defendant will or may claim a force majeure, Settling Defendant shall notify EPA's Project Coordinator by email. The deadline for the initial notice is seven (7) days after the date Settling Defendant first knew or should have known that the event would likely delay performance. Settling Defendant shall be deemed to know of any circumstance of which any contractor of, subcontractor of, or entity controlled by Settling Defendant knew or should have known. Within thirty (30) days thereafter, Settling Defendant shall send a further notice to EPA that includes: (i) a description of the event and its effect on Settling Defendant's completion of the requirements of the Decree; (ii) a description of all actions taken or to be taken to prevent or minimize the adverse effects or delay; (iii) the proposed extension of time for Settling Defendant to complete the requirements of the Decree; (iv) a statement as to whether, in the opinion of Settling Defendant, such event may cause or contribute to an endangerment to public health or welfare, or the environment; and (v) all available proof supporting their claim of force majeure. Failure to comply with the notice requirements herein regarding an event precludes Settling Defendant from asserting any claim of force majeure regarding that event, provided, however, that if EPA, despite late or incomplete notice, is able to assess to its satisfaction whether the event is a force majeure under ¶ 25 and whether Settling Defendant has exercised its best efforts under ¶ 25, EPA may, in its unreviewable discretion, excuse in writing Settling Defendant's failure to submit timely or complete notices under this Paragraph.

27. EPA will notify Settling Defendant of its determination whether Settling Defendant is entitled to relief under ¶ 25, and, if so, the duration of the extension of time for performance of the obligations affected by the force majeure. An extension of the time for performance of the obligations affected by the force majeure shall not, of itself, extend the time for performance of any other obligation. Settling Defendant may initiate dispute resolution under Section XI regarding EPA's determination within fifteen (15) days after receipt of the determination. In any such proceeding, Settling Defendant has the burden of proving that it is entitled to relief under ¶ 25 and that its proposed extension was or will be warranted under the circumstances.

28. The failure by EPA to timely complete any activity under the Decree or the Goodyear North Pit SOW is not a violation of the Decree, provided, however, that if such failure prevents Settling Defendant from timely completing a requirement of the Decree, Settling Defendant may seek relief under this Section.

XI. DISPUTE RESOLUTION

29. Unless otherwise provided in this Decree, Settling Defendant must use the dispute resolution procedures of this Section to resolve any dispute arising under this Decree. Settling Defendant shall not initiate a dispute challenging the Record of Decision. The United States may enforce any requirement of the Decree that is not the subject of a pending dispute under this Section.

30. A dispute will be considered to have arisen when Settling Defendant sends a written notice of dispute ("Notice of Dispute") to Plaintiff in accordance with ¶ 60. Disputes arising under this Decree must in the first instance be the subject of informal negotiations between the parties. The period for informal negotiations may not exceed twenty (20) days after the dispute arises, unless the parties to the dispute otherwise agree in writing. If the parties cannot resolve the dispute by informal negotiations, the position advanced by EPA is binding unless Settling Defendant

initiates formal dispute resolution under ¶ 31. By agreement of the parties, mediation may be used during this informal negotiation period to assist the parties in reaching a voluntary resolution or narrowing of the matters in dispute.

31. **Formal Dispute Resolution**

a. **Statements of Position**. Settling Defendant may initiate formal dispute resolution by serving on the Plaintiff, within twenty (20) days after the conclusion of informal dispute resolution under ¶ 30, an initial Statement of Position regarding the matter in dispute. The Plaintiff's responsive Statement of Position is due within twenty (20) days after receipt of the initial Statement of Position. All Statements of Position must include supporting factual data, analysis, opinion, and other documentation. A reply, if any, is due within ten (10) days after receipt of the response. If appropriate, EPA may extend the deadlines for filing statements of position for up to forty-five (45) days and may allow the submission of supplemental statements of position.

b. **Formal Decision**. The Director of the Superfund and Emergency Management Division, EPA Region 6, will issue a formal decision resolving the dispute ("Formal Decision") based on the statements of position and any replies and supplemental statements of position. The Formal Decision is binding on Settling Defendant unless Settling Defendant timely seeks judicial review under ¶ 32.

c. **Compilation of Administrative Record**. EPA shall compile an administrative record regarding the dispute, which must include all statements of position, replies, supplemental statements of position, and the Formal Decision.

32. **Judicial Review**

a. Settling Defendant may obtain judicial review of the Formal Decision by filing, within twenty (20) days after receiving it, a motion with the Court and serving the motion

on the Plaintiff. The motion must describe the matter in dispute and the relief requested. The parties shall brief the matter in accordance with local court rules.

b. **Review on the Administrative Record**. Judicial review of disputes regarding the following issues must be on the administrative record: (i) the adequacy or appropriateness of deliverables required under the Decree; (ii) the adequacy of the performance of the Goodyear North Pit Work; (iii) whether a Work Takeover is warranted under ¶ 9; (iv) determinations about financial assurance under Section VII; (v) whether a reopener condition under ¶ 43 is satisfied, including whether the Goodyear North Pit Work is not protective of human health and the environment; (vi) EPA's selection of modified or further response actions for the Goodyear North Pit Work; (vii) any other items requiring EPA approval under the Decree; and (viii) any other disputes that the Court determines should be reviewed on the administrative record. For each dispute, Settling Defendant bears the burden of demonstrating that the Formal Decision was arbitrary and capricious or otherwise not in accordance with law.

c. Judicial review of any dispute not governed by ¶ 32.b shall be governed by applicable principles of law.

33. **Escrow Account**. For disputes regarding a Response Cost billing, Settling Defendant shall: (a) establish, in a duly chartered bank or trust company, an interest-bearing escrow account that is insured by the FDIC; (b) remit to that escrow account funds equal to the amount of the contested Response Costs; and (c) send to EPA, in accordance with ¶ 60, copies of the correspondence and of the payment documentation (*e.g.*, the check) that established and funded the escrow account, including the name of the bank, the bank account number, and a bank statement showing the initial balance in the account. EPA may, in its unreviewable discretion, waive the requirement to establish the escrow account. Settling Defendant shall cause the escrow

agent to pay the amounts due to EPA under ¶ 23, if any, by the deadline for such payment in ¶ 23. Settling Defendant is responsible for any balance due under ¶ 23 after the payment by the escrow agent.

34. The initiation of dispute resolution procedures under this Section does not extend, postpone, or affect in any way any requirement of this Decree, except as EPA agrees, or as determined by the Court. Stipulated penalties with respect to the disputed matter will continue to accrue, but payment is stayed pending resolution of the dispute, as provided in ¶ 37.

XII. STIPULATED PENALTIES

35. Unless the noncompliance is excused under Section X (Force Majeure), Settling Defendant is liable to the United States for the following stipulated penalties:

a. for any failure: (i) to pay any amount due under Section IX; (ii) to establish and maintain financial assurance in accordance with Section VII; (iii) to submit timely or adequate deliverables under Sections 7 (Deliverables) and 8 (Schedules) of the Goodyear North Pit SOW:

Period of Noncompliance	Penalty Per Noncompliance Per Day
1st through 14th day	$1,000
15th through 30th day	$1,500
31st day and beyond	$5,000

b. for any failure to submit timely or adequate deliverables required by this Decree other than those specified in ¶ 35.a:

Period of Noncompliance	Penalty Per Noncompliance Per Day
1st through 14th day	$800
15th through 30th day	$1,000
31st day and beyond	$2,000

36. **Work Takeover Penalty**. If EPA commences a Work Takeover, Settling Defendant is liable for a stipulated penalty in the amount of $25,000. This stipulated penalty is in

addition to the remedy available to EPA under ¶ 17 (Access to Financial Assurance) to fund the performance of the Goodyear North Pit Work by EPA.

37. **Accrual of Penalties**. Stipulated penalties accrue from the date performance is due, or the day a noncompliance occurs, whichever is applicable, until the date the requirement is completed or the final day of the correction of the noncompliance. Nothing in this Decree prevents the simultaneous accrual of separate penalties for separate noncompliances with this Decree. Stipulated penalties accrue regardless of whether Settling Defendant has been notified of its noncompliance, and regardless of whether Settling Defendant has initiated dispute resolution under Section XI, provided, however, that no penalties will accrue as follows:

a. with respect to a submission that EPA subsequently determines is deficient under ¶ **7.6** of the Goodyear North Pit SOW, during the period, if any, beginning on the 31st day after EPA's receipt of such submission until the date that EPA notifies Settling Defendant of any deficiency;

b. with respect to a matter that is the subject of dispute resolution under Section XI, during the period, if any, beginning on the 21st day after the later of the date that EPA's Statement of Position is received or the date that Settling Defendant's reply thereto (if any) is received until the date of the Formal Decision under ¶ 31.b; or

c. with respect to a matter that is the subject of judicial review by the Court under ¶ 32, during the period, if any, beginning on the 31st day after the Court's receipt of the final submission regarding the dispute until the date that the Court issues a final decision regarding such dispute.

38. **Demand and Payment of Stipulated Penalties**. EPA may send Settling Defendant a demand for stipulated penalties. The demand will include a description of the noncompliance

and will specify the amount of the stipulated penalties owed. Settling Defendant may initiate dispute resolution under Section XI within thirty (30) days after receipt of the demand. Settling Defendant shall pay the amount demanded or, if it initiates dispute resolution, the uncontested portion of the amount demanded, within thirty (30) days after receipt of the demand. Settling Defendant shall pay the contested portion of the penalties determined to be owed, if any, within thirty (30) days after the resolution of the dispute. Each payment for: (a) the uncontested penalty demand or uncontested portion, if late; and (b) the contested portion of the penalty demand determined to be owed, if any, must include an additional amount for Interest accrued from the date of receipt of the demand through the date of payment. Settling Defendant shall make payment at https://www.pay.gov using the link for "EPA Miscellaneous Payments Cincinnati Finance Center," including references to the Site/Spill ID and DJ numbers listed in ¶ 60, and the purpose of the payment. Settling Defendant shall send a notice of this payment to DOJ and EPA, in accordance with ¶ 60. The payment of stipulated penalties and Interest, if any, does not alter any obligation by Settling Defendant under the Decree.

39. Nothing in this Decree limits the authority of the United States: (a) to seek any remedy otherwise provided by law for Settling Defendant's failure to pay stipulated penalties or interest; or (b) to seek any other remedies or sanctions available by virtue of Settling Defendant's noncompliances with this Decree or of the statutes and regulations upon which it is based, including penalties under section 122(*l*) of CERCLA, provided, however, that the United States may not seek civil penalties under section 122(*l*) of CERCLA for any noncompliance for which a stipulated penalty is provided for in this Decree, except in the case of a willful noncompliance with this Decree.

40. Notwithstanding any other provision of this Section, the United States may, in its unreviewable discretion, waive any portion of stipulated penalties that have accrued under this Decree.

XIII. COVENANTS BY PLAINTIFF

41. **Covenants for Settling Defendant**. Subject to ¶¶ 43 and 44, the United States covenants not to sue or to take administrative action against Settling Defendant under sections 106 and 107(a) of CERCLA regarding the Site.

42. The covenants under ¶ 41: (a) take effect upon the Effective Date, except with respect to future liability, for which these covenants take effect upon Notice of Goodyear North Pit Work Completion by EPA under ¶ **5.5** of the Goodyear North Pit SOW; (b) are conditioned on the satisfactory performance by Settling Defendant of the requirements of this Decree; (c) extend to the successors of Settling Defendant but only to the extent that the alleged liability of the successor of Settling Defendant is based solely on its status as a successor of Settling Defendant; and (d) do not extend to any other person.

43. **United States' Pre- and Post-certification Reservations**

a. Notwithstanding any other provision of this Decree, the United States reserves, and this Decree is without prejudice to, the right to issue an administrative order or to institute proceedings in this action or in a new action seeking to compel Settling Defendant to perform further response actions relating to the Site, to pay the United States for additional costs of response, or any combination thereof. The United States may exercise this reservation only if, at any time, conditions at the Site previously unknown to EPA are discovered, or information previously unknown to EPA is received, and EPA determines, based in whole or in part on these previously unknown conditions or information, that the Goodyear North Pit Work is not protective of human health or the environment.

b. Before Notice of Goodyear North Pit Work Completion, the information and the conditions known to EPA include only that information and those conditions known to EPA as of the date the Record of Decision was signed and set forth in the Record of Decision for the Site and the administrative record supporting the Record of Decision.

c. After Notice of Goodyear North Pit Work Completion, the information and the conditions known to EPA include only that information and those conditions known to EPA as of the date of Notice of Goodyear North Pit Work Completion and set forth in the Record of Decision, the administrative record supporting the Record of Decision, the post-Record of Decision administrative record, or in any information received by EPA in accordance with the requirements of this Decree prior to Notice of Goodyear North Pit Work Completion.

44. **General Reservations**. Notwithstanding any other provision of this Decree, the United States reserves, and this Decree is without prejudice to, all rights against Settling Defendant regarding the following:

a. liability for failure by Settling Defendant to meet a requirement of this Decree;

b. liability arising from the past, present, or future disposal, release, or threat of release of Waste Material outside of the Site;

c. liability based on Settling Defendant's ownership of the Site when such ownership commences after Settling Defendant's signature of this Decree;

d. liability based on Settling Defendant's operation of the Site when such operation commences after Settling Defendant's signature of this Decree and does not arise solely from Settling Defendant's performance of the Goodyear North Pit Work;

e. liability based on Settling Defendant's transportation, treatment, storage, or disposal, or arrangement for transportation, treatment, storage, or disposal of Waste Material at or in connection with the Site, after signature of this Decree by Settling Defendant, other than as provided in the Record of Decision, under this Decree, or ordered by EPA;

f. liability for damages for injury to, destruction of, or loss of natural resources, and for the costs of any natural resource damage assessments; and

g. criminal liability.

45. Subject to ¶ 41, nothing in this Decree limits any authority of Plaintiff to take, direct, or order all appropriate action to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site, or to request a Court to order such action.

XIV. COVENANTS BY SETTLING DEFENDANT

46. **Covenants by Settling Defendant**

a. Subject to ¶ 47, Settling Defendant covenants not to sue and shall not assert any claim or cause of action against the United States under CERCLA, section 7002(a) of RCRA, the United States Constitution, the Tucker Act, 28 U.S.C. § 1491, the Equal Access to Justice Act, 28 U.S.C. § 2412, the State Constitution, State law, or at common law regarding the Site.

b. Subject to ¶ 47, Settling Defendant covenants not to seek reimbursement from the Fund through CERCLA or any other law for costs regarding the Site.

47. **Settling Defendant's Reservation**. The covenants in ¶ 46 do not apply to any claim or cause of action brought, or order issued, after the Effective Date by the United States to the extent such claim, cause of action, or order is within the scope of a reservation under ¶¶ 43, and 44.a through 44.f.

48. ***De Minimis*/Ability to Pay Waiver**. Settling Defendant shall not assert any claims and waive all claims or causes of action (including claims or causes of action under sections 107(a) and 113 of CERCLA) that it may have against any third party who enters or has entered into a *de minimis* or "ability-to-pay" settlement with EPA to the extent Settling Defendant's claims and causes of action are within the scope of the matters addressed in the third party's settlement with EPA, provided, however, that this waiver does not apply if the third party asserts a claim or cause of action regarding the Site against the Settling Defendant. Nothing in the Decree limits Settling Defendant's rights under section 122(d)(2) of CERCLA to comment on any *de minimis* or ability-to-pay settlement proposed by EPA.

XV. EFFECT OF SETTLEMENT; CONTRIBUTION

49. The Parties agree and the Court finds that: (a) the complaint filed by the United States in this action is a civil action within the meaning of section 113(f)(1) of CERCLA; (b) this Decree constitutes a judicially approved settlement under which Settling Defendant has, as of the Effective Date, resolved its liability to the United States within the meaning of sections 113(f)(2) and 113(f)(3)(B) of CERCLA; and (c) Settling Defendant is entitled, as of the Effective Date, to protection from contribution actions or claims as provided by section 113(f)(2) of CERCLA, or as may be otherwise provided by law, for the "matters addressed" in this Decree. The "matters addressed" in this Decree are all response actions taken or to be taken and all response costs incurred or to be incurred, at or in connection with the Site (including all response costs incurred prior to the Effective Date of this Consent Decree), by the United States or any other person, except for the State, provided, however, that if the United States exercises rights under the reservations in ¶ 43 and ¶¶ 44.a through 44.f, the "matters addressed" in this Decree will no longer include those response costs or response actions or natural resource damages that are within the scope of the exercised reservation.

50. Settling Defendant shall, with respect to any suit or claim brought by it for matters related to this Decree, notify DOJ and EPA no later than sixty (60) days prior to the initiation of such suit or claim. Settling Defendant shall, with respect to any suit or claim brought against it for matters related to this Decree, notify DOJ and EPA within ten (10) days after service of the complaint on Settling Defendant. In addition, Settling Defendant shall notify DOJ and EPA within ten (10) days after service or receipt of any Motion for Summary Judgment and within ten (10) days after receipt of any order from a court setting a case for trial.

51. **Res Judicata and Other Defenses**. In any subsequent administrative or judicial proceeding initiated against Settling Defendant by Plaintiff for injunctive relief, recovery of response costs, or other appropriate relief relating to the Site, Settling Defendant shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, claim preclusion (res judicata), issue preclusion (collateral estoppel), claim-splitting, or other defenses based upon any contention that the claims raised by the United States in the subsequent proceeding were or should have been brought in the instant case.

52. Nothing in this Decree diminishes the right of the United States under section 113(f)(2) and (3) of CERCLA to pursue any person not a party to this Decree to obtain additional response costs or response action and to enter into settlements that give rise to contribution protection pursuant to section 113(f)(2).

XVI. RECORDS

53. **Settling Defendant Certification**. Settling Defendant certifies that: (a) to the best of its knowledge and belief, after thorough inquiry it has not altered, mutilated, discarded, destroyed or otherwise disposed of any documents and electronically stored information relating to the Site, including information relating to its potential liability under CERCLA regarding the Site, since the earlier of notification of potential liability by the United States or the filing of suit

against it regarding the Site; and (b) it has fully complied with any and all EPA requests for information under sections 104(e) and 122(e) of CERCLA, and section 3007 of RCRA.

54. **Retention of Records and Information**

a. Settling Defendant shall retain, and instruct its contractors and agents to retain, the following documents and electronically stored data ("Records") until ten (10) years after the Notice of Goodyear North Pit Work Completion under Goodyear North Pit SOW (the "Record Retention Period"):

(1) All records regarding Settling Defendant's liability under CERCLA regarding the Site;

(2) All reports, plans, permits, and documents submitted to EPA in accordance with this Decree, including all underlying research and data; and

(3) All data developed by, or on behalf of, Settling Defendant in the course of performing the Goodyear North Pit Work.

b. At the end of the Record Retention Period, Settling Defendant shall notify EPA that it has ninety (90) days to request Settling Defendant's Records subject to this Section. Settling Defendant shall retain and preserve its Records subject to this Section until ninety (90) days after EPA's receipt of the notice. These record retention requirements apply regardless of any corporate record retention policy.

55. Settling Defendant shall provide to EPA, upon request, copies of all Records and information required to be retained under this Section. Settling Defendant shall also make available to EPA, for purposes of investigation, information gathering, or testimony, their employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Goodyear North Pit Work.

56. **Privileged and Protected Claims**

a. Settling Defendant may assert that all or part of a record requested by Plaintiff is privileged or protected as provided under federal law, in lieu of providing the record, provided that Settling Defendant comply with ¶ 56.b, and except as provided in ¶ 56.c.

b. If Settling Defendant asserts a claim of privilege or protection, it shall provide Plaintiff with the following information regarding such record: its title; its date; the name, title, affiliation (e.g., company or firm), and address of the author, of each addressee, and of each recipient; a description of the record's contents; and the privilege or protection asserted. If a claim of privilege or protection applies only to a portion of a record, Settling Defendant shall provide the record to Plaintiff in redacted form to mask the privileged or protected portion only. Settling Defendant shall retain all records that it claims to be privileged or protected until Plaintiff has had a reasonable opportunity to dispute the privilege or protection claim and any such dispute has been resolved in Settling Defendant's favor.

c. Settling Defendant shall not make any claim of privilege or protection regarding: (1) any data regarding the Site, including all sampling, analytical, monitoring, hydrogeologic, scientific, chemical, radiological or engineering data, or the portion of any other record that evidences conditions at or around the Site; or (2) the portion of any record that Settling Defendant is required to create or generate in accordance with this Decree.

57. **Confidential Business Information (CBI) Claims**. Settling Defendant may claim that all or part of a record provided to Plaintiff under this Section is CBI to the extent permitted by and in accordance with section 104(e)(7) of CERCLA and 40 C.F.R. § 2.203(b). Settling Defendant shall segregate and shall clearly identify all records or parts thereof submitted under this Decree for which it claims is CBI by labeling each page or each electronic file "claimed as confidential business information" or "claimed as CBI." Records that Settling Defendant claims

to be CBI will be afforded the protection specified in 40 C.F.R. part 2, subpart B. If no CBI claim accompanies records when they are submitted to EPA, or if EPA notifies Settling Defendant that the records are not entitled to confidential treatment under the standards of section 104(e)(7) of CERCLA or 40 C.F.R. part 2, subpart B, the public may be given access to such records without further notice to Settling Defendant.

58. In any proceeding under this Decree, validated data generated in accordance with the Goodyear North Pit SOW and reviewed and approved by EPA, if relevant to the proceeding, is admissible as evidence, without objection.

59. Notwithstanding any provision of this Decree, Plaintiff retains all of its information gathering and inspection authorities and rights, including enforcement actions related thereto, under CERCLA, RCRA, and any other applicable statutes or regulations.

XVII. NOTICES AND SUBMISSIONS

60. All agreements, approvals, consents, deliverables, modifications, notices, notifications, objections, proposals, reports, waivers, and requests specified in this Decree must be in writing unless otherwise specified. Whenever a notice is required to be given or a report or other document is required to be sent by one Party to another under this Decree, it must be sent as specified below. All notices under this Section are effective upon receipt, unless otherwise specified. In the case of emailed notices, there is a rebuttable presumption that such notices are received on the same day that they are sent. Any Party may change the method, person, or address applicable to it by providing notice of such change to the other Party.

As to DOJ: *via email to*:
eescdcopy.enrd@usdoj.gov
Re: DJ # 90-11-3-10616/1

As to EPA: *via email to*:
follin.brian@epa.gov

Re: Site/Spill ID # 06JY

As to the Regional Financial Management Officer: *via email to*: jenkins.susan@epa.gov @epa.gov
Re: Site/Spill ID # 06JY

As to Settling Defendant: *via email to*: steven_bordenkircher@goodyear.com

XVIII. APPENDICES

61. The following appendices are attached to and incorporated into this Decree:

"Appendix A" is the Record of Decision.

"Appendix B" is the Goodyear North Pit SOW.

"Appendix C" is the map of the Site showing the historical boundary of the North Pit.

"Appendix D" is the map of the Site showing the outline of the areas (shown in green) of the North Pit that are the subject of the Goodyear North Pit Work under the Goodyear North Pit SOW.

XIX. MODIFICATIONS TO DECREE

62. Except as provided in ¶ 7 of the Decree and ¶ **7.6** of the Goodyear North Pit SOW (Approval of Deliverables), nonmaterial modifications to Sections I through XXIII and the Appendices must be in writing and are effective when signed (including electronically signed) by the Parties. Material modifications to Sections I through XXIII and the Appendices must be in writing, signed (which may include electronically signed) by the Parties, and are effective upon approval by the Court.

XX. SIGNATORIES

63. The undersigned representative of the United States and the undersigned representative of Settling Defendant certifies that he or she is fully authorized to enter into the terms and conditions of this Decree and to execute and legally bind such Party to this document.

XXI. PRE-ENTRY PROVISIONS

64. If for any reason the Court should decline to approve this Decree in the form presented, this agreement, except for ¶ 65 and ¶ 66, is voidable at the sole discretion of any Party and its terms may not be used as evidence in any litigation between the Parties.

65. This Decree will be lodged with the Court for at least 30 days for public notice and comment in accordance with section 122(d)(2) of CERCLA and 28 C.F.R. § 50.7. The United States may withdraw or withhold its consent if the comments regarding the Decree disclose facts or considerations that indicate that the Decree is inappropriate, improper, or inadequate.

66. Settling Defendant agrees to not oppose or appeal the entry of this Decree.

XXII. INTEGRATION

67. This Decree constitutes the entire agreement between the Parties regarding the subject matter of the Decree and supersedes all prior representations, agreements, and understandings, whether oral or written, regarding the subject matter of the Decree.

XXIII. FINAL JUDGMENT

68. Upon entry of this Decree by the Court, this Decree constitutes a final judgment between and among the United States and Settling Defendant. The Court finds that there is no just reason for delay and therefore enters this judgment as a final judgment under Fed. R. Civ. P. 54 and 58 between the Parties to this Decree.

SO **ORDERED** this ___ day of _____, 2024.

_____
Honorable Nelva Gonzales Ramos
United States District Judge

Signature Page for Consent Decree in *U.S. v. Energy Transfer (R&M), LLC, et al.* (S.D. Tex. 2:23-cv-214)

FOR THE UNITED STATES:

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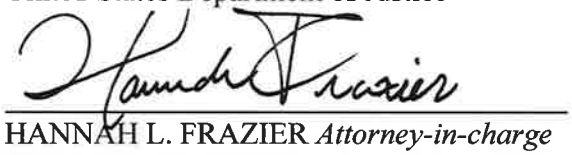
Assistant Attorney General
Environment and Natural Resources Division
United States Department of Justice



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FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY:

RONALD CROSSLAND

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Signature Page for Consent Decree in *U.S. v. Energy Transfer (R&M), LLC, et al.* (S.D. Tex. 2:23-cv-214)

FOR: THE GOODYEAR TIRE & RUBBER COMPANY

8/1/24
Dated

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APPENDIX A

EPA August 31, 2020, Record of Decision

BRINE SERVICE COMPANY SUPERFUND SITE
Corpus Christi, Nueces County, State of Texas
EPA Region 6

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6

RECORD OF DECISION
BRINE SERVICE COMPANY SUPERFUND SITE
TX0000605264
CORPUS CHRISTI, TX
August 31, 2020

Table of Contents

LIST OF ABBREVIATIONS & ACRONYMS

AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
AST	Aboveground Storage Tank
bgs	below ground surface
BHHRA	Baseline Human Health Risk Assessment
BTEX	Benzene, Toluene, Ethylbenzene, and Total Xylenes
BWG	Brine Working Group
CBBF	Coastal Bend Bays Foundation
CDI	Chronic Daily Intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFB	Circulating Fluidized Bed
CFR	Code of Federal Regulations
cm/sec	centimeters per second
COC	Chemical of Concern
COPC	Chemical of Potential Concern
COPEC	Chemical of Potential Ecological Concern
CR	Cancer Risk
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
CWA	Clean Water Act
cy	Cubic Yard
EC	Exposure Concentration
ERAGS	Ecological Risk Assessment Guidance for Superfund
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
ESA	Environmental Site Assessment
ESD	Explanation of Significant Difference
ft/day	feet per day
FD	Field Duplicate
FR	Federal Register
FS	Feasibility Study
GCL	Geosynthetic Clay Liner
GWBU	Groundwater Bearing Unit
HI	Hazard Index
HQ	Hazard Quotient
HRS	Hazard Ranking System
IC	Institutional Control
IH	Interstate Highway
IRIS	Integrated Risk Information System
IUR	Inhalation Unit Risk
LDR	Land Disposal Restrictions
LIF	Laser Induced Fluorescence
LNAPL	Light Non-Aqueous Phase Liquid
LOAEL	Lowest Observed Adverse Effects Level
LOI	Letter of Intent
LORP	Level of Required Performance

LPST	Leaking Petroleum Storage Tank
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
mg/kg	milligram/kilogram
mg/L	milligram/liter
µg/l	microgram/liter
MNA	Monitored Natural Attenuation
MW	Monitoring Well
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NFRAP	No Further Remedial Action Planned
NOAEL	No Observable Adverse Effects Level
NPL	National Priorities List
NWI	National Wetland Inventory
O&M	Operation and Maintenance
OPA	Oil Pollution Act
OW	Oily Water
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PCCA	Port of Corpus Christi Authority
PCL	Protective Concentration Levels
PID	Photoionization Detector
PM10	Small Particulate Matter
PRP	Potentially Responsible Party
psi	Pounds per Square Inch
RAGS	Risk Assessment Guidance for Superfund
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SDL	Sample Detection Limit
SF	Slope Factor
SH	State Highway
Site	Brine Service Company Superfund Site
SLERA	Screening Level Ecological Risk Assessment
SMDP	Scientific Management Decision Point
SPLP	Synthetic Precipitation Leaching Procedure
SSI	Site Screening Inspection
STU	Second Transmissive Unit
SVOC	Semivolatile Organic Compound
TAC	Texas Administrative Code
TAG	Technical Assistance Grant
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons

TRRP	Texas Risk Reduction Program
TRV	Toxicity Reference Values
TW	Temporary Well
TXDOT	Texas Department of Transportation
UCL	Upper Confidence Limit
USDOT	United States Department of Transportation
USFWS	United States Fish and Wildlife Service
UST	Underground Storage Tank
UTU	Upper Transmissive Unit
VOC	Volatile Organic Compound
VSP	Visual Sample Plan

PART I: THE DECLARATION

1.0 SITE NAME AND LOCATION

The Brine Service Company Superfund Site is located in Corpus Christi, Texas. The National Superfund Database Identification Number is TX0000605264.

2.0 STATEMENT OF BASIS AND PURPOSE

This decision document presents the "Selected Remedy" for the Brine Service Company Superfund Site (hereinafter "the Site," Figure 1 - Site Location Map) which was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 United States Code §§ 9601-9675, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Part 300, as amended.

The State of Texas, represented by the Texas Commission on Environmental Quality (TCEQ), was provided the opportunity to review and comment on the Selected Remedy.

3.0 ASSESSMENT OF THE SITE

The response action selected in this Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment.

4.0 DESCRIPTION OF THE SELECTED REMEDY

The overall cleanup strategy for this Site is to reduce the amount of contamination in soil and groundwater and to address sludge and reworked soil/waste to protect both human and ecological receptors. The selected remedy treats the source materials constituting principal threats at the Site. The selected remedy is estimated to cost $9,940,000. The components of this alternative are described in detail in Section 19.0 (Selected Remedy) of this ROD. Briefly, the major components of this alternative are:

- In-situ solidification of sludge and/or reworked soil/waste (South Pit) – Targeted areas of the light non-aqueous phase liquids (LNAPL) and waste sludge in the South Pit would be solidified in-situ. In-situ solidification uses mechanical equipment such as augers or buckets to add/mix binders to the waste leaving the resultant solidified material in place. Approximately 25% of the South Pit area has waste materials that are targeted for solidification. The location and extent of the targeted area would be verified with field studies during the remedial design.
- Single-component cap (South Pit) – A single-component cap will be installed over the materials in the South Pit. A cap controls contaminant migration by limiting infiltration of rain through the solidified waste materials. Wastes adjacent to and under the Site buildings and beneath and east of the pipeline corridor will not be solidified or capped.
- LNAPL recovery – Readily recoverable LNAPL will be removed as a source control measure onsite prior to implementation of in-situ solidification. An LNAPL investigation will be conducted to identify prospective locations for recovery wells. Recovery wells will be installed, and LNAPL would be removed periodically using manual recovery methods such as bailers,

vacuum trucks, or skimmer pumps. An LNAPL recovery plan will be developed which will describe the criteria for transition to a monitored natural attenuation (MNA) remedy.

- Groundwater monitoring with MNA remedy – As part of an MNA remedy, EPA will rely on natural processes to decrease or "attenuate" concentrations of contaminants in soil and groundwater, and conditions will be monitored to make sure natural attenuation is working. Specifically, groundwater samples will be collected and analyzed for the presence of contaminants and other Site characteristics. After the installation of permanent groundwater monitoring wells, a groundwater monitoring program will be implemented to demonstrate groundwater plume stability and assess exposure to chemicals of concern concentrations in the groundwater.
- Surface soil removal (North Pit area) – Approximately 1,250 cubic yards (cy) of soil in the North Pit area and adjacent to the East Ditch will be excavated to a depth of 18 inches below ground surface (bgs), containerized, and transported to a regulated offsite disposal facility.
- East Ditch sediment cap operation and maintenance (O&M) – The remedy includes O&M activities for the East Ditch sediment cap. This sediment cap was constructed as a CERCLA response action in December 2017 and extended in February 2020 to prevent hydrocarbon intrusion into the East Ditch from contaminated groundwater. The sediment cap remains in place at the Site under the Selected Remedy.
- Institutional controls - Institutional controls (ICs) prohibiting groundwater usage will be placed on the Site and any impacted offsite properties. An IC requiring commercial/industrial land usage will be placed on the onsite properties. The implementation of the ICs is subject to the approval of the property owners. The requirements for filing land use restrictions in the State of Texas are specified in Title 30, Texas Administrative Code (TAC), Chapter 350, Subchapter F. Although there is no current unacceptable risk, the vapor intrusion pathway will be addressed through institutional controls that will require an evaluation of risk prior to future building construction in the South Pit area.

5.0 STATUTORY DETERMINATIONS

The Selected Remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

The Selected Remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduce the toxicity, mobility, or volume of hazardous substances through treatment) for South Pit sludge and reworked soil/waste and LNAPL.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unrestricted use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

6.0 ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this Record of Decision (Part 2). Additional information can be found in the Administrative Record file for this Site.

- Chemicals of concern and their respective concentrations (Section 14.1.1)
- Baseline risk represented by the chemicals of concern (Section 14.3)
- Cleanup levels established for chemicals of concern and the basis for these levels (Table in Section 19.4)
- How source materials constituting principal threats are addressed (Section 18.0)
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the Baseline Human Health Risk Assessment and ROD (Sections 13 and 19.4)
- Potential land and groundwater use that will be available at the Site as a result of the Selected Remedy (Sections 13 and 19.4)
- Estimated capital, annual operation and maintenance (O&M), and total present worth cost, discount rate, and the number of years over which the remedy cost estimates are projected (Section 16.1; Table 8)
- Key factor(s) that led to selecting the remedy (i.e. how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision) (Sections 14.3, 16.2, 17, 19, and 20.0; Table 9)

7.0 AUTHORIZING SIGNATURE AND SUPPORT AGENCY ACCEPTANCE OF REMEDY

This ROD documents the Selected Remedy for the Brine Service Company Superfund Site. This remedy was selected by the Environmental Protection Agency (EPA) with the support of the TCEQ. The Director of the Superfund Division (EPA, Region 6) has been delegated the authority to approve and sign this ROD.

U.S. Environmental Protection Agency (Region 6)

By:

WREN STENGER

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Superfund and Emergency Management Division (SED)

CONCURRENCE PAGE – RECORD OF DECISION
BRINE SERVICE COMPANY SUPERFUND SITE

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Date

PART II: THE DECISION SUMMARY

This Decision Summary provides a description of the site-specific factors and analyses that led to the selected remedy. It includes background information, the nature and extent of contamination, the assessment of human health and environmental risks posed by the contaminants at the Site, and the identification and evaluation of remedial action alternatives for the Site.

8.0 SITE NAME, LOCATION, AND DESCRIPTION

The Brine Service Company Superfund Site is located in Corpus Christi, Nueces County, Texas, in an industrial and petrochemical refining area situated between Interstate Highway 37 (IH-37) and Up River Road (Figure 1 and Figure 3). The National Superfund Database Identification Number is TX0000605264. The EPA is the lead agency, and the Texas Commission on Environmental Quality (TCEQ) is the support agency. The EPA expects to negotiate a settlement with potentially responsible parties (PRPs) to perform the cleanup of the Site, as outlined in this ROD.

The approximately 16-acre Site contains two former pit areas, the North Pit and the South Pit, which were originally used for sand mining (Figure 2). The South Pit, the larger of the two, was subsequently used for disposal of drilling muds and refinery wastes (Goldston, 2004). The Site is comprised of Lots 2 through 8 of Block 1, Goldston Addition, as well as a Texas Department of Transportation (TXDOT) drainage ditch, and a portion of the Buckeye Texas Processing LLC (Buckeye) property. The Site is bounded on the west by Goldston Road, on the east by Buckeye, on the south by the frontage road to IH-37, by Up River Road east of the TXDOT drainage ditch (East Ditch), and by a parking lot (Lot 1B of Block 1, Goldston Addition) owned by Buckeye west of the ditch.

The Site map (Figure 2) shows that approximately 40% of the North Pit and South Pit areas are covered by buildings or non-vegetative cover such as asphalt or caliche base. In addition, approximately 75% of the surface of Lot 6 contains equipment and other materials associated with heavy equipment repair. Multiple underground pipelines transporting a variety of products transect the Site in various directions (Figure 4). Eight active pipelines and two fiber optic cables (in one corridor) are in or adjacent to the South Pit area.

A drainage ditch (East Ditch) located along the east side of the Site empties into a northwest trending ditch north of Up River Road, which extends to Tule Lake. A drainage ditch for Up River Road enters the East Ditch at the culverts on the south side of the road. Based on a review of historical aerial photographs and topographic maps, it appears that the course of the East Ditch has evolved and matured over time from a small drainage swale to an engineered drainage channel maintained by TXDOT.

9.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

This section of the ROD provides the history of the Site and a brief discussion of the EPA's and the state's remedial and enforcement activities.

9.1 History of Site Activities

The Site history is developed from a review of ownership records, operational records and aerial photographs. Ownership and operational records were obtained from the 104(e) responses provided by Mr. James Goldston (Goldston, 2002a, b; 2004). Ownership records were obtained from the Nueces County Appraisal District (NCAD) (NCAD, 2017). The aerial photographs date from February 1956 to November 2014 (Appendix A). For purposes of the historical aerial photograph review, due to changing

landmarks, the Site is defined as shown in Figure 2. As described previously, the East Ditch course evolved/was rerouted over this time period.

Lots 2-7, 8A and 8B

The pit area was originally used as a quarry for sand and caliche in the mid-1950s, after which it was used as a disposal facility for oil-field wastes/drilling fluids and refinery wastes. Waste-disposal pit operations appear to be active in 1960 through 1970 aerial photographs per information in the Site Screening Inspection Report. (TNRCC, 2000). A 1960 aerial photograph of the area revealed two pits, a north pit and a south pit. The liquid in the South Pit appeared to have a dark mottled appearance, which may have been an indication of floating hydrocarbons. The South Pit area was operated as an unpermitted disposal area by the Brine Service Company (TNRCC, 2000; TNRCC, 2001). The South Pit area was backfilled in the early 1970s by M&M Construction Company with concrete ruble and debris, and topped with approximately 4 to 6 feet of caliche fill. The North Pit area was backfilled between 1961 and 1968 (Ref. 31, p. 19). There is no known documentation of the presence of liners or maintenance controls for North or South Pit areas.

Historical aerial photographs (Appendix C) suggest that the North and South Pits were intermittently connected with each other and with portions of the East Ditch. The North Pit is evident from 1957 to approximately 1965. From interviews contained in 104(e) information request responses (Goldston, 2004), only one pit (South Pit) was operated for waste disposal, and the North Pit was historically used to contain overflow from the South Pit. By 1957, the pits appeared to contain liquids which persisted (intermittently for the North Pit as depicted by the absence of liquids in the 1959 aerial photograph) through at least 1962. By 1965, the area of the North Pit was backfilled and the north area of the South Pit was partially backfilled. The 1966 aerial photograph shows the construction of IH-37 with construction completed by 1969. The South Pit appeared to be incrementally backfilled until 1973 when it was completely backfilled. As stated in the 104(e) request response, the pits were covered with fill materials from land located west of the pits. The material in the pit was reportedly mixed with dry dirt and backfilled by the firm, M&M Construction (Goldston, 2004).

The aerial photographs indicate the South Pit appeared to occupy parts of Lots 5, 6, 7, and the southern portion of Lot 8B; and the North Pit occupied portions of Lots 2, 3, and 4, and the southwestern corner of Lot 8B. Lot 8B is also reportedly the location of a third pit, approximately 1.5 acres, operated by The Goldston Company from approximately 1957 until 1958 for the containment of soil and road film (Goldston, 2004). This pit was deed recorded in 1979 for operating as a containment for soil and road film. A deed recordation was filed in 1998 that the operations of the pit had ceased. No buildings or other surficial features associated with the three pits currently exist on the Site. Lots 6 and 7 are currently occupied by a construction equipment repair shop and an adult video store, respectively. Lot 3 was occupied by a truck tire shop (Wingfoot Tire) and Lots 8A/8B were occupied by The Goldston Company, a tanker transportation company (Willoughby Trucking), a paint shop, and a wash rack (TES, 1996). The Site lots are depicted on Figure 2.

By 1973, the southern portion of the Site was a construction laydown area. By 1997, the southern portion of the Site appeared as it is presently. As stated in the Goldston 104(e) response, the pits were covered with fill materials from Burtex land located west of the pits. The material in the pit was reportedly mixed with dry dirt and backfilled by M&M Construction. A four to six-foot cover was placed over the South Pit (Goldston, 2004). Subsequently, as part of the industrial development of the Site, the lots were improved with 6 to 12 inches of compacted caliche base and portions were paved with

hot asphalt mix (Goldston, 2010). Creosoted-treated railroad pilings from the demolition of an abandoned railroad bridge across Nueces Bay were stored on Lots 2 through 5 for approximately two years from 1976 through 1977 (Goldston, 2004). Some creosote seepage from the pilings was documented in the 104(e) response. By 1997 the Site appeared as it is presently. The 1997 aerial photograph shows the buildings for Robert's Equipment on Lot 6 and Adult Video on Lot 7 as well as the Nueces Power Equipment (NPE) facilities on the west side of Goldston Road.

Lot 2 is approximately 4.41 acres and was developed with three underground 1000-gallon septic tanks, about 800 linear feet of underground septic drain lines, and a small wastewater treatment system. The septic system was constructed in the late 1970s, and Mr. Goldston stated that no evidence of previous excavation was observed (Goldston, 2004). The lot was covered with 8 inches of compacted caliche and contains a right-of-way for petroleum pipelines (Goldston, 2002b). Lot 3, the location of the former tire company, is approximately 2.97 acres and was developed with an 8,000 square foot metal warehouse building that was originally a fabrication shop for The Goldston Company. During the Remedial Investigation (RI) Site visits, numerous lead tire weights were observed throughout Lot 3. Sandblasting activities were documented on Lot 3 in the 1992 and 1998 Phase I Environmental Site Assessments (ESA) (Goldston, 1992; TNRCC, 2000, Reference 14). Lot 3 is paved with 8 inches of compacted caliche and 2 inches of hot mix asphalt (Goldston, 2002b). Lot 4 is approximately 0.84 acres. Lot 5 contained a radio tower which was installed in the late 1970s and demolished by 2012. Lot 6 was improved with a compacted caliche base and asphalt cover and is the location of Robert's Equipment. Lot 7 is approximately 3 acres and contains the South Pit. Lot 7 also reportedly contained an underground storage tank (UST) and was used as a pipe storage yard (Goldston, 1992). Lots 8A/8B are approximately 4.67 acres and were the location of the Goldston Company operations, including a paint shop, USTs, a warehouse, equipment and wash facilities, a shop, and office buildings. The lots were improved with 6 to 12 inches of compacted caliche base, and portions were paved with hot asphalt mix (Goldston, 2010). On May 18, 1979, The Goldston Company deed recorded an onsite pit for containment of soil and road film. The photolog in Appendix C depicts landscape photographs of the Site and some the features and buildings described above.

East Ditch

TXDOT maintains the East Ditch, which runs from south to north across the Site, for highway/roadway water drainage control. The aquatic ecological area of the Site is the East Ditch. The East Ditch is approximately 4,200 feet long, and the headwaters are located south of the Site in the agricultural fields between Leopard Street and the IH-37 feeder road. TXDOT has a permanent easement within the East Ditch between IH-37 and Up River Road. The East Ditch appears on the National Wetlands Inventory and is classified as riverine, unknown perennial, unconsolidated bottom (FWS, 2017). At a point immediately north of the South Pit and south of the North Pit, the East Ditch curves from the east side of the property more to the center of the property. This curve, the "S curve," is lined with concrete. The south segment (i.e., the portion of the ditch south of the S curve) is a freshwater, intermittent drainage ditch and the north segment (i.e., the portion of the ditch north of S curve) is a marine, perennial drainage ditch. Roadside drainage for Up River Road enters the East Ditch through culverts and surface flow from the west and east on the south side of the road. The East Ditch empties into a northwest trending ditch north of Up River Road, which extends to Tule Lake. The intersection where the East Ditch empties into a northwest trending ditch north of Up River Road is the northern terminus of the Site. The photolog in Appendix C contains some photographs of the East Ditch area.

Based on a review of the historical aerial photographs, the North and South Pits appeared to be intermittently connected with each other and with portions of the East Ditch. These photographs are discussed in greater detail in Section 1.2.2 in the RI Report and included as Appendix A in the RI (BCP, 2018c). Some of the aerial photographs are included in Appendix C.

The 1956 aerial photograph shows the East Ditch surface water drainage pattern during the approximate time frame that the Site was being excavated for sand deposits. This photograph depicts the East Ditch generally traversing the east side of the sand pits and meandering up to Up River Road. The photograph shows vegetation changes, sections that appear as drainage swales, and sections with a more clearly defined channel. No well-defined East Ditch channel can be observed north of the North Pit boundary.

In the 1957 aerial photograph, there appears to be a partial draining connection between the southeast corner of the South Pit and the East Ditch. A clear boundary cannot be determined between the North and South Pits in the 1957 aerial photograph. A 1958 aerial photograph appears to depict a limited portion of the South Pit in hydraulic communication with the East Ditch. In addition, the aerial photograph shows an apparent hydraulic connection between the North and South Pits but with no clearly defined outfall to the North Pit. Similar drainage conditions existed in the 1959 aerial photograph; however, a berm along the north side of the North Pit separated the pit from the East Ditch which extended toward Up River Road.

A 1962 aerial photograph depicts hydraulic communication between the East Ditch and the southeastern corner of the South Pit (but no clear indication of flow direction). A ditch channel can be observed east of the South Pit and skirting the boundary of the North Pit. Drainage can be observed from the North Pit as well as from Lots 8A/8B.

The morphology of the East Ditch did not change appreciably until 1965, at which point, the ditch entered the southeast corner of the Site and trended down the eastern boundary past the limits of the South Pit, made a 90° turn to the west, and then a 90° turn to the north (S curve), and from there continued north to Up River Road. The photograph depicts the drainage pattern for the East Ditch from the S curve to Up River Road. The 1965 aerial photograph shows a berm between the South Pit and the East Ditch.

The 1969 aerial photograph depicted the S curve as being concrete lined and generally in the present position of the ditch. This is the first indication of a true continuous channel to Up River Road. The concrete appears to have been installed to improve hydrologic characteristics of the ditch in association with the construction of IH-37 and channelization of the East Ditch to improve storm water runoff from the highway based on aerial photography history and documents provided by the TXDOT. Between 1965 and 1966, construction on IH-37 began and the upstream part of the East Ditch was routed under the new highway, in a concrete culvert as exists today. During this time, the East Ditch became a more defined channel.

The ditch morphology changed between 1975 and 1980 when the northern part of the East Ditch was relocated approximately 30 to 60 feet east and straightened by The Goldston Corporation (Goldston, 2010). The Site was backfilled and developed by The Goldston Corporation.

A drainage ditch for Up River Road enters the East Ditch at the culverts on the south side of the road. The Up River Road drainage ditch conveys storm water to the East Ditch culvert from both directions

(east and west) which includes Southern Minerals Road west to the East Ditch culvert and from 300 feet east of Goldston Road east to the East Ditch culvert (NCDPW, 2007). The Up River Road drainage ditch receives runoff from the road and stormwater outfalls.

9.2 History of Federal, State and Local Investigations; Response Actions; and CERCLA Enforcement Activities

The State of Texas first became aware of environmental impacts at the Site in November 1997 when Koch Pipeline Company notified the Texas Natural Resource Conservation Commission (TNRCC; now the TCEQ) of impacted soil in an excavation trench for an interconnecting pipeline. Koch excavated and disposed of approximately 3,000 cy of soil. A TNRCC inspector onsite during the excavation observed visible staining and LNAPL in the groundwater seeping into the excavation.

Numerous local, state, and federal actions have been conducted at the Site:

- Koch Pipeline Excavation: Approximately 3,000 cy of contaminated soil were excavated from Lots 5 and 7 during pipeline easement excavations conducted in November 1997. Ten soil samples were collected by an engineering team retained by Koch on November 3, 1997, from the Koch Pipeline excavation on the east side of Lots 5 and 7. Analytical results indicated that total petroleum hydrocarbons (TPH), metals (arsenic and lead), semivolatile organic compounds (SVOCs) (3 & 4-methylphenol, naphthalene) total polychlorinated biphenyl (PCB) (Aroclor 1254), and volatile organic compounds (VOCs) (benzene and ethylbenzene) concentrations would exceed current human health screening criteria. The maximum reported benzene concentration was 79 milligram per kilogram (mg/kg), and the maximum TPH concentration was 52,000 mg/kg. Approximately 1,000 cy of the contaminated soil were characterized as hazardous (D018 benzene) and the remaining 2,000 cy were classified as Class I non-hazardous waste. The contaminated soil from the trench excavations was disposed of by Koch Refinery after coordination with TNRCC (TNRCC 2001). The disposal of wastes by Koch Refinery was only for those soils excavated along the Koch pipeline right-of-way, not the entire pit area (TNRCC, 2000, Reference 10; TNRCC 2001).
- Site Screening Inspection (SSI): Soil and sediment samples were collected during the TNRCC February 2000 SSI. Four soil samples were collected from 8 to 12 feet bgs in the area of the North Pit. Polycyclic aromatic hydrocarbons (PAHs), 4,4'-DDD, and metals were detected in three samples. A soil sample was collected on Lot 8B. Benzene, ethylbenzene, total xylenes, PAHs, dieldrin, 4,4'-DDE, 4,4'-DDD, and metals were detected in the Lot 8B sample. Five sediment samples were collected in the marine portion of the East Ditch. PAHs and metals were detected in four samples.
- EPA proposed the Site to the National Priorities List (NPL) on September 13, 2001 (66 FR 47612), and finalized the listing on September 5, 2002 (67 FR 56757). In 2009, six potentially responsible parties (Brine Cooperating Parties) and EPA executed an Administrative Order on Consent (AOC) to perform a Remedial Investigation/Feasibility Study (RI/FS) for the Site. The intersection where the East Ditch empties into a northwest trending ditch north of Up River Road is the northern terminus of the Site as denoted in the AOC.
- Lot 8A and 8B Investigation and Soil Excavation: Between February and May 2014, EF 90, LLC (now Buckeye Texas Processing) completed Phase I and Phase II ESAs on Lots 8A and 8B and submitted a self-implementation notice to the TCEQ for excavation of affected soil (Arcadis, 2014a, 2014b). The data showed a historic release of mercury to surface soil at the former

vehicle wash sump. Buckeye removed approximately 596 cy of mercury impacted soil and disposed offsite at the Republic Services El Centro Landfill.

- East Ditch Sediment Cap Response Action: During a January 17, 2017, field event at the Site, the Brine Cooperating Parties, EPA, and TCEQ observed a sheen and LNAPL on the surface water in a limited area of the East Ditch (BCP, 2017a). Vegetation and the sediment along the bank in the area did not appear to be impacted. The Brine Cooperating Parties managed the hydrocarbon contamination with sorbent booms and absorbent pads until additional investigations and a response action were planned and implemented. In December 2017, the Brine Cooperating Parties installed a sediment cap in a limited portion of the East Ditch. The sediment cap is comprised of 2 to 3 feet of compacted clay in the ditch invert and overlaid with a composite liner system (geosynthetic clay liner bonded to a 60-mil high density polyethylene geomembrane), covered with 12 inches of clay and an erosion control material. The sediment cap was extended in February 2020 to further control additional hydrocarbon contamination found in the East Ditch in December 2018 during a field event.
- The approved final RI was submitted in July 2018.

10.0 COMMUNITY PARTICIPATION

The RI/FS Report and Proposed Plan for the Site were made available to the public on September 9, 2019. A newspaper notice was published in the Corpus Christi Caller Times on August 27, 2019. The notice announced the date of the public meeting and the availability and location of the Administrative Record. The RI/FS Report and the Proposed Plan can be found in the Administrative Record file and the information repository maintained at the:

Owen R. Hopkins Public Library
3202 McKinzie Rd, Corpus Christi, TX 78410
Telephone: 361.826.7055
Hours: Monday 10:00 AM to 8:00 PM
Tuesday 10:00 AM to 9:00 PM
Wednesday 10:00 AM to 8:00 PM
Thursday - Saturday 10:00 AM to 6:00 PM
Sunday - Closed

Texas Commission on Environmental Quality, Central Records
Building E, Records Management, First Floor
12100 Park 35 Circle, Austin, TX 78753
512.239.2920
Hours: Monday - Friday 8:00 AM to 5:00 PM

The Proposed Plan provided for a public comment period from September 9, 2019, to October 10, 2019, which was later extended to December 10, 2019. A newspaper notice was published in the Corpus Christi Caller Times on October 17, 2019, announcing the extension of the public comment period.

A public meeting was held on September 10, 2019, to present the Proposed Plan to a broader community audience than those that had already been involved at the Site. At this meeting, representatives from the EPA and the TCEQ provided information to the public and presented the cleanup alternatives and the EPA preferred alternative for cleanup of the Site. EPA's response to comments received during the public comment period is included in the Responsiveness Summary, which is Part III of this ROD.

A Community Involvement Plan was prepared in September 2010 and updated in March 2019. The plan's purpose is to guide two-way communication between the community surrounding the Brine Service Company Superfund Site and EPA and to encourage community involvement in Site activities. EPA will utilize the community involvement activities outlined in this plan to ensure that residents and business owners and workers near the Site are kept informed and provided opportunities to be involved.

A Technical Assistance Grant (TAG) was awarded to the Coastal Bend Bays Foundation (CBBF) in October 2002. A TAG is for a local citizens' group to secure the services of a technical advisor to increase citizen understanding of information developed about the Site during the Superfund process. An "Availability Notice" was published in the Corpus Christi Caller Times on September 24, 2001, and September 18, 2002. A Letter of Intent (LOI) was received on October 2, 2002, from the CBBF. The EPA published a notice in the Corpus Christi Caller Times on October 16, 2002, that the CBBF submitted a LOI to apply for the TAG. A final application was received on February 3, 2003, from the CBBF. A TAG was awarded to the CBBF in May 2003 and expired in 2006.

These community participation activities during the remedy selection process meet the public participation requirements in CERCLA and the NCP.

11.0 SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

The NCP, 40 CFR § 300.5, defines an operable unit as a discrete action that comprises an incremental step toward comprehensively addressing Site problems. This discrete portion of a remedial response manages migration, or eliminates or mitigates a release, threat of a release, or pathway of exposure. The cleanup of a site can be divided into a number of operable units, depending on the complexity of the problems associated with the Site.

The EPA will use only one operable unit for the Site. The Selected Remedy addresses contamination in soil and groundwater, and sludge and/or reworked soil/waste to protect both human and ecological receptors. EPA will use treatment to address the principal threats posed by a site, wherever practicable, and engineering controls for waste that poses a relatively low long-term threat or where treatment is impracticable. See sections 300.430(a)(l)(iii)(A) and 300.430(a)(l)(iii)(B) of the Code of Federal Regulations. Through the use of treatment as a principal element, the Selected Remedy will satisfy the preference for treatment of waste material, including LNAPL and sludge in the South Pit, and reduce the toxicity and mobility of these source materials that constitute the principal threat wastes at the Site. The treatment methods for LNAPL and sludge and reworked soil/waste can be found in Section 19 of this ROD.

This response action applies a comprehensive approach to all Site problems; therefore, only one operable unit is required to remediate the Site. The primary objectives of this action are to remediate the source of contamination at the Site, to reduce and minimize the downward migration of contaminants to the groundwater, and to minimize any potential future health and environmental impacts.

12.0 SITE CHARACTERISTICS

This section of the ROD provides a brief comprehensive overview of the Conceptual Site Model (CSM), surface and subsurface features of the Site, sampling strategies used in the RI, known or suspected sources of contamination, types of contamination, location of contamination and known or potential routes of migration, and the geology and hydrology at the Site. Detailed information about the Site's characteristics can be found in the RI Report (BCP, 2018c).

12.1 Conceptual Site Model

The CSM for the Site identifies the sources of contamination, release mechanisms, pathways for contaminant transport, the exposure route for contamination, and potential receptors. Figure 5 presents a representation of Site contaminant location and movement, potential routes of contaminant migration, and potential receptors.

Human Health CSM

The CSM developed in the Baseline Human Health Risk Assessment (BHHRA) is presented in Figure 6. The human health CSM focused on the following exposure pathways: health effects for commercial/industrial workers and adolescent trespassers that could result from exposure to 1) the waste source, 2) contaminated soils, 3) surface water, 4) sediment, and 5) groundwater through incidental ingestion, inhalation, and dermal contact. The BHHRA also evaluated exposure through indoor air vapor intrusion. The exposure pathways are discussed further in Section 14.1.

Ecological Heath CSM

The CSM developed in the Screening Level Ecological Risk Assessment (SLERA) is presented in Figure 7. The ecological CSM focused on the following exposure pathways: risk to terrestrial plants, soil invertebrates, reptiles/amphibians, birds, mammals, burrowing mammals, water column organisms, and benthic organisms through direct exposure, incidental ingestion, and food ingestion. The SLERA evaluated ecological receptors across the Site but focused on the habitat areas proximate to the East Ditch. The exposure pathways are discussed further in Section 14.2.

12.2 Site Overview

As described previously, the Site is located in Corpus Christi, Nueces County, Texas, in an industrial and petrochemical refining area situated between IH-37 and Up River Road. The approximately 16-acre Site contains two former pit areas, the North Pit and the South Pit, which were originally used for sand mining (Figure 2). The South Pit, the larger of the two, was subsequently used for disposal of oil field wastes/drilling fluids and refinery wastes (Goldston, 2004). TXDOT maintains the East Ditch, which runs from south to north across the Site, for highway/roadway water drainage control. The aquatic ecological area of the Site is the East Ditch. The East Ditch is approximately 4,200 feet long, and the headwaters are located south of the Site in the agricultural fields between Leopard Street and the IH-37 feeder road. TXDOT has a permanent easement within the East Ditch between IH-37 and Up River Road. The East Ditch appears on the National Wetlands Inventory and is classified as riverine, unknown perennial, unconsolidated bottom (FWS, 2017).

The upper two feet of soils at the Site are generally comprised of a thin layer of topsoil (up to 6 inches) with caliche (calcium carbonate with gravel, sand, clay, and silt binders) and gravel fill, and underlying clayey silt. The lots were improved with 6 to 12 inches of caliche base and portions were paved with hot asphalt mix (Goldston, 2010). The Site map (Figure 2) shows that approximately 40% of the North Pit and South Pit areas are covered by buildings or non-vegetative cover such as asphalt or caliche base. In addition, approximately 75% of the surface of Lot 6 contains equipment and other materials associated with heavy equipment repair.

Two groundwater bearing units are identified at the Site: the upper transmissive unit (UTU) and second transmissive unit (STU). The UTU lacks lateral continuity across the Site. The UTU is underlain by very stiff to hard clay which is continuous across the Site. The UTU was encountered from 6 feet (shallower on the southern portion of the Site) to 26 feet bgs. The thickness of the clay layer varies from

approximately 2 feet to 9 feet. The clay layer is underlain by the STU. East of the East Ditch, the STU was encountered at approximately 14 feet bgs and depths up to 36 feet bgs on the western portion of the Site. The STU is laterally continuous in the vicinity of the South Pit. Site groundwater is described further in Section 12.9.

The East Ditch empties into a northwest drainage ditch north of the Site, which extends to Tule Lake. Tule Lake is a brackish shallow water wetland area and a habitat for several State Listed Threatened Species. In addition, a roadside drainage ditch on the south side of Up River Road flows into the East Ditch. Both the northwest drainage ditch and Tule Lake are classified as wetlands, including the portion of the East Ditch north of the S curve which is perennial and is affected by tidal influences. Tule Lake empties into the Corpus Christi Inner Harbor, which empties into Corpus Christi Bay (TNRCC, 2000). Both Corpus Christi Inner Harbor and Corpus Christi Bay are designated as segments under the Texas Surface Water Quality Standards (30 TAC 307). The Bay also is used for recreational and commercial fishing. Surface water and sediment discharges appeared to have entered Tule Lake from multiple sources from 1956 to the present.

12.3 Surface and Subsurface Features

Site topography is relatively flat, declining from south to north. The 2010 Annaville topographic map shows the East Ditch elevation declining from approximately 30 feet mean sea level (MSL) at IH-37 to 20 feet MSL approximately 900 feet south of Up River Road. It appears that the area from Southern Minerals Road to approximately 1,000 feet west of the East Ditch drains into the East Ditch (USGS, 2010).

A Flood Hazard Boundary Map from 1976 shows Zone A (Area of 100-year flood) extending approximately 750 feet into the East Ditch. Zone B (Area between the limits of 100-year flood and 500-year flood) extends to approximately IH-37 (FIA, 1976). The 2015 preliminary Flood Rate Insurance Map Panel Number 4835C0285G for Nueces County shows an area of the East Ditch extending approximately 250 feet south of Up River Road (approximately the southern boundary of Lot 1B) as being in Zone AE which has a 1% annual chance of flood. The segment from approximately 250 feet south of Up River Road to approximately 1050 feet south of Up River Road (approximately the southern boundary of Lot 3) is Zone X with a 0.2% annual chance of flood. The remainder of the East Ditch and the portion of the Site south of Lot 4 is in Zone X (FEMA, 2015).

Lots 6 and 7 are currently occupied by a construction equipment repair shop, Robert's Equipment, and an adult video store, Adult Video, respectively. Observations noted from the geophysical survey include anomalies (such as orbitals which could be inferred as pipes). The geophysical profile shows an area of relative low conductivity in the vicinity of the leach field identified by Mr. Goldston. The conductivity profile indicates that low conductivity material potentially associated with the drain field exists to a depth of approximately 20 feet bgs. A septic system adjacent to Adult Video and the septic system for Robert's Equipment were also identified.

Underground utility surveys were conducted by X-Ray Locating and Frontier Surveying to more accurately map the locations of underground pipelines transecting the Site. Multiple underground pipelines transporting a variety of products transect the Site in various directions (Figure 4). Third party line locators (X-Ray Locating and Ground Penetrating Radar Services) were contracted to mark the locations of the known underground utilities and other unknown obstructions in the vicinity of proposed borings to more safely perform intrusive subsurface activities. In addition, the appropriate notifications

were made to the State of Texas utility locators (Texas 811, Lone Star 811, etc.). Soil boring and monitoring well locations were adjusted in the field based on input from pipeline locators and utility surveys. Several pipelines and other suspected pipes (i.e., linear features) were also identified from geophysical profiles. These include the Javelina pipeline in the southwest corner of the Site and the Koch pipeline in Lots 5 and 7.

The presence of archaeological and historical sites was evaluated by researching landmarks listed in the Corpus Christi Landmark Commission (Corpus Christi, 2010) and the Texas Historical Commission Texas Historic Sites Atlas (THC, 2014). No historical or archaeological sites were identified in the vicinity of the Site.

12.4 Sampling Strategy

The RI characterized the nature and extent of Site contamination through representative sampling of various environmental media, including:

- Materials in North and South Pit;
- Onsite and offsite surface and subsurface soil;
- Onsite and offsite groundwater;
- Onsite and offsite sediments and surface water;
- Soil gas; and
- Sub-slab soil gas.

The sampling and analytical program was described in the August 2010 RI/FS Work Plan, August 2010 RI/FS Sampling and Analysis Plan and the November 2010 Phase I and II Technical Memoranda. Additional sampling was described in the December 2016 Vapor Intrusion Sampling and Analysis Plan and March 2017 East Ditch Investigation Sampling and Analysis Plan (BCP, 2016; BCP, 2017a). The nature and extent of chemicals of potential concern (COPCs) were investigated through the installation of 24 temporary wells, 25 permanent monitoring wells, 15 piezometers, 51 soil borings, and 48 surface soil locations. These sampling locations produced 24 waste and light non-aqueous phase liquid (LNAPL) samples, 287 Site and 13 background soil samples, 50 Site and 11 background (upstream) sediment samples, 17 Site and four background (upstream) surface water samples, seven Up River Road sediment and surface water samples, 72 groundwater samples, 52 passive soil gas samples, 5 near source soil gas samples, and 12 sub-slab (vapor intrusion) soil gas samples (BCP 2018b; URS, 2010b; URS 2010c). The photolog in Appendix C includes pictures of some of the sampling conducted.

The soil investigation focused on characterization and vertical and horizontal delineation of COPCs attributable to the North and South Pits and the generation of data suitable for the human health and ecological risk assessments. Sample locations were identified in the RI/FS Work Plan using a probability-based design and systematic grid sampling with a random start using Visual Sampling Plan Version 6.0 (Battelle, 2010). Background sample locations were identified in the Phase II Technical Memorandum using the Visual Sampling Plan design (URS, 2011b).

Additional judgmental sample locations were identified in the RI/FS Work Plan to 1) provide data for the evaluation of the vapor intrusion pathway, 2) characterize the buried former course of the East Ditch, and 3) evaluate the characteristics of the black, high plasticity clay observed in the North Pit area. Judgmental sampling locations were recommended in the Phase II Memoranda (URS, 2011b; 2012) to address data gaps identified in the evaluation of the Phase I field data.

Sampling in the North Pit area was conducted in 2017 to verify Phase II results (BCP, 2017c). Based on the soil boring evaluation and analytical results, it appears that the North Pit consists mostly of backfill which supports the historical use of the North Pit exclusively as a storm water overflow structure to the South Pit, with overflow continuing from the North Pit to Up River Road. As demonstrated in the 2017 North Pit investigation, the historical area of the North Pit does not contain waste materials

Thirteen soil background samples (sufficient for statistical evaluation) were collected from a property owned by Catholic Solitudes on Dunn-Meady Road. The locations were on vacant land without an industrial use history. Sample locations were identified using a probability-based design, systematic grid sampling with a random start using Visual Sampling Plan Version 6.0 (Battelle, 2010). Samples were collected from 0 to 0.5 feet bgs and 1 to 2 feet bgs. These depths are most likely to be influenced by aerial deposition of COPCs from area vehicular traffic and industry.

The final Site soil sampling locations are shown in Figure 9. Surface and subsurface soil samples were collected between September to December 2010, in March and December 2012, and in January and March 2017.

Prior to implementing the subsurface soil boring program, a geophysical survey was conducted at the Site. The objectives of the geophysical survey were to 1) identify the horizontal and vertical extent of the former North and South Pits, 2) identify anomalies within the pit including debris, heterogeneities of the waste material and/or fill material, and 3) locate underground utilities for future drilling activities. Integrated conductivity (electro-magnetic (EM) ground conductivity mapping using EM31) and resistivity imaging was performed to provide a plan view and vertical profiles of the soil based on the differences in the bulk electrical properties of the soil. A metal detection survey (EM61) was performed to locate buried metallic utilities and anomalies in the subsurface prior to drilling. The images depicted by the electro-magnetic surveys identified potential disturbances of native soil and high and low conductivity layering that could be related to the waste depositional areas of the pit.

Conductivity anomalies reported in the geophysical survey report refer to indications of potential changes in lithologies, waste or fill material, conductive linear features, or other buried features. Numerous metallic anomalies were identified across the EM61 survey area. Sources of these anomalies are likely buried debris. These appear to be small in nature and are not indicative of buried drums or other larger containers.

Observations noted from the geophysical survey include anomalies (such as orbitals which could be inferred as pipes). An area of relative low conductivity was identified in the vicinity of the leach field identified by Mr. Goldston. The conductivity profile indicates that low conductivity material potentially associated with the drain field exists to a depth of approximately 20 feet bgs. The septic system adjacent to Adult Video and the septic system for Robert’s Equipment were also identified. Several pipelines and other suspected pipes (i.e., linear features) were also identified from both the EM31 and EM61 geophysical profiles. These include the Javelina pipeline in the southwest corner of the Site and the Koch pipeline in Lots 5 and 7.

Criteria were established to classify waste materials encountered in the soil borings. Waste material was classified as either sludge-like, exhibiting a non-granular, oily, viscous or grease-like consistency, or a reworked soil/waste material, such as hydrocarbons in a granular soil matrix. Based on the

classifications, the sample was identified as sludge when sufficient material was available and the reworked soil/waste material was sampled as a soil based on the predominant soil lithology.

Criteria were also established to classify the waste depositional areas of the pit separate from areas of pit backfill. Criteria included a visual determination of waste (either the sludge or reworked soil/waste material), LNAPL occurrence in the vadose zone, or analytical soil data exceeding screening criteria for hydrocarbons related COPCs (such as benzene, toluene, ethylbenzene, and total xylenes (BTEX) or polycyclic aromatic hydrocarbons (PAHs)). In contrast, the boring was logged as fill material if it contained reworked soil or non-native gravel/debris content such as caliche, pea gravel, oyster shells, concrete, wood, or other material.

Surface soil samples were collected from the 0 to 0.5 feet bgs depth interval. Soil borings for subsurface soil samples were generally advanced to approximately 15 to 20 feet bgs. Deeper soil borings for the installation of permanent monitoring wells were drilled to characterize the full extent of the lithology of the uppermost groundwater bearing unit (GWBU), the UTU, and to install permanent monitoring wells in the second GWBU, the STU. Subsurface soil samples were collected based on visual observations, field screening using an organic vapor meter (e.g., photoionization detection [PID]), or other criteria. At a minimum, during the 2010 to 2012 investigations, soil samples were collected from the shallow soil at the 1 to 2 feet bgs depth interval, from the subsurface soil at the 4 to 5 feet bgs depth interval, and at a deeper depth interval. If a specific interval displayed characteristics indicative of being affected by COPCs and the reference interval did not display these characteristics, the interval suspected of being affected by Site COPCs was sampled.

In the January 2017 North Pit investigation, soil samples were collected from the depth interval with the black, high plasticity clay. In the March 2017 East Ditch investigation, soil samples were collected from either the depth interval with observations of staining and/or elevated PID readings and above the UTU. If sludge-like material was encountered in the soil borings, a sample was collected for the same definitive analyses as the field samples and the boring was terminated at that depth to prevent any potential vertical migration of Site COPCs.

The extent of horizontal migration of impacted groundwater was evaluated by installing permanent monitoring wells, supplemented by temporary monitoring wells, for additional screening level assessment data. Permanent monitoring wells were drilled and installed between November 4 and December 9, 2010; January 6 to January 27, 2012; March 7, 2012; and February 19 to February 20, 2014. Temporary monitoring wells were drilled and installed between November 4 to November 9, 2010; January 3 and January 4, 2013; and October 7 through October 9, 2013. Monitoring wells were gauged for water level elevations, and if present, the thickness of LNAPL after well installation and development. Groundwater samples were collected from the monitoring wells which did not contain LNAPL for definitive chemical analysis.

LNAPL samples were collected from monitoring wells and surface water for physical and chemical characterization. LNAPL samples were collected from monitoring wells in 2012 using a bailer.

Sediment samples were collected from the East Ditch to evaluate potential impacts to ecological and human receptors. Sediment samples were collected October 5 to October 6, 2010; November 15 to November 18, 2010; January 31 to February 1, 2012; March 22, 2017; and October 24 to October 25, 2017. Sediment samples were collected from the segment of the East Ditch located south of the Site to

determine background COPC concentrations. Sediment samples were collected from the ditch bordering Up River Road to evaluate non-Site related contributions to the East Ditch. Sample locations for the 2010 investigations were identified using a probability-based design and systematic grid sampling with a random start for each investigation unit. Samples collected in 2012 and 2017 were collected from judgmental locations designed to fill data gaps. Sediment sample locations are shown on Figure 10 and Figure 11.

Surface water levels were gauged in the East Ditch adjacent to monitoring wells MWGW02, MWGW13, MWGW14, MWGW15, MWGW16, MWGW05, and south of the confluence of the Up River Road Ditch and East Ditch. Surface water elevation measurements were collected to represent base flow conditions (after several days of no rain). Surface water and groundwater measurements were collected at the same time as the adjacent monitoring wells.

Passive soil gas samples were collected in the vicinity of the occupied buildings, Wingfoot Tire on Lot 3, Robert's Equipment on Lot 6, and Adult Video on Lot 7, in December 2011. Fifty-two passive soil gas sample locations were installed for the vapor intrusion investigation (Figure 12). The soil gas samplers contained two sets of adsorbent cartridges. Samples were collected from a depth of 2 to 3 feet bgs. After evaluation of the passive soil gas data, four locations were sampled for near source soil gas concentrations using Summa® canisters (near source soil gas) in March 2012 (CalEPA, 2011; USEPA, 2010a; USEPA 2010b; USEPA 2010c).

Sub-slab soil gas samples were collected adjacent to Robert's Equipment and Adult Video in January and May 2017 (BCP, 2016). Sub-slab sampling points were installed to collect vapor immediately below the concrete sidewalk slabs adjacent to the buildings (Figure 12).

A habitat evaluation was conducted on October 19, 2010, with detailed consideration of the likelihood of utilization of the Site by special status species. "Special status species" includes those species identified by the Federal Endangered Species Act or by the State of Texas as endangered, threatened, or as a candidate for listing. This list also includes those species identified by the State of Texas as "rare" but with no regulatory status. This information was incorporated into the SLERA (TPWD, 2006; TPWD, 2017).

The East Ditch empties into a northwest drainage ditch, which extends to Tule Lake. In addition, a roadside drainage ditch on the south side of Up River Road flows into the East Ditch. Both the northwest drainage ditch and Tule Lake are classified as wetlands, including the portion of the East Ditch north of the S curve which is perennial and is affected by tidal influences. Although narrow, the riparian corridor along the East Ditch is vegetated and contains shrubs and small trees which provides limited ecological habitat.

12.5 Treatability Study

The primary wastes remaining at the Site are the LNAPL in groundwater and residual waste material within the former South Pit. The residual waste material at the Site is characterized as sludge-like, exhibiting a non-granular, oily, viscous/grease-like consistency, or a reworked soil/waste material, such as hydrocarbons in a granular soil matrix. The LNAPL has a density slightly less than water and is highly viscous.

Data developed during the RI were used to calculate a range of sludge and reworked soil/waste volumes for the South Pit. The volume of sludge is estimated to be 15,000 cy and the volume of sludge and reworked soil/waste is approximately 53,000 cy. The volume of soil overburden is approximately 37,000 cy.

In accordance with the Treatability Study Work Plan (BCP, 2017e), a composite sample was prepared from sludge and reworked soil/waste collected in February 2018, from five locations within the South Pit area for the formulation screening and formulation verification phases of the study. In addition to being included in the composite sample, waste materials collected adjacent to MWGW09 in March 2018, were also included in the study to evaluate the amount of reagent that could be required for solidification in the area of the South Pit with LNAPL.

A bench-scale treatability study for the sludge and reworked soil/waste was conducted to determine the feasibility of the solidification technology for the Site waste materials. The objectives of this study were to identify:

- Solidification reagents for reducing chemicals of concern (COC) concentrations in leachate from the sludge and reworked soil/waste; and
- Solidification reagents for strengthening the sludge and reworked soil/waste to support future land use infrastructure or a cap.

The following information was obtained from the study:

- Unconfined compressive strength (UCS) measurements of solidified waste materials to evaluate capability to support a cap or future land use infrastructure;
- COPC concentrations in synthetic precipitation leaching procedure (SPLP) leachate of solidified waste materials to evaluate potential infiltration to groundwater;
- Corrosivity or pH of solidified waste materials to evaluate potential reagent effects on the pipelines; and
- Volatile emissions generated during solidification to determine extent of volatilization.

Solidification reagents and concentrations were identified which reduced COC concentrations in leachate from sludge and reworked soil/waste. The SPLP (EPA Solid Waste Manual 846, Method 1312) is designed to determine the mobility of both organic and inorganic analytes present in liquids, soils and wastes. The SPLP was utilized to evaluate the potential for the solidified waste to leach to groundwater and for a direct comparison of the leachate concentrations to the Site preliminary remediation goals (PRGs). The toxicity characteristic leaching procedure (TCLP) would have been the preferred procedure to document leaching through a municipal landfill, and if the objective was to demonstrate that the solidified material was not a hazardous waste. The SPLP data were utilized in the Feasibility Study report to evaluate the ability of waste solidification to reduce COPC mobility. The SPLP concentrations for the four formulation verification samples (A-1, A-38, A-40, and A-42) had leachate concentrations below the TCEQ Texas Risk Reduction Program (TRRP) $^{GW}GW_{Class3}$ protective concentration levels (PCLs) PRGs. The TCEQ publishes and updates regularly PCLs for the commercial/industrial groundwater exposure scenarios: groundwater ingestion from Class 1 or Class 2 groundwater ($^{GW}GW_{ing}$), Class 3 groundwater ($^{GW}GW_{Class3}$), and inhalation from groundwater ($^{Air}GW_{Inh\text{-}V}$). The PCLs evaluated provide levels of protectiveness for commercial/industrial worker exposure to groundwater from non-drinking water units (TCEQ, 2017d).

Preferred reagents for treating organic wastes are Portland cement, circulating fluidized bed (CFB) ash, Class C fly ash, and quicklime. CFB ash is prepared from 100% petroleum coke as the fuel and limestone as a scrubber, which calcines the limestone into lime.

The Treatability Study identified solidification reagents and concentrations which will strengthen the sludge and reworked soil/waste. The initial study evaluated 42 mix designs with varying combinations of Site soil (0 to 20%), quicklime (0 or 5%), circulating fluidized bed ash (0 to 30%), fly ash (0 to 30%), and Portland cement (0 to 30%). The four formulation verification samples were a mix of 10% Site soils or waste materials collected adjacent to MWGW09 to 10% fly ash (Formulation A-1), 5% CFB ash (Formulation A-38), 5% fly ash (Formulation A-40), and 5% Portland cement (Formulation A-42).

Prior to solidification an aliquot of the untreated waste sample, MWGW-09, was analyzed for total benzene concentrations. Since the sample was analyzed as a solid, the appropriate units are mg/kg. The sample was mixed with 5% Portland cement and, after 26 days, an aliquot of the treated sample was subjected to SPLP. Since the leachate was analyzed as a liquid, the appropriate units are milligrams per liter (mg/L).

The benzene concentration (0.78 mg/L) in the 5% Portland cement MWGW09 sample, which is representative of an area of the South Pit with LNAPL, slightly exceeded the TCEQ $^{GW}GW_{Class3}$ benzene PCL (0.5 mg/L). The benzene concentration in the MWGW09 sample prior to solidification was 54 mg/kg. The SPLP concentration in MWGW09 was 0.78 mg/L. The expected concentration (54 mg/kg/20 preparation factor) would be 2.7 mg/kg. This shows an approximate 71% reduction for the actual concentration. The benzene concentration was reduced from 54 mg/kg to 0.78 mg/L 26 days after the mix was prepared. A comparison of the untreated and treated waste samples indicates that the solidification reagents reduce the overall hydrocarbon composition of the LNAPL plume which would render the treatment area less toxic. For example, the TPH concentrations were reduced from a total concentration of 11,600 mg/kg to a leachable concentration of 5 mg/L in MWGW09. The reagents tested are not expected to react chemically with the organic constituents in the waste but will bind metals such as arsenic and lead. A small increase in the reagent concentration is likely to yield a formulation for the portion of the South Pit that will not leach benzene. This can be verified during the remedial design.

The four formulation verification samples identified solidification reagents and concentrations that will strengthen the sludge and reworked soil/waste. Even at the lower reagent concentrations for the formulation verification samples, UCS ranged from 50.22 to 200.21 pounds per square inch (psi). The lowest strength was measured for the 10% Site soils/10% fly ash formulation while the highest strength was measured for the 5% Portland cement formulation. The 5% Portland cement formulation for MWGW09 was also greater than 50 psi.

Permeability values of the treated wastes after 28 days ranged from 4.0E-04 to 1.7E-08 centimeters per second (cm/s). Hydraulic conductivity for the UTU ranged from 2.42E-04 to 2.91E-03 cm/s. Groundwater modeling indicates that the reduction in hydraulic conductivity of the treated waste could result in flow that preferentially bypasses the stabilized South Pit materials.

The data indicate the potential for volatile emissions that may require worker protection measures for both businesses and the remediation contractor. Real-time monitoring can be used to assess the

emissions in order to implement mitigation measures. The data indicate that the pH values are basic. pH values ranged from 11.0 to 12.1 for the formulation verification samples and MWGW09.

The results of the Treatability Study indicate strength, leaching, emissions, and corrosivity characteristics of solidified reworked soil/waste and sludge indicate a reduction in the risk to human health and the environment from LNAPL, reworked soil/waste, and sludge. Portland cement, fly ash, and CFB ash at a 5% additive were shown to provide strength with composite waste leachate concentrations less than the TCEQ Class 3 PCLs.

12.6 Known or Suspected Sources of Contamination

As described previously, the South Pit, the larger of the two pits at the Site, was used for disposal of drilling muds and refinery wastes. The primary wastes remaining at the Site are the LNAPL in UTU groundwater and residual waste material within the former South Pit. Sludge-like material, black tarry material, and reworked soil/waste mixtures were identified in the soil borings installed within the historical boundaries of the South Pit.

Elevated metals concentrations (barium, lead, mercury, selenium, and zinc) were found in the surface soil in both pit areas. These metals appear to be associated with the caliche and gravel fill overlying the pit areas or from tire weights found at the 8,000 square foot metal warehouse building operated by Wingfoot Tire in Lot 3.

12.7 Types of Contamination and Affected Media

The major findings of the RI regarding the types of contamination and affected media are listed below:

- Media impacted at the Site include surface and subsurface soils, surface water, sediment, and groundwater. Sample results were compared to applicable screening levels and to background values.
- Waste:
    - The primary wastes remaining at the Site are the LNAPL in groundwater and residual waste material including sludge and reworked soil/waste mixtures within the former South Pit. Wastes in the South Pit contain hydrocarbons such as BTEX or PAHs. The volume of waste material including sludge is approximately 15,000 cy. The volume of the reworked soil/waste mixture is approximately 53,000 cy. The waste material is characteristically hazardous due to benzene and cresols concentrations. Historical aerial photographs and RI field observations and sampling support the conclusion of a heterogenous pit in terms of contents and consistency. Appendix C provides aerial photographs and Figure 13 provides the estimated thicknesses for reworked soil/waste and for sludge. Historical aerial photographs show the northern half of the South Pit (approximately Lot 5) was backfilled by March 1965 (BCP, 2018c). Backfilling of the western portion of the southern half of the South Pit (approximately Lot 6) appears to have started in February 1969 and was completed by July 1970. The November 1975 photograph, does not show any evidence of the South Pit. The aerial photographs correspond with field observations and boring log records from the RI. Waste materials encountered in soil borings were evaluated using the criteria of sludge-like, exhibiting a non-granular, oily, viscous or grease like consistency, or a reworked soil/waste, such as hydrocarbons in a granular soil matrix (BCP, 2018c). For example, cross-sections A-A', C-C' and I-I' in the RI report depict sludge underlying the reworked soil/waste. Cross

sections C-C' and I-I' are shown in Figure 13. As depicted in Figure 13, the reworked soil/waste and sludge is predominately in the south and east portions of the South Pit area. The sludge is described in RI boring logs as having dark brown to black product (SPSB01), black, flowing oily material (SPSB06), or black sludge and gravel, flowing with brown LNAPL or liquid (MWGW10). The flowing, liquid nature of the sludge indicates that this material is potentially a source of LNAPL and dissolved phase COCs to the UTU outside of the South Pit area. In general, the reworked soil/waste was observed in the northern portion of the South Pit while sludge-like material was observed in the southern portion of the South Pit, in the area of the LNAPL wells, MWGW09 and MWGW10.

  - LNAPL was observed in monitoring wells that penetrate and terminate in the waste material, including sludge and reworked soil/waste, which is evidence of mobile LNAPL. The LNAPL has a density slightly less than water and is highly viscous. LNAPL extent has been monitored for 10 years. Borings and groundwater sampling have not identified LNAPL east of the East Ditch (BCP, 2017b). LNAPL was identified in two temporary wells (TW) and three monitoring well (MW) locations, TWGW02, TWGW03, MWGW01, MWGW09, and MWGW10 (Figure 14). The locations where LNAPL was identified corresponds to the areas identified in Figure 13 with sludge and reworked soil/waste.
  - No waste materials were identified in the North Pit (BCP, 2017c).
- Soil: Benzene and other aromatic VOCs, as well as phenols and PAHs were found in subsurface soil in the South Pit area. Elevated metals concentrations (barium, lead, mercury, selenium, and zinc) were found in the surface soil and appear to be associated with the caliche and gravel.
- Groundwater:
  - The UTU near the South Pit is impacted by LNAPL and dissolved phase constituents. Dissolved phase constituents have historically migrated beyond the downgradient limits of the footprint of the South Pit. Based on the geology and the temporary well data, delineation of the impacted groundwater is complete downgradient in the UTU. There is affected groundwater containing benzene and other volatile aromatic hydrocarbons upgradient of the Site on the adjacent western property. The area of the groundwater plume (benzene/LNAPL groundwater plume) was estimated at approximately 5.1 acres. The area with LNAPL covers approximately 3.1 acres (Figure 14). The LNAPL extent was estimated from descriptions in soil boring logs as encompassing an area defined by soil borings SPSB19A/SPSB03/SBPS10 on the west, SPSB19A/SPSB05/SPSB06 on the north, TWGW03/MWGW02/TWGW02 and the East Ditch on the east, and SPSB02/MWGW01/SPSB10 on the south.
  - Evaluation of the groundwater to surface water pathway, using groundwater data from permanent monitoring wells installed along the East Ditch, indicates that metals, SVOCs, cyanide, and pesticide concentrations in the UTU exceed the acute ecological screening criteria for freshwater in the south segment of the ditch. Construction of the sediment cap (See 4th bullet – "Sediment and Surface Water" below) has reduced impacts to surface water from groundwater contaminants.
  - In the north segment of the East Ditch, monitoring well data indicates that metal and pesticide concentrations in the UTU exceed the chronic screening criteria for saltwater. Using a Tier 2 dilution factor, representative concentrations for the groundwater to surface water pathway in the north segment are below their respective site-specific surface water protective concentration levels (PCLs) (SWGW) (TCEQ, 2006a).

  - Concentrations of arsenic and benzene in the STU groundwater in the South Pit and offsite exposure areas exceed the primary drinking water maximum contaminant levels (MCLs) (Figure 15).
  - Lines of evidence indicate that natural attenuation of contaminant concentrations is occurring in the vicinity of the South Pit. Historical groundwater data demonstrates a trend of stable or decreasing concentrations over time. Hydrogeologic and geochemical indicators indirectly demonstrate natural attenuation processes for the destruction of groundwater chemicals of concern.
- Sediments and Surface Water:
  - Arsenic is the only contaminant in the East Ditch surface water with concentrations exceeding human health screening criteria (TCEQ, 2006b).
  - Metals, PAHs, and pesticide concentrations in surface water of the marine (north) segment of the East Ditch exceed ecological screening criteria.
  - Metals, PAHs, and pesticide concentrations in sediment samples collected from both the freshwater (south) and marine (north) segments of the East Ditch exceed ecological screening criteria.
  - Waste material including sludge and reworked soil/waste are not in direct contact with the East Ditch. After industrial development adjacent to the East Ditch in 2013 to 2016 increased surface water discharges, transmissive pathways periodically existed in a portion of the East Ditch adjacent to the South Pit which provided intermittent transport for LNAPL and dissolved phase constituents through overlying clays as hydrocarbon seeps in 2017 into East Ditch surface water. In November and December 2017, a sediment cap was installed in the south segment of the East Ditch to reduce surface water and sediment impacts. The cap was extended in February 2020 to address additional transmissive pathways identified after installation of the cap in 2017.
- Vapor Intrusion: Soil gas sampling results indicate vapor intrusion could be a concern for future construction in the South Pit area. Sub-slab samples were collected at the Adult Video Store and Roberts Equipment Sales and Service buildings in September and October 2017. The concentrations and reporting limits for the sub-slab vapor samples collected at the Adult Video and Robert's Equipment Sales and Service buildings are below their commercial/industrial soil gas screening criteria.

12.8 Locations of Contamination and Known or Potential Routes of Migration

The primary wastes remaining at the Site are the LNAPL in groundwater and residual waste material, including sludge and reworked soil/waste mixtures within the former South Pit. The waste material is characteristically hazardous due to benzene and cresols concentrations. LNAPL was observed in monitoring wells that penetrate and terminate in the waste material including sludge and reworked soil/waste which is evidence of mobile LNAPL. The LNAPL has a density slightly less than water and is highly viscous.

The UTU near the South Pit is impacted by LNAPL and dissolved phase constituents. Dissolved phase constituents have historically migrated beyond the downgradient limits of the footprint of the South Pit. Concentrations of arsenic and benzene in the STU groundwater in the South Pit and offsite exposure areas exceed the primary drinking water MCLs.

12.9 Site Groundwater

Most of the Corpus Christi area is located on outcrops of the Pleistocene age Beaumont Formation that consists of four depositional systems including: fluvial meanderbelt and interfluvial-interdeltaic floodbasin, wave-dominated deltaic and strandplain, coastal barrier, and bay-lagoon systems. These areas represent interdistributary, abandoned channel fill and overbank flood basin deposits.

The UTU is encountered at approximately 11 feet bgs and reaches a thickness of 15 feet in the southern portion of the Site. Near the South Pit, the UTU potentiometric surface maps depict groundwater flow southwest to northeast from a groundwater high situated near MWGW12, possibly due to the change in subsurface characteristics from naturally occurring soil to the waste materials. See Figure 16 for potentiometric mapping. The UTU lacks lateral continuity across the Site and appears to be discontinuous east of the South Pit area and the northeastern portion of the South Pit area (near the S curve). The UTU is not in direct hydraulic communication with the East Ditch in the vicinity of the South Pit. However, due to recent anthropogenic changes in surface water discharges, the UTU interacted with the south segment of the East Ditch during the presence of standing water in the ditch The UTU near MWGW12 is approximately 18 inches below the East Ditch invert. Between November and December 2017, a sediment cap was installed in the south segment of the East Ditch to prevent surface water from creating a wetting condition that allows for transport of COPCs from the UTU to surface water through the overlying clays. In February 2020, the sediment cap was extended north, to the concrete portion of the S curve, to further manage the transport of COPCs from the UTU through the overlying clays to surface water.

The UTU is underlain by very stiff to hard clay which is continuous across the Site. The clay layer is underlain by the STU. The STU is laterally continuous near the South Pit. There are insufficient borings to determine if the STU is laterally continuous near the North Pit. East of the East Ditch, the STU was encountered at approximately 14 feet bgs and depths up to 36 feet bgs on the western portion of the Site. Generalized stratigraphy for the South Pit area from cross sections C-C’ and I-I’ are shown in Figure 13.

The UTU unit is classified as a Class 3 groundwater resource based on total dissolved solids (TDS) concentrations (USEPA, 1988). Aquifer tests resulted in hydraulic conductivity values ranging from 2.42E-04 to 2.91E-03 centimeters per second (cm/sec). In the vicinity of the South Pit, the UTU has a hydraulic flow gradient to the north to northeast at 0.0096 feet/feet. The clay layer that lies beneath the UTU separates it from the underlying confined STU. Native hydraulic conductivities of the clay layer range from 5.85E-07 to 9.03E-07 cm/sec.

The STU is classified as a Class 2 groundwater resource. Aquifer tests indicate a hydraulic conductivity from 6.79E-05 to 1.39E-03 cm/sec. The STU has a hydraulic flow gradient to the north to northeast at 0.003 feet/feet in the South Pit Area. Arsenic concentrations in the 2014 sample event exceeded the screening criteria (0.000052 mg/L) and the MCL (0.010 mg/L) in MWGW201, MWGW203, and MWGW204. The arsenic concentrations reported for MWGW201, the upgradient well, increased from 0.00756 mg/L (duplicate 0.00837) in January 2012 to 0.0177 mg/L in February 2014 to 0.0221 mg/L in January 2014 A similar pattern was observed in MWGW203 (0.00415 mg/L in February 2012 to 0.0109 mg/L in February 2014). Arsenic concentrations in the remaining STU wells were consistent, with most below the MCL.

Based on RI sampling data collected in July 2019, STU groundwater monitoring well MWGW204, located on Buckeye property may have experienced a one-time pulse of contamination into the STU

during construction of the Buckeye facility from a contamination source unrelated to the Site. Footings for refinery construction can extend to 100 feet bgs. MWGW204 was installed in 2014; Buckeye construction took place from 2013 to 2016. The construction destroyed STU groundwater monitoring well MWGW19; MWGW204 replaced this well. Contamination in MWGW204 represents an unexpected contribution of material from an unplanned penetration.

The waste profile for MWGW204 contaminated groundwater is different from the contamination in the wells on Site property. Specifically:

- Phenols – Phenols presence is characteristic of the Brine Service Site waste material and groundwater contamination. 2,4-Dimethylphenol, 2-Methylphenol, 3&4-Methylphenol and Phenol are elevated in groundwater impacted by the waste material in the pit on Site; MWGW204 has low 2,4-Dimethylphenol and very low or non-detect 2-Methylphenol, 3&4-Methylphenol and Phenol.
- TPH (Aliphatics) - presence of both gasoline and diesel range aliphatics is characteristic of the Brine Service Site waste material and groundwater contamination.
    - nC6 to nC12# (gasoline range) and nC12 to nC28# (diesel range) aliphatics are elevated in groundwater impacted by the waste material in the pit on Site; MWGW204 has lower nC6 to nC12# (gasoline-range) aliphatics and very low or non-detect nC12 to nC28# (diesel range) aliphatics.
    - TPH are elevated in groundwater impacted by the waste material in the pit on Site; MWGW204 has lower to very low TPH.

STU groundwater monitoring well MWGW03 is a "test case" for natural attenuation when a pulse of waste/contamination is introduced to a STU well. Contamination was likely dragged from the waste pit into the STU when MWGW03 was drilled/installed. Additionally, groundwater sampling indicated that:

- MWGW03 shows a decrease in contamination from when the well was installed in 2010 to May 2019; oxidation-reduction reaction (redox) conditions exist, and contamination attenuation is naturally occurring.
- MWGW204 shows a rapid decrease in contamination after the one-time pulse of contamination occurred during refinery construction. Even with the penetration and introduction of contamination, redox conditions exist, and contamination attenuation is naturally occurring.

13.0 CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

This section discusses the current and reasonably anticipated future land uses and current and potential beneficial ground and surface water uses at the Site. This information forms the basis for reasonable exposure assessment assumptions and risk characterization conclusions presented in Section 14.

13.1 Current and Potential Future Land Uses

The Site consists of a mixture of commercial/industrial facilities, parking lots, and maintained (mowed) grassy areas. Lots 6 and 7 are currently occupied by a construction equipment repair shop (Robert's Equipment Sales and Service [Robert's Equipment]) and an adult video store (Adult Video), respectively. Lot 3 was occupied by a truck tire shop (Wingfoot) and Lots 8A/8B were occupied by The Goldston Company, a tanker transportation company (Willoughby Trucking), a paint shop, and a wash rack. Lot 8A is currently owned and occupied by Buckeye. Multiple underground pipelines transporting

a variety of products transect the Site in various directions (Figure 4). Eight active pipelines and two fiber optic cables (in one corridor) are in or adjacent to the South Pit area.

The Site is currently in commercial/industrial use and is expected to remain commercial/industrial in the future. The Site is located within the Port of Corpus Christi Inner Harbor Port Related District (POCC, 2015) and Industrial District Number One (COCC, 02017). The Inner Harbor Port Related District has multiple refining-related industries and heavy industrial businesses (Figure 3). Adjacent land use is commercial/industrial. Buckeye is located east of the Site, and the Nueces Power Equipment (NPE) facility is located west of the Site across Goldston Road. Buckeye provides refrigerated liquified petroleum gas storage and refining. NPE rents and repairs heavy construction equipment.

Per the City of Corpus Christi, Lots 2 through 6 have current industrial district agreements (COCC, 2018). Lot 7 does not currently have an industrial district agreement but is eligible. In exchange for a payment in lieu of taxes, an industrial district agreement contractually protects properties from City requirements for permitting and platting. According to the City of Corpus Christi geographic information system map viewer, future land use will be heavy industrial. (COCC, 2017).

13.2 Current and Potential Future Groundwater and Surface Water Uses

The EPA groundwater classification system consists of three general classes of groundwater representing a hierarchy of groundwater resource values to society. These classes are: Class I – special groundwater; Class II – groundwater currently and potentially a source for drinking water; and Class III – groundwater not a source of drinking water. The TCEQ TRRP at 30 Tex. Admin. Code § 350.52 establishes three categories of groundwater resources, designated Class 1, Class 2, and Class 3, based upon a site-specific evaluation of the current use of the groundwater-bearing unit, as well as its potential use, as defined on the basis of natural water quality and well yield. Both groundwater classification systems describe a potential source of drinking water as one that is capable of yielding 150 gallons/day and with a TDS concentration of less than 10,000 (mg/L) (EPA, 1988a; TCEQ, 2010). The areas adjacent to Corpus Christi and Nueces Bays are not favorable for groundwater supply purposes based on naturally occurring TDS concentrations generally above 3,000 mg/L and net sand thicknesses (Woodman et al., 1978; BEG, 1981).

The UTU is classified as Class 3 groundwater. The average TDS concentrations in the UTU at the Site exceed 10,000 mg/l. The Class 3 classification of the UTU is further supported by the presence of an estuarine, tidally-influenced (northern) portion of the East Ditch and the groundwater classification of nearby facilities. The STU is classified as a Class 2 groundwater resource because it has limited value as a drinking water source. While the average naturally occurring TDS concentrations in the STU are less than 10,000 mg/L, the lowest measured TDS concentration on the Site is 4,980 mg/L. Groundwater with TDS concentrations greater than 1,000 mg/L would have an unacceptable taste and would require extensive treatment for drinking water purposes. Monitoring wells screened in the shallow portions of the STU on the northeast side of the Site have TDS levels at or above 10,000 and may be influenced by the estuarine conditions north of the Site.

There are no current plans for use of groundwater at the Site. The City of Corpus Christi provides drinking water to the Brine site and to the surrounding area.

Limited surface water exists in the East Ditch. Observations during Site visits from 2010 to 2014 indicated that the south segment of the ditch was ephemeral, only having flow after precipitation, while

the north segment was perennial. During the 2017 Site visits, the south segment was observed to have transitioned from an ephemeral stream to an intermittent stream due to certain anthropogenic effects occurring in the vicinity of the adjacent Buckeye facility to the east, including potential changes in surface water drainage patterns and the addition of permitted outfalls along the ditch. Surface water gauging measurements conducted from March to June 2017, as well as field observations from March to November 2017 indicate that the south segment of the ditch returns to the dry conditions in between rainfall events and permitted discharges. There are no current uses of Site surface water or planned futures uses.

14.0 SUMMARY OF SITE RISKS

This section of the ROD provides a summary of the Site's human health and environmental risks. As part of the RI, the Brine Cooperating Parties conducted a BHHRA and SLERA to determine the current and possible future effects of contaminants on human health and ecological receptors if the contaminants were left in an un-remediated state. The Site currently consists of a mixture of commercial/industrial facilities, parking lots, and maintained (mowed) grassy areas, and, the reasonably anticipated reuse for the Site will be commercial/industrial. A BHHRA for the Site was completed in December 2017, which estimated the probability and magnitude of potential adverse human health effects from exposure to contaminants associated with the Site assuming no remedial action was taken. A SLERA for the Site was completed in June 2018.

14.1 Summary of Human Health Risk Assessment

The BHHRA (BCP, 2017d) estimates what human health risks the Site poses if no action were taken. It provides the basis for taking action at the Site and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The BHHRA evaluates the baseline potential risk that might be experienced by human receptors coming into contact with contaminated air, soil, sediment, surface water, ground water, and fish tissue. This section of the ROD summarizes the results of the BHHRA. The BHHRA follows the protocols for EPA Risk Assessment Guidance for Superfund (RAGS) Part A (USEPA, 1989), RAGS Part B (USEPA, 1991a), RAGS Part D (USEPA, 2001), RAGS Part E (USEPA, 2004), and RAGS Part F (USEPA, 2009). In addition, the risk assessment was completed in accordance with the USEPA-approved BHHRA Work Plan (Work Plan) for the Site (URS, 2010a). This BHHRA followed a four-step process:

1. Hazard identification/Identification of COPCs;
2. Exposure assessment;
3. Toxicity assessment; and
4. Risk characterization.

14.1.1 Hazard Identification / Identification of COPCs

Data evaluation and screening is a common data reduction step used in quantitative risk assessments to identify COPCs. It allows the risk evaluation to focus on those constituents that are likely to have the greatest potential impact on the overall risk and to eliminate constituents that are expected to pose negligible risk. The data screening process for this BHHRA includes the following steps:

1. Determination of exposure areas;
2. Evaluation of essential nutrients;
3. Evaluation of frequency of detection;
4. Evaluation of background levels;

5. Selection of screening criteria; and
6. Identification of COPCs/COCs.

Determination of Exposure Areas – During the RI planning, the Site soils were segregated into five investigation units; however, for the purposes of the BHHRA, the onsite soil investigative units have been combined to determine exposure areas (i.e., the South Pit Exposure Area, North Pit Exposure Area, and Lot 8B Exposure Area). The soil exposure areas were selected based on the distribution of the Site analytical data and consideration of reasonable anticipated human receptor activity patterns. The two impacted groundwater-bearing units (i.e., UTU and STU) at the Site are also evaluated by exposure area (South Pit Exposure Area, North Pit Exposure Area, Lot 8B Exposure Area, and Off-Site Exposure Area). The East Ditch was evaluated for potential exposures to surface water and sediment and, since the East Ditch south of the S curve is intermittent, samples collected along this segment of the East Ditch are also evaluated as soils in the BHHRA. Sediment and surface water samples collected in the East Ditch south of IH-37 to immediately north of IH-37 were designated as East Ditch background samples. Sediment and surface water samples were collected in the drainage ditch that parallels Up River Road to characterize offsite contributions to the East Ditch area.

Evaluation of Essential Nutrients – TNRCC (2001) and TCEQ (2007b) indicate that environmental concentrations of certain nutrients (calcium, magnesium, potassium, sodium, and phosphorus) are not expected to be a health concern. Based on this guidance, calcium and magnesium were eliminated as COPCs in surface water.

Evaluation of Frequency of Detection – Pursuant to USEPA (1989), chemicals detected at a low frequency in media of concern may be considered as sampling or analytical anomalies and, therefore, may not be related to the site operations or require quantitative assessment. A detection frequency of five percent is conventionally used as a benchmark to eliminate chemicals from further quantitative assessment when at least 20 or more samples are collected from a specific medium. No chemicals were excluded from consideration in the BHHRA based on frequency of detection.

Evaluation of Background Levels – A statistical background comparison was completed for select naturally-occurring and anthropogenic constituents (i.e., PAHs and metals) in surface soil, surface water, and sediment. Site-specific background values were developed for soil; however, the Texas-Specific Median Background values for soil promulgated in the TRRP rule (TCEQ, 2007a) were used if the site-specific soil background values were lower. Note that the results of the background comparison are not used to eliminate constituents from the BHHRA; rather the findings are used to support determining Site-related contributions.

Selection of Screening Criteria – Applicable screening criteria were determined based on the current land use and reasonable anticipated future land use. The Site is currently in commercial/industrial use and is expected to remain commercial/industrial in the future (USEPA, 2011a).

Identification of COPCs - The constituents with maximum concentrations greater than their human health screening criteria are retained for further evaluation as COPCs. If a constituent was not detected in a medium of concern and the sample detection limit (SDL) exceeds its human health screening criterion, it is evaluated further in the Uncertainty Analysis. COPCs are evaluated further in the exposure assessment toxicity assessment and risk characterization. Tables 1A through 1F summarize the COPCs and exposure point concentrations (EPC) (the concentration that will be used to estimate the

exposure and risk from each COPC) for the COPC detected in waste, soils, groundwater, sediments, surface water, and soil vapor. The tables include the range of concentrations detected for each COPC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the Site), the EPC, and how the EPC was derived (USEPA, 2017).

Waste Materials

The primary wastes remaining at the Site are LNAPL in the UTU and residual waste material (sludge, reworked soil/waste mixtures) within the former South Pit. LNAPL samples from Site monitoring wells MWGW01, MWGW09, and MWGW10 were characteristically hazardous for benzene, and the LNAPL sample from MWGW09 was characteristically hazardous for chromium and total cresols. The sludge samples collected from South Pit well borings MWGW09 and MWGW10 were characteristically hazardous for benzene. No waste materials were identified in the North Pit.

Waste

The RI data demonstrate the following key points for waste data:

- The following COPCs, detected in waste materials in the South Pit exposure area, exceed human health screening criteria: arsenic, lead, mercury, alpha-BHC, beta-BHC, heptachlor epoxide, benzene, ethylbenzene, methylene chloride, naphthalene, 1-methylnaphthalene, 3&4-methylphenol, benzo(a)pyrene, and dibenz(a,h)anthracene.
- The following COPCs, detected in waste vapors in outdoor air, exceed human health screening criteria: mercury, heptachlor epoxide, and benzene.
- The following COPCs, indicating waste leaching to a Class 3 groundwater, exceed human health screening criteria: lead, mercury, alpha-BHC, beta-BHC, heptachlor epoxide, benzene, methylene chloride, 1-methylnaphthalene, and 3&4 methylphenol.

Soils

The RI data demonstrate the following key points for the soils data:

- Soils are impacted in the South Pit Exposure Area. The following COPCs, detected in soil, exceed soil human health screening criteria: arsenic, lead, mercury, heptachlor epoxide, total PCB (Aroclor 1254), benzene, benzo(a)pyrene, and 1-methylnaphthalene.
- The following COPCs, detected in subsurface soil vapors in outdoor air in the South Pit Exposure Area, exceed human health screening criteria: mercury, Aroclor 1254, and total PCBs.
- The following COPCs, indicating soils leaching to a Class 3 groundwater, exceed human health screening criteria: lead, mercury, benzene, and 1-methylnaphthalene.
- Soils are impacted in the North Pit Exposure Area. The following COPCs, detected in soil, exceed soil human health screening criteria; arsenic, lead, selenium, mercury, bis(2-ethylhexyl)phthalate, and 1-methylnaphthalene.
- Soils are impacted in the Lot 8B Exposure Area. The following COPCs, detected in soil, exceed soil human health screening criteria: arsenic, mercury, benzene, ethylbenzene, and naphthalene and methylene chloride.

Groundwater
The RI data demonstrate the following key points for the two groundwater bearing units data:

- The following detected constituents were identified as exceeding human health criteria in the South Pit UTU: arsenic, alpha-BHC, dieldrin, benzene, and 3&4-methylphenol.
- Benzene is the only constituent that exceeds human health criteria in the offsite UTU.
- The following detected constituents were identified as exceeding human health criteria for the South Pit STU: arsenic, cobalt, manganese, alpha-BHC, beta-BHC, dieldrin, 4.4'-DDD, heptachlor, heptachlor epoxide, benzene, ethylbenzene, naphthalene, and cyanide.
- The following detected constituents were identified as exceeding human health criteria for the offsite STU: arsenic, cobalt, manganese, 4,4'-DDE, beta-BHC, dieldrin, heptachlor, heptachlor epoxide, benzene, ethylbenzene, naphthalene, benz(a)anthracene, 1-methylnaphthalene, 2,4-dimethyphenol, 4,6-dinitro-2-methylphenol, and pentachlorophenol.
- The following detected STU constituents were identified as exceeding drinking water primary maximum contaminant levels (MCLs): arsenic, manganese, and benzene.

Sediments and Surface Water
The RI data demonstrate the following key points for surface water and sediments data:

- Arsenic and aldrin concentrations in surface water exceed human health screening criteria.
- Arsenic and the PAHs (benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3) pyrene) were identified as detected constituents that exceed human health screening criteria for sediments in the East Ditch.

Soil Gas
The detected soil gas constituents in near-source samples that indicate an exceedance of their screening criteria are benzene, ethylbenzene, and TPH (C_5-C_8 aliphatics). The analytical data obtained from the sub-slab vapor intrusion sampling collected at the Adult Video and Robert's Equipment demonstrate that, other than C_5-C_6 aliphatic hydrocarbons at the Adult Video, soil-gas COPC concentrations and reporting limits are below default commercial/industrial soil gas screening criteria.

14.1.2 Exposure Assessment

Exposure refers to the potential contact of an individual (the receptor) with a contaminant. The exposure assessment evaluates the magnitude, frequency, duration, and route of potential exposure. This section describes which populations may be exposed, the exposure pathways, and the level of exposure to the contaminants present.

The objective of the exposure assessment is to evaluate potential current and future human exposures to COPCs in all media of concern – waste, soil, sediment, surface water, groundwater, and air (soil gas). The current and potential future human receptors were determined by the Site's configuration, land and water use, and activity patterns. Receptors were identified for both current and potential future Site conditions.

A complete discussion of all the scenarios and exposure pathways is presented in the BHHRA, summarized in the following discussion, and depicted in the Site CSM for human health included as Figure 6. The Site currently has various commercial/industrial uses and is expected to be used for commercial/industrial purposes in the future. The potentially exposed human receptors for the Site are:

- Onsite Current/Future Outdoor Worker;
- Onsite Current/Future Indoor Worker;
- Onsite Current/Future Construction Worker;
- Onsite Current/Future Maintenance Worker;
- Onsite Current/Future Adolescent Trespasser;
- Offsite Current/Future Outdoor Worker; and
- Offsite Current/Future Construction Worker.

As depicted in the CSM, the following pathways for current and future receptors were considered complete:

- Subsurface Waste: Subsurface waste is defined as sludge and reworked soil/waste mixtures located below 2 feet bgs within the South Pit Exposure Area. Inhalation of volatile COPCs migrating from subsurface waste to ambient air is considered a complete exposure pathway. In addition, because construction work is assumed to occur to a depth of 10 feet bgs, incidental ingestion, dermal contact, and inhalation of volatile COPCs and particulates are considered complete exposure routes for subsurface waste to a depth of 10 feet bgs.
- All Soil or All Waste: All soil or all waste is defined as soils or sludge and reworked soil/waste mixture overlying the UTU in the South Pit Exposure Area and soils overlying the UTU in the North Pit and Lot 8B Exposure Areas. Current and future leaching of COPCs in the soils or waste to groundwater is considered a complete pathway.
- Surface Soil: Surface soil is defined as soils from the ground surface to 2 feet bgs within the South Pit, North Pit, and Lot 8B Exposure Areas. Incidental ingestion, dermal contact, and inhalation of volatile COPCs and particulates are considered complete exposure routes.
- Subsurface Soil: Subsurface soil is defined as soils located below 2 feet bgs within the South Pit, North Pit, and Lot 8B Exposure Areas. Inhalation of volatile COPCs migrating from subsurface soil to ambient air is considered a complete exposure pathway. In addition, because construction work is assumed to occur to a depth of 10 feet bgs, incidental ingestion, dermal contact, and inhalation of volatile COPCs and particulates are considered complete exposure routes for subsurface soils to a depth of 10 feet bgs.
- Groundwater (UTU): Direct use of groundwater in the UTU for drinking is an incomplete pathway because it is considered non-potable (Class 3). The UTU is evaluated based on its Class 3 groundwater designation and the potential for volatile COPCs in the UTU to migration to ambient air. In addition, because construction work is assumed to take place to a depth of 10 feet bgs, a construction worker conducting work in a trench is assumed to be exposed to the UTU via incidental ingestion, dermal contact, and inhalation of volatile COPCs.
- Groundwater (STU): No public water supply wells were identified within a 1-mile radius of the Site, and potable water at the Site and vicinity is supplied by the City of Corpus Christi. However, a conservative assumption is that groundwater in the STU can be potentially used as a drinking water source (Class 2). Dermal contact with COPCs in the STU was not evaluated since it is assumed that STU water is not routinely used for bathing and the hand-washing scenario is considered significantly less conservative than a drinking water scenario. An onsite outdoor worker scenario represents the most conservative exposure for ingestion of groundwater (i.e., COPCs in the STU) based on the assumptions for exposure duration (25 years) and exposure frequency (250 days/year) for an outdoor worker versus exposure duration (1 year) and exposure

frequency (60 days/year) for a construction worker; therefore, an additional evaluation is not performed for the onsite construction worker.

- Sediments/Soils: Sediment is a potential exposure medium for human receptors that may maintain or trespass the East Ditch Area along the intermittent and perennial segments. Incidental ingestion, dermal contact, and inhalation of volatile COPCs are potential routes of exposure. Evaluation of the inhalation route is considered unnecessary because no sufficiently volatile COPCs are screened for further evaluation for the sediment/soil pathway for the East Ditch.
- Surface Water: Surface water is a potential exposure medium for human receptors that may maintain or trespass the East Ditch Area. Incidental ingestion, dermal contact, and inhalation of volatile COPCs are potential routes of exposure. Evaluation of the inhalation route is considered unnecessary because no sufficiently volatile COPCs are screened for further evaluation for the surface water pathway.
- Outdoor Air: Sufficiently volatile COPCs in subsurface soil, groundwater (UTU and STU), and LNAPL/waste could migrate to outdoor air. Inhalation of COPCs emanating from these media to outdoor (ambient) air is considered a complete exposure pathway.
- Indoor Air: Sufficiently volatile COPCs in soil, groundwater, and LNAPL/waste could migrate to indoor air (vapor intrusion). Inhalation of COPCs emanating from these media into indoor air is considered a potentially complete exposure pathway and is evaluated using soil gas data.

The risk assessor considers the different ways that people might be exposed to the contaminants, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, the risk assessor calculates a "reasonable maximum exposure" (RME) scenario, which portrays the highest level of human exposure that could reasonably be expected to occur. Exposure route, receptor, receptor-specific assumptions, exposure point, exposure parameters values (duration, frequency, etc.) are presented in Tables 2A through 2I (Values Used Risk Assessment). These exposure routes were evaluated to determine Site risk to contamination.

14.1.3 Toxicity Assessment

The toxicity assessment, evaluating the potential toxicity of the COPCs, is a key step in the BHHRA. This section summarizes the EPA's process for developing carcinogenic and noncarcinogenic toxicity factors and identifies the hierarchy of toxicity sources used in the BHHRA (USEPA, 2005a).

Toxicity values used to evaluate noncarcinogenic effects (effects other than cancer) include the following:

- Oral reference dose (RfD) in mg/kg-day; and
- Inhalation reference concentration (RfC) in mg/m^3.

Chronic oral RfDs and inhalation RfCs are estimates of the daily exposure to the human population (including sensitive subgroups) that are not expected to cause any harmful effects during a lifetime.

Chronic RfDs and RfCs are specifically developed to be protective for long-term exposures and are used to evaluate all potential exposure scenarios in this BHHRA (including short-term exposure scenarios such as a construction worker).

Toxicity values used to evaluate carcinogenic effects include the following:

- Cancer slope factor (CSF) in units of milligrams per kilogram per day $(mg/kg\text{-}day)^{-1}$; and
- Inhalation unit risk (IUR) in units of micrograms per cubic meter $(\mu g/m^3)^{-1}$.

Toxicity assessment is accomplished in two steps: hazard identification and dose-response assessment. Hazard identification is the process of determining whether exposure to a chemical is associated with a particular adverse health effect and involves characterizing the nature and strength of the evidence of causation. The dose-response assessment is the process of predicting a relationship between the dose received and the incidence of adverse health effects in the exposed population. From this quantitative dose-response relationship, toxicity values are derived that can be used to estimate the potential for adverse effects as a function of potential human exposure to the chemical.

Tables 3A and 3B show the cancer and the non-cancer toxicity data, respectively, for the COPCs that are the risk contributors at the Site. For complete information on the toxicity of the COPCs, see the BHHRA. The risk assessment results are discussed in detail in Section 14.3 which identifies the Basis for Remedial Action.

14.1.4 Risk Characterization

The final step in the BHHRA is the characterization of the potential risk and hazard associated with exposures to COPCs detected in media of concern at the Site. Risk characterization involves integrating the information developed in the exposure assessment and the toxicity assessment to estimate potential human health risk or hazard. Baseline risks are those risks and hazards that the Site poses if no action were taken. The probabilities that adverse human health effects will occur are presented separately for non-cancer hazards and cancer risks due to differences in toxicological endpoints, relevant exposure averaging times, and risk characterization methods. Cancer risks (CR) are expressed as unitless values in scientific notation. Non-cancer hazards are expressed as a unitless ratio of the estimated intake or exposure concentration to an acceptable daily intake or reference concentration (i.e., hazard quotient, HQ). Cumulative exposure route- or target organ-specific non-cancer hazards represent the sum of individual HQs and are presented as hazard indices (HI).

Tables 4A through 4D present the carcinogenic risk characterization for outdoor (onsite and offsite) workers and construction (onsite and offsite) workers. Noncarcinogenic risk characterization is presented in Tables 4E through 4G. The risk assessment results are discussed in detail in Section 14.3 which identifies the Basis for Remedial Action.

Carcinogens

Risks associated with exposure to chemicals classified as carcinogens are estimated as the incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure (USEPA, 1989).

Carcinogenic risk for oral and dermal exposures is calculated by multiplying the estimated daily intake or dose of a chemical (averaged over a lifetime) by a chemical-specific and route-specific CSF. The calculation of carcinogenic risk for a chemical via the oral and dermal exposure routes is illustrated by the following equation:

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated using the following equation:

Carcinogenic Risk = CDI x CSF

where:

Risk = a unitless probability (e.g., 2 x 10^{-5}) of an individual developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
CSF = slope factor, expressed as ([mg/kg-day]$^{-1}$)

For inhalation exposures, carcinogenic risk is calculated by the following equation:

Carcinogenic risk = EC x IUR x CF

where:

EC = Exposure concentration milligram per cubic meter (mg/m^3)
IUR = Chemical- and route-specific cancer slope factor ([µg/m^3]$^{-1}$)
CF = Conversion factor [1000 microgram per milligram (µg/mg)]

An excess lifetime cancer risk of 1x10^{-6} indicates that an individual experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual's developing cancer from all other causes has been estimated to be as high as one in three. EPA's generally acceptable risk range for site-related exposures is 1x10^{-4} to 1x10^{-6}, also denoted as 1.0E-04 to 1.0E-06.

Noncarcinogens

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., life-time) with a RfD derived for a similar exposure period. A RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. Estimated HQs for noncarcinogenic effects are generated on a constituent-by-constituent basis for each relevant exposure pathway and route. To assess exposure to multiple constituents by multiple pathways, the constituent-specific HQs are summed for all constituents associated with a specific pathway to determine the pathway-specific HI. HIs for all pathways are then summed to determine the total cumulative HI for the receptor exposure scenario. If the total cumulative HI for a receptor exposure scenario is greater than unity (1), the HI is segregated by critical effect and mechanism of action (USEPA, 1989). HQs for constituents that affect the same target organ are summed to derive target organ/endpoint specific HIs. Target organ/endpoint specific HIs that are 1 or less indicate there is less likelihood that an adverse health effect will occur. A HI greater than 1 indicates that site-related exposures may present a risk to human health.

The HQ is calculated as follows:

Non-cancer HQ = EC/RfD

where:

EC = Exposure concentration (mg/m^3)
RfD = Chemical-specific Reference Concentration (mg/m^3)

EC and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short-term).

The methodology used to evaluate noncarcinogenic health hazards, unlike the methodology used to evaluate carcinogenic risks, is not a quantitative measure of risk (i.e., it does not result in a probability

for potential occurrence of adverse noncarcinogenic health effects). The HQ or HI is not a mathematical prediction of the incidence of severity of those effects (USEPA, 1989). If an HQ or HI exceeds unity (one), noncarcinogenic health effects could potentially occur under the defined exposure conditions. Note that the determination of a RfD assumes a margin of safety and, therefore, an HQ or HI greater than 1 does not necessarily indicate that an adverse noncarcinogenic health effect will occur; hence, an HI less than or equal to 1 indicates that it is unlikely adverse noncarcinogenic health effects will occur.

According to 30 TAC § 350.51(l)(5) (TRRP, 2007a), a "hot spot" assessment may be required where site-specific features are present such that there is likely to be preferential exposure to smaller areas. Based on the site-specific exposure assessment, there are no areas with existing infrastructure that would encourage preferential human exposures (i.e., a human receptor spending a predominant portion of their work typical day in smaller area) within the identified Exposure Areas. A hot spot assessment was conducted for surface soil COPCs identified for the South Pit, North Pit, and Lot 8B Exposure Areas to identify areas of potential concern should preferential exposure occur in the future. The hot spot assessment is comprised of an outlier test, using the USEPA's ProUCL data analysis software (USEPA, 2013), comparison to ten (10) times the human health direct contact screening criteria, and calculation of COPC cancer risk and non-cancer hazard quotient, if 10 times the human health direct contact screening criteria is exceeded. The findings of the hot spot assessment indicate that outlier concentrations reported for COPCs in the South Pit, North Pit, and Lot 8B Exposure Areas are marginally elevated relative to other concentrations in these exposure areas and therefore no focused remedial efforts are to address potential future preferential exposure scenarios at the Site.

14.1.5 Uncertainty Analysis

The purpose of the uncertainty analysis is to provide a summary of the factors that may significantly influence the risks estimated and assess the contribution of these factors to under- or over-estimate risks. Each step in the BHHRA process requires making assumptions which can contribute to uncertainty in the risks estimated. The EPA's guidance documents on risk assessments provide systematic methods for estimating potential health risks posed by chemical exposures. Despite the advanced state of current risk assessment methodologies, uncertainties and limitations are inherent in the risk assessment process. Uncertainty can lead to an over- or under-estimation of potential risk. In regulatory risk assessment, the methodology dictates that assumptions err on the side of overestimating potential exposure and risk. The effect of using numerous assumptions that each overestimated potential exposure provides a conservative estimate of potential risk.

The uncertainty analysis for this BHHRA is primarily qualitative. Uncertainties associated with each key step of the risk assessment process, including data evaluation and screening, exposure assessment, toxicity assessment, and risk characterization are evaluated.

Data Evaluation and Screening Uncertainty

Uncertainties are introduced into the COPC identification process if evaluations such as background comparisons for inorganic constituents, frequency of detection, and a weight-of evidence evaluation of the relationship of a constituent to the Site are utilized to eliminate analytes for the screening process. In this risk assessment a conservative approach of evaluating all detected analytes was utilized regardless of the frequency of detection of weight-of-evidence evaluation. Rejecting analytes as COPCs could have potentially resulted in an underestimation of risk.

Samples Representative of Site Media

Sampling and analysis procedures represent primary sources of uncertainty associated with the data. Sample locations were identified in the RI/FS Work Plan using a probability-based design and systematic grid sampling with a random start using the Visual Sample Program (Battelle, 2010). Bias (over-estimation) is possible, since sample collection depths were chosen based on displayed characteristics (visual observations of contamination, field screening using an organic vapor meter, or other criteria). In the BHHRA, it is assumed that samples collected are representative of the areas to which human receptors could be exposed. However, the collected samples may not be representative, due to biases in sampling and/or to random variability of samples.

Analytical Methods

Samples collected in the RI were analyzed using EPA-approved methods and the analytical data were validated to assess their usability in the BHHRA. To achieve lower reporting limits than stated in the EPA-approved methods, all detections above the method detection limit (MDL) were reported as "J" values.

Screening Criteria

The screening criteria selected for the data screening step will influence the COPCs identified for further evaluation in the risk characterization step. Applicable screening criteria were determined based on the current land use and reasonable anticipated future land use. The Site is currently used for commercial/industrial use and is expected to remain commercial/industrial in the future. This approach is protective for all potentially exposed receptors given that the screening criteria protective of a standard industrial worker scenario would also be protective of other human receptor populations that utilize the Site at lower exposure frequencies and shorter durations.

Exposure Assessment Uncertainty

The exposure assessment is the qualitative or quantitative evaluation of the magnitude, frequency, duration, and route of exposure to COPCs that were detected in affected media. This requires understanding of the environmental setting and the exposure pathways by which human receptors may potentially be exposed to COPCs.

To quantify exposure, exposure parameters are required to estimate chemical intake or exposure concentration for each potential exposed receptor. For this BHHRA, exposure parameters recommended in RAGS Part A and B (USEPA, 1989; USEPA, 1991a; USEPA,1991b), EPA's Supplemental Soil Screening Guidance (USEPA, 2002a), EPA's Dermal Risk Assessment Guidance (USEPA, 2004), and EPA's Inhalation Risk Assessment Guidance (USEPA, 2009) were generally selected. Where appropriate and applicable, professional judgment was used to select site-specific exposure parameters. As most of the exposure assumptions were selected from EPA sources, it is less likely that the risks and hazards were underestimated.

Fate and transport models (along with the assumptions) were obtained from EPA and state agency sources (USEPA, 2002; USEPA, 2004; TCEQ, 2007a; and VDEQ, 2012). The construction in a trench model, developed by the Virginia Department of Environmental Quality (VDEQ, 2012), was used to estimate concentrations in ambient air due to migration of volatile COPCs from groundwater into a trench. EPA's Vapor Intrusion Screening Level (VISL) Calculator (USEPA, 2016) and default model input parameters were used to estimate indoor air EPCs from sub-slab soil gas data. EPA's vapor intrusion models likely overestimate the risks for indoor exposures for petroleum hydrocarbons.

Petroleum hydrocarbons are readily degraded in aerobic environments, and attenuation due to aerobic biodegradation or other processes are not factored in the EPA models (USEPA, 2011).

Because of the uncertainty associated with estimating the true average concentration at a site, the 95% upper confidence limit (UCL) of the arithmetic mean was used for this variable. The 95% UCL provides reasonable confidence that the true site average will not be underestimated. Statistical methods included in the EPA's ProUCL data analysis software (USEPA, 2013), were used to estimate 95% UCL of the mean for determining EPCs for COPCs in surface and subsurface soil and waste materials (where applicable). Maximum detected concentrations were used as the EPCs for groundwater in the UTU and STU, soil gas, surface water and sediment. Since EPCs for both RME and CTE scenarios are either the maximum reported concentration or the 95% UCL of the mean, it is unlikely that risks and hazards are underestimated.

Toxicity Assessment Uncertainty
The sources of carcinogenic and noncarcinogenic toxicity factors were selected in accordance with the EPA's toxicity factors hierarchy guidance (USEPA, 2003a, 2003b). Toxicity factors are predicted values for the most sensitive subpopulations and incorporate safety factors that are generally conservative. However, in general, the available scientific information is insufficient to provide a thorough understanding of all the potential toxic characteristics of the chemicals to which humans are potentially exposed. Some sources of uncertainty related to toxicity data are as follows: use of toxicity data from animal studies, extrapolation from one exposure route to another (e.g., ingestion to dermal absorption), use of chronic toxicity factors to evaluate short-term exposure durations, and lack of toxicity data.

Overall, the uncertainties indicated for the toxicity assessment are not expected to result in an underestimation of risks and hazards since conservative approaches were generally used.

14.2 Summary of Ecological Risk Assessment

The SLERA (BCP, 2018b) estimates what ecological risks the Site poses if no action were taken. It provides the basis for taking action at this Site and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The SLERA evaluates the potential risk that might be experienced by ecological receptors in contact with contaminated soil, riparian soil, sediment, surface water, and groundwater. This section of the ROD summarizes the results of the SLERA. The EPA (1997) guidance document, Ecological Risk Assessment Guidance for Superfund (ERAGS), describes an eight-step process. TCEQ's approach uses 10 Required Elements per 30 TAC § 350.77(c). Figure 8 compares the ERAGS steps and the TCEQ approach.

This SLERA followed these three-steps and is described in greater detail in the SLERA document:

1. Screening level ecological effects evaluation,
2. Screening level exposure assessment and risk calculation, and
3. Trophic level analysis.

14.2.1 Screening Level Ecological Effects Evaluation

The screening-level problem formulation and ecological effects evaluation provides the following:

- Environmental setting and COPCs known to exist at the Site and the maximum concentrations present for each medium;
- Contaminant fate and transport mechanisms that might exist at the Site;

- The mechanisms of ecotoxicity associated with COPCs and likely categories of receptors that could be affected;
- The complete exposure pathways that might exist at the Site from COPC sources to receptors that could be affected; and
- Screening ecotoxicity values equivalent to no observed adverse effects level (NOAEL) based on conservative assumptions (USEPA, 1997).

The majority of the Site consists of a mixture of commercial/industrial facilities, including associated parking lots and maintained (mowed) grassy areas. Significant ecological habitat was not observed within the commercial/industrial facilities and their parking lots. Approximately 40% of the North Pit and South Pit areas are covered by buildings or nonvegetative cover such as asphaltic or caliche base and 75% of the surface of Lot 6 contains equipment and other materials. In addition, approximately 75% of the surface of Lot 6 contains equipment and other materials. Because of the soil type, commercial/industrial facilities, and mowing, terrestrial habitat is limited in the North and South Pit areas.

Site ecological habitat consists of the East Ditch corridor. Ecological resources are limited for aquatic receptors due to the intermittent nature of the East Ditch drainage channel. Although narrow, the riparian corridor along the East Ditch contained shrubs and small trees along its entire length, providing lower quality ecological habitat.

Based on the habitat evaluation and a review of the special status species listing for Nueces County, the Texas indigo snake (*Drymarchon corais erebennus*), wood stork (*Mycteria americana*), reddish egret (*Egretta rufescens*), and white-faced ibis (*Plegadis chihi*) are evaluated in the SLERA because of their potential presence.

Evaluating potential exposure pathways is one of the primary tasks of the screening-level ecological characterization of a site. For an exposure to be complete, a constituent that is present at a source of environmental release or one that has migrated from a source of release must be taken up by the ecological receptors via one or more exposure pathways and exposure routes. Identifying complete exposure pathways allows the assessment to focus on only those constituents that could be taken up by ecological receptors via the pathways/routes by which exposure could occur.

The CSM contains relevant exposure pathways and routes of exposure for the vertebrate wildlife species and community-level receptors evaluated in the SLERA for terrestrial and aquatic pathways. Sample data from the East Ditch is organized into the following exposure areas:

- South segment (freshwater) of the East Ditch;
- Riparian soil samples from the south segment of the East Ditch; and
- North segment (marine) of the East Ditch.

Sample data from the 0 to 0.5-foot soil interval were evaluated for risk to terrestrial receptors. This is the most biologically active zone for the soil column. Samples were collected from the top 6 inches of sediment. This is the most biologically active zone in the sediment column.

The primary sources (sources with the largest volume of impacted media) of COPCs at the Site

are the now buried South Pit and anthropogenic activities such as agriculture, pipeline operations, oil and gas wells, production facilities, and current businesses.

COPCs within the waste liquids and sludge placed in the South Pit were investigated for releases to the Site soils, the North Pit area, and the East Ditch by discharges (overtopping), spills or leaks to surface soil, or migration into soil through infiltration or percolation to subsurface soils. Rain and surface water infiltration through impacted soil leaches the more water-soluble portions of the fluids resulting in the water-miscible fluids mixing with the groundwater and, depending on site characteristics, migrating laterally through sand and silty layers.

The CSM (Figure 7) indicates that COPCs in surface soil may have migrated vertically to subsurface soil by desorption and leaching processes and potentially entered groundwater. Depending on the subsurface stratigraphy, release potential to subsurface soils would be low in areas constructed over the impermeable native clay, while the release potential to subsurface soils would be higher in areas constructed in a transmissive zone. COPCs residing in subsurface soils (> 2-feet bgs) may migrate vertically to groundwater by leaching processes. Subsurface soil COPCs may volatilize to soil gas and ultimately naturally biodegrade or disperse in the atmosphere. In addition, subsurface soil COPCs may migrate to groundwater and volatilize with dispersion in the atmosphere. COPCs in the groundwater adjacent to the south segment of the East Ditch may migrate through groundwater advection.

Surface runoff (during Site operations) from contaminated surface soils could drain to the East Ditch. Discharge/runoff from the East Ditch was (and currently is) channeled to offsite surface water and sediments.

The results of the screening-level problem formulation and ecological effects evaluation are used to prepare the screening-level exposure estimates and risk characterizations for the North and South Pit area soils and for the surface water, sediment and groundwater to surface water pathway.

14.2.2 Screening Level Exposure Assessment and Risk Calculation

The screening-level exposure estimates and risk calculations are a simple ratio between the maximum concentrations from a data grouping to the media-specific screening-level.

The highest measured or estimated contaminant concentration for soils in the North and South Pits was used as the exposure concentration. Ecotoxicity benchmark screening values, protective of communities in soil, are compared directly against the maximum soil concentration or non-detect constituents if the detection levels are above screening levels (USEPA, 2000; TCEQ, 2017b, 2017c).

Site Soils: Soil COPCs were retained if they were detected and considered bioaccumulative (e.g., 4,4'-DDD) or if the COPC was detected with a maximum concentration exceeding the screening value. Metals, organochlorine pesticides, total PCBs (Aroclor 1260 and Aroclor 1254 were the only Aroclors detected), 2,4-dimethylphenol, benzaldehyde, carbazole, dibenzofuran, high molecular weight polycyclic aromatic hydrocarbons (PAHs), and cyanide are South Pit exposure area COPCs retained for evaluation. Metals, organochlorine pesticides, total PCBs (only Aroclor 1260 was detected), bis(2-ethylhexyl)phthalate, high molecular weight PAHs, pentachlorophenol, and cyanide are North Pit exposure area COPCs retained for evaluation.

South Segment of the East Ditch: Ecotoxicity benchmark screening values that are protective of communities in freshwater are compared directly against the maximum detected concentrations in surface water, sediment and riparian soil concentrations associated with the south segment of the East Ditch. Salinity measurements in this section of the ditch ranged from 0.273 to 0.486 parts per thousand (ppt). The segment of the East Ditch south of the S curve is classified as freshwater and is considered intermittently wet. A sediment cap was installed in November/December 2017 and extended in January 2020 in the south segment of the East Ditch. The SLERA includes sediment and sediment as soil data from locations currently under the cap and no longer an exposure consideration.

- Surface Water: Aluminum, five organochlorine pesticides (4,4'-DDD, 4,4'-DDE, 4,4'-DDT, gamma-chlordane, and heptachlor), and total PAHs are the COPCs retained for the surface water analysis for the south segment of the East Ditch based on comparison to chronic criteria. Only the aluminum concentration exceeds the acute criteria.
- Riparian Area: Barium, chromium, cyanide, selenium, and vanadium are retained as community COPCs in the 0 to 0.5 foot soil interval for the transitional riparian area.

North Segment of the East Ditch: Ecotoxicity benchmark screening values that are protective of communities in marine environments were compared directly to the maximum detected concentrations in surface water and sediment in the north segment of the East Ditch. Samples were collected in the East Ditch north of the S curve up to Up River Road. This segment of the East Ditch is classified as marine based on salinity (up to 15.6 ppt).

- Surface Water: Aluminum, cobalt, manganese, 4,4'-DDT, alpha-chlordane, beta-BHC, endrin aldehyde, heptachlor, heptachlor epoxide, and methoxychlor are retained as community COPCs.
- Sediment: Barium, heptachlor, and PAHs are retained as benthic COPCs based on the comparison of the benchmark and the 95% UCL exposure point concentration. Beryllium, thallium, endosulfan sulfate, and cyanide are retained since a screening level was not available for evaluation.

Groundwater to Surface Water: Ecotoxicity benchmark screening values that are protective of communities in freshwater and marine water are compared directly to the maximum detected concentrations in groundwater potentially discharging to the south segment of the East Ditch. The sediment cap prevents the groundwater to surface water connection in the south segment of the East Ditch. The SLERA includes data from locations currently under the cap and no longer an exposure consideration.

- North Segment of the East Ditch: Cobalt, manganese, 4,4'-DDT, endosulfan I, endosulfan sulfate, gamma-chlordane, heptachlor, and heptachlor epoxide representative concentrations exceed the surface water marine chronic criteria. Since COPC concentrations at the groundwater to surface water point of exposure wells exceed the surface water marine chronic criteria, the criteria were adjusted by the Tier 1 dilution factor of 0.15 (TCEQ, 2007b). The groundwater in this portion of the Site is discharging to a flowing body of water, the perennial portion of the East Ditch. The north segment of the East Ditch has contributions from groundwater, surface water and tidal influences from the Corpus Christi Inner Harbor.

Screening-level exposure estimate and risk characterization COPCs are retained for further evaluation in the trophic level analysis of the ecological risk assessment process if they were detected and considered bioaccumulative or if the COPC was detected with a maximum concentration exceeding the screening value (TCEQ, 2013).

A screening-level scientific management decision point (SMDP) was made prior to the trophic level analysis. The screening level SMDP is the point during the process when the risk assessor communicates results of the assessment to a risk manager. The risk manager determines whether the information is sufficient to arrive at a decision regarding risk management strategies and/or the need for additional information to characterize risk (USEPA, 1997). The screening level SMDP will be one of the following or a combination of the following:

1. There is adequate information to conclude that the ecological risks are negligible and therefore no need for remediation on the basis of ecological risk;
2. The information is not adequate to make a decision at this point, and the ecological risk assessment process will continue; or
3. The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted (such as a Baseline Ecological Risk Assessment).

Current Site ecological risk information was not adequate to make a decision at this point, and the ecological risk assessment process continued to the next step. As discussed above, the COPCs are: 1) non-bioaccumulative and were detected above the benchmark or 2) are considered bioaccumulative and were detected. The North Pit soil exposure area (4.7 acres) was evaluated further using terrestrial receptors. The 2.2 acre north segment of the East Ditch was evaluated as a saltwater aquatic system.

14.2.3 Trophic-Level Analysis

The trophic-level analysis refines the exposure estimates and risk characterization. Trophic-level analysis assumptions are refined from conservative estimates of exposure and toxicological impacts (i.e., maximum concentrations compared to media-based screening values) to site-specific and receptor-specific estimates of exposures and trophic-based ecotoxicity screening values (USEPA, 2001). In the trophic-level analysis risks are calculated using a trophic model (Sample et.al., 1998a, 1998b) and exposure assumptions in an iterative process that determines the constituents, media and pathways that are of primary concern at the site. This iterative process includes:

- Preparation of conservative exposure assumptions, intake equations that account for total exposure, NOAEL and lowest observed adverse effects level (LOAEL) values;
- Utilize an ecological HQ methodology to compare exposures to the NOAELs to eliminate COPCs that pose no unacceptable risk (i.e., NOAEL hazard quotient less than or equal to 1); and
- Justify the use of refined assumptions (e.g., a larger home range) to adjust the exposure and repeat the HQ exercise in Required Element 6 eliminating COPCs that pose no unacceptable risk based on comparisons to the NOAELs and LOAELs.

Some of the COPCs retained for trophic-level analysis might pose negligible risk because of conservative assumptions used during the screening-level ecological effects evaluation and screening-level exposure assessment and risk calculation (USEPA, 1997). Site-specific assessment endpoints were refined and expanded for each feeding guild (and community where appropriate) within each trophic level of habitat specific food webs (USEPA, 1997).

The exposure assessment phase expands the problem formulation and defines quantitative inputs for the exposures. These inputs include:

- Representative wildlife receptors with accompanying exposure parameters such as body weight, ingestion rates, and portions of dietary exposure;
- Methods used to estimate the trophic exposure point concentrations for food web modeling (e.g., bio-uptake factors from soil to plants or soil to invertebrate); and
- Criteria used to determine toxicity reference values (TRVs) including application of uncertainty factors.

Wildlife receptor species known to be susceptible to food web exposures or are representative prey of organisms that are susceptible to food web exposures (USEPA, 1993) were selected for food web modeling. They reflect a range of trophic levels (e.g., large carnivorous mammal as compared to a small omnivorous mammal) and thus dietary exposure. Furthermore, dietary and toxicological information is available for these species, making them good candidate species for food web modeling (USEPA, 1993; Sample et al., 1996). As such, the selected species can be used as surrogates to represent the types of exposures and potential impacts that could occur to other wildlife at the Site. These animals are also commonly found near the Site:

- Terrestrial System
    - Herbivorous mammals – Eastern cottontail, Texas pocket gopher
    - Omnivorous mammal – White-footed mouse, nine-banded armadillo
    - Carnivorous mammal – Coyote
    - Herbivorous Bird – Mourning dove
    - Omnivorous Bird – American robin
    - Carnivorous Bird – Red-tailed hawk
    - Reptiles – Texas indigo snake, listed as a Texas threatened species.
- Aquatic System (East Ditch)
    - Omnivorous mammals – Raccoon
    - Carnivorous Bird – Snowy egret; the snowy egret is a surrogate for the wood stork, reddish egret and white-faced ibis – listed as Texas threatened species.

Mammal and bird TRVs were developed through a three-step process: 1) literature search; 2) selection of a TRV; and 3) adjustment of the selected TRV for the receptor. Each COPC has a TRV based on a LOAEL and on a NOAEL. The rationale for selection of a TRV for each ecological COPC was based on several key factors:

- Preference for chronic (i.e., long-term) studies, especially those that include critical life stages;
- Preference for the use of the ecological receptor as a test organism;
- Preference for the highest NOAEL that did not exceed the lowest LOAEL;
- Preference for food studies over gavage or oral intubation studies; and
- Preference for ecologically significant effects, such as survival, growth, and/or reproduction.

Toxicity data were chosen by weighing multiple factors including species used in study, life stage, chemical form of the contaminant, route of exposure, length of study, and other measured endpoints. The relevant information about the available toxicity studies was evaluated and assessed for a constituent when choosing the toxicity data to be used in the evaluation.

Typically, chronic exposures should be more protective, thus are more relevant. However, given the differences in species response, methods, observed effects, dispersal characteristics, and habitat use in the field, all potential toxicological endpoints and exposure periods were considered. The following guidelines were used to determine the exposure duration of the toxicity study:

- Chronic exposures are considered to be those equal to or greater than 10% of the life span of the test organism. An exception to this criterion is when exposure occurs during a sensitive life stage such as gestation.
- Sub-chronic exposures are considered to be those repetitive exposures less than 10% of the life span of the test organism, yet greater than 14 days for an ingestion study.
- Acute exposures are considered to be those of a single exposure or repetitive exposures up to 14 days or 10% of the life span of the test organism (USACHPPM, 2000).

14.2.4 Risk Characterization

Predictions of the likelihood for adverse effects, if any, for the food web modeling studies are based on HQs (USEPA, 1997). The HQs were calculated by dividing the estimated ingestion intakes by the reference toxicity values for each of the COPCs for each of the species.

NOAEL – HQ = Exposure Dose/NOAEL-TRV and
LOAEL – HQ = Exposure Dose/LOAEL-TRV

where:

- Exposure Dose = estimated constituent intake for the Site or area (mg COPC/kg body weight per day)
- NOAEL-TRV = toxicity reference dose based on a NOAEL (mg COPC/kg body weight per day)
- LOAEL-TRV = toxicity reference dose based on a LOAEL (mg COPC/kg body weight per day)

The HQ value of greater than a value of 1 was considered the threshold for indicating that adverse effects may occur. An HQ less than a value of 1 (to one significant figure) indicates that adverse impacts to wildlife are considered unlikely (USEPA, 1997).

14.2.5 Screening Analysis

HQs were calculated using NOAEL-based TRVs, assumptions of 100% bioavailability, and with no exposure modifying factors. Those COPCs with HQs less than 1 in the screening analysis were not carried forward to the refined analysis. Assessment using media specific screening levels was calculated for plants and invertebrates and for upper trophic level receptors (Efroymson etal., 1997a, 1997b):

- South Pit Soils – The following COPCs are retained for further evaluation: barium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, vanadium, zinc, 4,4'-DDT, beta-BHC, gamma-BHC and high molecular-weight PAHs;
- North Pit Soils – The following COPCs are retained for further evaluation: aldrin, barium, cadmium, chromium, copper, lead, nickel, mercury, selenium, zinc, cyanide, bis(2-ethylhexyl)phthalate, and high molecular-weight PAHs;
- East Ditch Riparian Soil (South) – The following COPCs are retained for further evaluation: barium, chromium, vanadium, and selenium;

- East Ditch Sediment (South) as Soil – The following COPCs are retained for further evaluation: barium, cadmium, chromium, copper, lead, manganese, mercury, selenium, vanadium, zinc, and beta-BHC;
- East Ditch Freshwater (South Segment) – Surface water criteria were evaluated in addition to calculations for plants and invertebrates and for upper trophic level receptors. The following COPCs are retained for further evaluation: barium, beryllium, chromium, copper, selenium, thallium, vanadium, zinc, dieldrin, gamma-BHC, heptachlor, 1-methylnaphthalene, 2,4-dimethylphenol, benzo(a)pyrene, phenanthrene, bis(2-ethylhexyl)phthalate, gamma-chlordane, and cyanide.
- East Ditch Marine (North Segment) – Surface water criteria were evaluated in addition to calculations for plants and invertebrates and for upper trophic-level receptors. All representative COPC concentrations are below their respective Tier 2 surface water criteria. The following COPCs are retained for further evaluation: barium, beryllium, lead, selenium, thallium, endosulfan sulfate, cyanide, bis(2-ethylhexyl)phthalate, and total PAHs.

14.2.6 Refined Analysis

TCEQ Required Element 7 requires that the exposure parameters remain consistent with the screening analysis (e.g., body weight, ingestion rates, and the exposure point concentration), but other site-specific and COPC-specific factors can be modified. These include the exposure modifying factor (depending on the species home range and Site size). The HQ is calculated with the same NOAEL used in the conservative analysis, but a LOAEL-based TRV is added. For this Site, the exposure point concentration is modified from the maximum detected concentration to the 95% UCL and the LOAEL is added as a TRV.

Terrestrial Habitat

Site terrestrial habitat is limited. Most of the Site consists of a mixture of commercial/industrial facilities, including associated parking lots, and maintained (mowed) grassy areas. Significant ecological habitat was not observed within the commercial/industrial facilities and their parking lots. The upper two feet of soils at the Site are generally comprised of a thin layer of topsoil (up to 6 inches) with a caliche (calcium carbonate with gravel, sand, clay, and silt binders) and gravel fill and underlying clayey silt.

The Site map (Figure 2) shows that approximately 40% of the North Pit and South Pit areas are covered by buildings or non-vegetative cover such as asphalt or caliche base. In addition, approximately 75% of the surface of Lot 6 contains equipment and other materials.

Various commercial/industrial buildings, including Robert’s Equipment, Adult Video, and warehouse buildings for former tire and fabricating shops, are located within the Site boundaries. Lot 7 (Adult Video) is within the city limits of the City of Corpus Christi. The remainder of the Site is located within the extra-territorial jurisdiction of the City of Corpus Christi. Land use within the Site is either zoned commercial (Adult Video) or light industrial (COCC, 2017). The Site is located within the Port of Corpus Christi Inner Harbor Port Related District (POCC, 2015) and Industrial District Number One (COCC, 2017) (Figure 3). In July 1990, The Goldston Corporation recorded an Industrial District Agreement with the City of Corpus Christi for 19.575 acres. According to the City of Corpus Christi geographic information system map viewer, future land use will be heavy industrial. Because of the soil type, commercial/industrial facilities, and mowing, as well as future land use considerations, the use of the North and South Pit areas as terrestrial habitat is limited.

TCEQ defines “disturbed ground” primarily as a location that is predominately urban or commercial/industrial in nature (and thus characterized by human presence and activities) where any habitat that may have once existed has been altered, impacted or reduced to such a degree that it is no longer conducive to use by ecological receptors (Section 3.3.3.2 in TCEQ, 2017a). The risk evaluation was completed for the South and North Pit soils, but the quality of the habitat is extremely limited.

Based on the limitations of the soil benchmarks for receptors with limited mobility or range, further evaluation of ecological risk to the plant and invertebrate community is not warranted. However, some COPC concentrations at locations within the South Pit and North Pit areas (Figure 17) exceed the community receptor benchmarks by an order of magnitude or more. These “hot spot” locations present a potential acute risk to community receptors, or depending on proximity to ditch, a potential transport pathway to sediments.

South Pit area COPCs for the plant and invertebrate community are chromium, vanadium, zinc, mercury, and beta-BHC. North Pit area COPCs for the plant and invertebrate community are barium, chromium, lead, selenium, vanadium, zinc and mercury. Chromium and vanadium are not considered final COPCs for community receptors. Beta-BHC is not considered a final community COPC because there was only one detection in the 22 samples analyzed from the 0 to 0.5 foot interval (less than 5%). Final COPCs for community receptors in the South Pit soils based on potential acute risk or potential transport to sediments are mercury and zinc. Final COPCs for community receptors based on potential acute toxicity or transport to sediments in the North Pit soils are barium, lead, mercury, selenium, and zinc.

The exposure area for the South Pit soils is 6.9 acres and the North Pit area soils is 4.7 acres. The areas are smaller than the home ranges for the red-tailed hawk, mourning dove, coyote, and armadillo. The home ranges for the American robin, white footed mouse, eastern cottontail and least shrew are not larger than the South Pit and North Pit exposure areas and therefore it is assumed that these receptors could be onsite 100% of the time. Final COPCs for the South Pit soils for wildlife are lead, zinc, and 4,4’-DDT. Final COPCs for the North Pit soils for wildlife are barium, cadmium, lead, selenium, and zinc.

East Ditch (South)

The south segment of the East Ditch was evaluated for exposure in the 0.49-acre riparian area and the 0.6 acre intermittent ditch. The designation of final COPCs is based on COPC concentrations outside the cap area. East Ditch riparian soils, sediment (evaluated as soil), and surface water (freshwater) were evaluated.

East Ditch (South) Riparian Soils: Barium, chromium, vanadium and selenium remain community (plant and invertebrate) COPCs in the East Ditch riparian soils. The maximum chromium detection of 5.86 mg/kg and the maximum vanadium concentration of 13.8 mg/kg are less than Site background. Further evaluation of ecological risk for barium and selenium to the plant or invertebrate community is not warranted based on the limitations of the soil benchmarks for receptors with limited mobility or range. The maximum barium concentration outside the cap area of 224 mg/kg (soil sample ESSS12) is less than the soil benchmark of 330 mg/kg. The maximum selenium concentration of 1.19 mg/kg (ESSS12) only slightly exceeds the Site background of 0.89 mg/kg. There are no final COPCs for riparian soil in the south segment of the East Ditch.

East Ditch (South) Sediment: In November-December 2017, a sediment cap was installed in the south segment of the East Ditch. In February 2020, the sediment cap was extended to the north, to the concrete portion of the S curve. The SLERA evaluated data from locations currently under the cap. Based on the cap extension in February 2020, all East Ditch sediment south of the S curve is under the sediment cap. All East Ditch (South) sediment COPCs are eliminated.

East Ditch (South) Surface Water: Only aluminum remains as a COPC for surface water. The concentrations in the south segment surface water range from 0.446 to 1.12 mg/L with a geometric mean of 0.60 mg/L. The geometric mean is less than the state water quality standard of 0.991 mg/L (30 TAC 307 Table 1). Aluminum is eliminated as a final COPC.

East Ditch (North)
The north segment of the East Ditch is approximately 0.22 acres and was evaluated for water column receptors, benthic invertebrates and upper trophic level receptors. The north segment of the east ditch is a perennial marine ecosystem and runs from the mid-point of the East Ditch S curve to Up River Road, north of the Site property.

East Ditch (North) Surface Water: Numerous organochlorine pesticides were detected, and some at concentrations greater than the water column receptor screening values (4,4'-DDT, alpha-chlordane, beta-BHC, endrin aldehyde, heptachlor, heptachlor epoxide, and methoxychlor). Aluminum, cobalt and manganese are detected at concentrations that also exceed the chronic criteria. While these COPCs are retained as COPCs for risk to water column receptors, they were detected at concentrations greater than screening-levels or detected and considered bioaccumulative in upstream, offsite surface water and were eliminated in the Uncertainty Analysis.

East Ditch (North) Sediment: While beryllium, thallium, endosulfan sulfate, and cyanide were retained for sediment benthic macroinvertebrates because they do not have benthic screening levels, COPCs lacking benthic screening values were eliminated in the Uncertainty Analysis. These COPCs were not retained as final COPCs. Barium, heptachlor, and PAHs are retained because their exposure point concentration exceeds the benthic PCL. Heptachlor was detected in two of the 22 samples collected in the north segment of the East Ditch. Based on the low frequency of detection, heptachlor was not designated as a final COPC.

The total PAH exposure point concentration of 18 mg/kg is less than the benthic PCL of 24.4 mg/kg. While PAH concentrations periodically exceeded the benthic PCL, these exceedances may have been caused by urban and roadway runoff to the sample locations adjacent to Up River Road. The Up River Road drainage ditch conveys storm water to the East Ditch culvert from both directions (east and west) which includes Southern Minerals Road west to the East Ditch culvert and from 300 feet east of Goldston Road east to the East Ditch culvert (NCDPW, 2007). Mean PAH concentrations in surface water particulates from runoff in unsealed and asphalt or coal-tar sealed parking lots ranged from 54 to 3,600 mg/kg (Mahler, et. al., 2005). Based on this information, PAHs were eliminated as final COPCs for benthic invertebrates in the north segment of the East Ditch.

14.2.7 Uncertainty Analysis

The characterization of uncertainty is a component of the ecological risk assessment process (USEPA, 1997). This SLERA was prepared in a manner in accordance with EPA and TCEQ guidance. The approach used in the SLERA develops protective (conservative) estimates of exposure, which likely

indicate a potential for hazard that is greater than what would actually be encountered by organisms that might utilize the Site.

Uncertainties introduced in the SLERA may include:

- Constituents are included in the risk assessment that are not related to the Site;
- Risk is most likely overestimated in the exposure assessment because the selected exposure point concentrations are either the maximum detected or the 95% UCL concentrations;
- Concentrations of metals and PAHs in soil at the ecological exposure areas could have been contributed by other sources;
- Background and upstream samples not representative of anthropogenic offsite sources;
- COPC toxicity to birds and mammals selected to represent wildlife species that may forage at the Site may not be representative of represent toxicity potential to reptiles and amphibians;
- Dermal exposure pathways for wildlife are typically not characterized;
- Receptor home range from literature is not representative to what occurs in the field;
- Ecological value of the Site;
- Literature values were not available to evaluate the toxicity of COPCs for all receptor species, especially the VOCs;
- Toxicity data were not available for some constituents. Unavailable or limited toxicity data could cause underestimation of risk;
- Prediction of ecosystem effects from laboratory studies is difficult. Laboratory studies cannot take into account the effects of environmental factors that may add to the effects of chemical stress;
- Simultaneous exposure to multiple constituents;
- TRVs were selected from studies using single-constituent exposure scenarios;
- Bioavailability is most likely overestimated (all of the COPCs was assumed to be 100%);

The risk characterization process incorporates uncertainties that may overestimate risk, especially at the screening level. Risk estimation utilizes the results of the exposure assessment and effects assessment to generate ecological HQ values. The exceedance of a screening level or HQ of 1 does not necessarily mean that there is a threat to the referenced receptor. It means only that the potential for adverse effects may exist, but the likelihood of overestimating or underestimating risk may be further explored to gain a better understanding of the confidence placed in the assumptions (exposure and effects) used to calculate risk.

A full Baseline Ecological Risk Assessment is not warranted for this Site for the following reasons:

- The waste material is subsurface (> 3-feet bgs) and is not contributing to ecological risk in the surface soils over the South Pit.
- The COPCs detected in the riparian soil samples do not indicate that COPCs associated with the waste material are migrating to the East Ditch.
- Exposure to subsurface soil (> 0.5 and < 2 feet bgs) is unlikely because of the nature of the soils in the area.

However, “hot spot” COPC concentrations adjacent to the East Ditch area of the Site exceed the community receptor benchmarks by an order of magnitude or more. These locations present a potential

acute risk to community receptors, or depending on proximity to ditch, a transport pathway to sediments. The SLERA recommended evaluation of these "hot spot" COPC concentrations be performed in the FS. The final SLERA terrestrial COPCs are included in the following table:

Final Terrestrial COPCs

South Pit Terrestrial Soil		North Pit Terrestrial Soil	
Community	**Wildlife**	**Community**	**Wildlife**
Mercury	Lead	Barium	Barium
Zinc	Zinc	Lead	Cadmium
---	4,4'-DDT	Mercury	Lead
---	---	Selenium	Selenium
---	---	Zinc	Zinc

14.3 Basis for Remedial Action

The response action selected in this ROD is necessary to protect the public health or welfare and the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment.

Human Health – Basis for Remedial Action

Human health COCs were determined based on the risk characterization step. The BHHRA identified unacceptable risk in the exposure areas listed below:

- LNAPL, waste materials, and subsurface soil in the South Pit Exposure Area: COC concentrations in LNAPL, waste materials and subsurface soil source materials pose a risk to the commercial/industrial receptor.
- Groundwater in the UTU in the South Pit Exposure Area: Because construction work is assumed to take place to a depth of 10 feet bgs at the Site, a construction worker is assumed to be exposed to groundwater in the UTU while working in a trench/excavation. The maximum detected concentration for arsenic, benzene, and 3&4-methylphenol in the South Pit Exposure Area exceeds the non-cancer HI of 1 (HI = 28) through incidental ingestion and dermal contact.
- Groundwater in the STU in the South Pit Exposure Area: Arsenic and benzene contributes to the overall cancer risk and non-cancer hazard for the current and future outdoor worker in the STU via ingestion.
- Soil gas (vapor) future exposure in the South Pit Exposure Area: The near-source soil gas sampling results for SG-13, SG-22, and SG-33 indicate vapor intrusion could be a concern for new construction (potential future exposure scenarios) in the South Pit Exposure Area.
- Groundwater in the UTU in the Offsite Exposure Area: The estimated RME non-cancer hazard (HI =1.9) for benzene in the UTU exceeds the EPA's non-cancer HI of 1 for the construction worker primarily via ingestion and dermal contact.
- Groundwater in the STU in the Offsite Exposure Area: Arsenic is the primary contaminant that contributes to the overall cancer risk and non-cancer hazard for the current and future outdoor worker in the STU via ingestion.

Areas of the Site within acceptable human health risk ranges include:

- South Pit Exposure Area
  - The estimated RME cancer risk for the current and future onsite construction worker (CR=6.9E-05) is within the EPA's acceptable cancer risk management range (1E-04 to 1E-06) for all applicable exposure media, pathways, and routes.
  - The estimated RME cancer risk and non-cancer hazard for the current and future outdoor worker (CR=1.1E-04 and HI =1.3) slightly exceed the upper bound of the EPA's acceptable cancer risk management range (1E-04 to 1E-06) and non-cancer HI of 1, considering all applicable exposure media, pathways, and routes. However, no medium-specific exposure route total exceeded the EPA cancer risk management range and no organ-specific HIs exceed 1. Hence, the "all media and pathways" HI (1.3) for the onsite outdoor worker is acceptable because the non-cancer health effects do not affect the same target organs.
  - The estimated RME cancer risks and non-cancer hazards for the current and future onsite indoor worker (HI=0.92), current and future onsite maintenance worker (CR=4.5E-07 and HI=0.01), and onsite adolescent trespasser (CR=5.8E-06 and HI=0.13) are within or less than the EPA acceptable cancer risk management range (1E-04 to 1E-06) and noncancer HI of 1.

- North Pit Exposure Area – The estimated RME cancer risks and non-cancer hazards for the current and future onsite outdoor worker (CR=2.7E-06 and HI=0.086), onsite construction worker (CR=1.3E-07 and HI=0.041), onsite maintenance worker (CR=3.8E-07 and HI=0.0081), and onsite adolescent trespasser (CR=5.0E-06 and HI=0.11) are within or less than the EPA's acceptable cancer risk management range (1E-04 to 1E-06) and non-cancer HI of 1 for all applicable exposure media, pathways, and routes combined.

- Lot 8B Exposure Area – The estimated RME cancer risks and non-cancer hazards for the current and future onsite outdoor worker (CR=3.9E-06 and HI=0.14), onsite construction worker (CR=2.9E-07 and HI=0.095), onsite maintenance worker (CR=3.8E-07 and HI=0.011), and onsite adolescent trespasser (CR=5.0E-06 and HI=0.16) are within or less than the EPA's acceptable cancer risk management range (1E-04 to 1E-06) and non-cancer HI of 1 for all applicable exposure media, pathways, and routes combined.

Ecological Risk – Basis for Remedial Action
Ecological exposure is extremely limited because of the lower quality of the ecological habitat. Limited quality habitat does exist adjacent to and within the East Ditch.

As indicated in the RI Investigation section, transmissive pathways were observed in January 2017 in a portion of the ditch adjacent to the South Pit which provided intermittent transport for LNAPL and dissolved phase constituents through overlying clays as hydrocarbon seeps into East Ditch surface water. In November and December 2017, a sediment cap was installed in the south segment of the East Ditch as a response action to reduce surface water and sediment impacts. The cap was extended in February 2020 to address additional transmissive pathways identified after installation of the cap in 2017. The sediment cap serves to protect the ecological receptor from LNAPL and dissolved phase constituents within the East Ditch.

Concentrations of Site COPCs at some terrestrial soil locations within the North and South Pit soil areas exceed their ecological screening level with a HQ of 10 or greater. These "hot spot" surface and shallow

subsurface locations present a potential acute risk to ecological receptors, or depending on proximity to the East Ditch, a potential transport pathway to sediments. Risk management decisions were made to address shallow soils with metals (lead, mercury, selenium, and zinc) with concentrations an order of magnitude or more above the ecological screening level in the limited quality habitat areas adjacent to the East Ditch in the North Pit area (NRCS, 2018).

Ecological risk from South Pit terrestrial soils will be addressed with the remedial action intended for protection of the construction worker receptor. No additional action is needed in the South Pit area for protection of the ecological receptor. Barium associated with North Pit terrestrial soils was not retained for further evaluation. Locations with barium exceeding screening levels were not located in the same location as lead, mercury, selenium, and zinc. Locations with barium exceeding screening levels were located on or adjacent to non-habitat areas on the east side of the East Ditch.

15.0 REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) consist of medium-specific or location-specific goals for protecting human health and the environment. This section presents the RAOs for soil, waste pond sediment, waste pond surface water, ground water and LNAPLs, and other media at the Site. It outlines the risks identified in Section 14 and provides the basis for evaluating the cleanup options presented in Section 16. The RAOs also serve to facilitate the five-year review determination of protectiveness of human health and the environment.

15.1 Remedial Action Objectives for the Site

The RAOs summarized below provide medium-specific goals for protecting human health and the environment at the Site.

The RAOs for LNAPL and waste materials in the South Pit are to:

- Reduce the migration of LNAPL source material to Site soil, sediment, and surface water.
- Reduce migration of source waste material COCs to UTU groundwater in concentrations exceeding risk-based criteria* of 0.5 mg/L benzene and 37 mg/L 3&4-methylphenol.
- Reduce the potential for future migration of source waste material COCs (benzene and 3&4-methylphenol) through UTU groundwater to sediment and surface water.
- Protect current and future commercial/industrial receptors from inhalation of COCs (benzene, ethylbenzene, and TPH C5-C8) emanating from waste materials and migrating to indoor air in concentrations that exceed risk-based criteria.

The RAOs for soil are to:

- Limit the migration of COCs (benzene) from the South Pit source subsurface soil to UTU groundwater in concentrations exceeding the risk-based criteria* of 0.5 mg/L benzene.
- Reduce the risk to benthic invertebrate receptors in sediments from potential future overland transport of surface soils located in accessible ecological habitat areas adjacent to the East Ditch containing lead, mercury, selenium, and zinc concentrations that have the potential for acute toxicity.

* Based on TRRP commercial/industrial Tier I Class 3 groundwater PCLs criteria providing risk-based endpoint concentrations.

- Reduce risk to plant and terrestrial invertebrate receptors through direct contact with and incidental ingestion of surface soil in ecological habitat areas adjacent to the East Ditch containing lead, mercury, selenium, and zinc concentrations that have the potential for acute toxicity.

The RAOs for groundwater (South Pit and offsite) are to:

- Protect current and future commercial/industrial receptors from direct contact with and incidental ingestion of COCs in the offsite UTU groundwater with concentrations exceeding the risk-based criteria* of 0.5 mg/L benzene.
- Protect current and future commercial/industrial receptors from direct contact with and incidental ingestion of COCs in the Site UTU groundwater with concentrations exceeding the risk-based criteria* of 0.5 mg/L benzene, 1.0 mg/L arsenic, and 37 mg/L 3&4-methylphenol.
- Limit the migration of UTU groundwater with COCs (benzene) in concentrations exceeding the risk-based criteria* of 0.5 mg/L benzene beyond the Site boundaries.
- Protect current and future commercial/industrial receptors from direct contact with and incidental ingestion of COCs (benzene and arsenic) in STU groundwater with concentrations exceeding the federal Safe Drinking Water Act MCLs.
- Restore the STU groundwater with Site COCs (benzene and arsenic) concentrations exceeding the federal Safe Drinking Water Act MCLs.

15.2 Basis and Rationale for Remedial Action Objectives

The basis for the RAOs for LNAPL, waste materials, and subsurface soil in the South Pit Exposure Area is the current and future commercial/industrial use of the Site. As described in Section 12.9, the UTU is classified as a Class 3 groundwater resource based on TDS concentrations (USEPA, 1988). Construction work is assumed to take place to a depth of 10 feet bgs at the Site; a construction worker (and potentially the outdoor worker) is assumed to be exposed to groundwater in the UTU while working in a trench/excavation. Addressing the source materials (LNAPL, waste materials, subsurface soil), and UTU groundwater in the South Pit Exposure Area will be protective of the construction worker receptor. Additionally, addressing the LNAPL keeps it from continuing to act as a source of contamination for soil and groundwater.

The basis for RAOs for groundwater is to ensure that current and future receptors are not exposed to contaminated groundwater in the UTU. As described in Section 14.1.2, since construction work is assumed to occur to a depth of 10 feet bgs, incidental ingestion, dermal contact, and inhalation of volatile COPCs and particulates are considered complete exposure routes for subsurface waste to a depth of 10 feet bgs. Because there is potential unacceptable risk to current and future commercial/industrial receptors from exposure to groundwater during construction, EPA developed remedial alternatives to mitigate potential unacceptable risk from groundwater exposure. Achieving the TRRP commercial/industrial Tier 1 PCL criteria in the UTU provides risk-based endpoint concentration PRGs for each exposure route to provide protection for the construction worker.

EPA developed PRGs for the STU groundwater based on federal Safe Drinking Water Act MCLs but did not base these PRGs on actual or potential use of this groundwater. Achieving the MCLs provides

* Based on TRRP commercial/industrial Tier I Class 3 groundwater PCLs criteria providing risk-based endpoint concentrations.

endpoint concentrations, PRGs, for each exposure route that provide protection for the construction worker and the outdoor worker. Drinking water at the Site and adjacent properties is supplied by the City of Corpus Christi. Groundwater flows from the Site in a northeasterly direction under the Buckeye facility and then north toward the Tule Lake Turning Basin.

Near-source soil gas sampling indicates vapor intrusion could be a concern for new construction (potential future exposure scenarios) in the South Pit Exposure Area. Protection of current and future commercial/industrial receptors from inhalation would be achieved by meeting the RAO for indoor air exposure.

EPA did not develop RAOs for the protection of human health from COCs in surface (South Pit and North Pit areas) and subsurface soils (North Pit area), because the BHHRA determined that these media do not present a potential unacceptable risk.

The basis for the RAOs for surface soil is for the protection of the ecological receptors in ecological habitat areas adjacent to the East Ditch containing metals that have the potential for acute toxicity. Addressing these soils provides protection of onsite ecological receptors and reduces the potential for overland transport of these metals. Surface soil remediation volume estimates were estimated from the North Pit “hot spot” areas shown in Figure 17 and an excavation depth of 18 inches. The volume of surface soil to be addressed is estimated at 1,250 cy.

15.3 Risks Addressed by the Remedial Action Objectives

The risks addressed through remedial action of South Pit Exposure Area include:

- Reduction of risk from ingestion, inhalation, and dermal contact to the construction worker exposed to groundwater in a trench;
- Reduction of risk from inhalation of vapors; groundwater ingestion; subsurface soil ingestion, inhalation, and dermal contact; and waste materials inhalation to the outdoor worker working in an excavation.
- Addressing the LNAPL, waste materials, and subsurface soil reduces continued migration of contaminants to UTU groundwater.
- Reduction of risk from the inhalation of vapors from soil or groundwater to the indoor worker (future potential exposure).

The risks addressed through remedial action of the STU include:

- Reduction of risk to the outdoor worker from ingestion of STU groundwater.

To determine if the RAOs for soil (protective of the ecological receptors) would reduce potential risk of terrestrial COCs with a hazard quotient exceeding 10, the 95% upper confidence limits on the mean were compared pre- and post-remedial action. After remediation of the accessible ecological habitat areas adjacent to the East Ditch exhibiting lead, mercury, selenium, and zinc concentrations that have the potential for acute toxicity, an 84% sitewide reduction in mercury risk was estimated. Maintaining the East Ditch sediment cap prevents or reduces the migration of LNAPL to Site soil, sediment, and surface water, protecting the East Ditch and downstream ecological receptors.

16.0 DESCRIPTION OF ALTERNATIVES

To facilitate the selection of remedial alternatives that meet the RAOs, the Site was divided into remedial units. The remedial units were selected based upon the media, the types of contaminants, and exposure scenario. The waste sources are sludge, reworked soil/waste, and LNAPL in the South Pit area. The environmental media are surface and subsurface soil, sediment, surface water, and groundwater. Types of contaminants are metals, VOCs, and semivolatile organic compounds (SVOCs). The exposure scenarios include human exposure to sludge, reworked soil/waste materials, LNAPL, subsurface soil, and groundwater and ecological exposure to surface soils. The groundwater remedial unit includes both the UTU and STU.

16.1 Description of Remedy Components

In addition to a site-wide "no action" alternative, general response actions, those actions that would satisfy the RAOs for each medium of concern, were evaluated for the Site. General response actions include both containment and treatment. Containment physically controls the media without a reduction in volume but is protective of human health and the environment by preventing potential exposure or by reducing the mobility of the contaminants. Treatment alternatives can range from those that address wastes only, with the management of treated residuals and untreated wastes through containment, to those that eliminate or minimize the need for long-term risk management at a Site.

General response actions were developed for LNAPL, sludge, reworked soil/waste, and COCs in subsurface soils (South Pit only), future vapor intrusion (South Pit only), and groundwater as media estimated in the BHHRA to present a risk to human health. In addition, general response actions were developed for COCs in surface soils estimated in the SLERA to present a potential acute risk to plant and terrestrial invertebrate receptors or the potential for overland transport of surface soil from ecological habitats adjacent to the East Ditch. The following table provides a summary of remedial alternatives:

Summary of Remedial Alternatives	
Alternative Designation	**Description**
Alternative 1	No Action
Alternative 2	LNAPL Source Control, MNA, and Groundwater Monitoring
Alternative 3	South Pit Subsurface Barrier Wall and Cap
Alternative 4	South Pit Solidification and Cap
Alternative 5	South Pit Excavation and Offsite Disposal

Common Elements

The remedial alternatives include common components/elements. Other than "No Action," the components listed below are assumed common to Alternatives 2 to 5:

- Pre-construction activities including bench and pilot-scale tests as needed to finalize the remedial designs, preparation of submittals, and construction of project facilities and utilities;
- General improvements such as Site restoration (grading, fill soil, vegetation);
- Air monitoring programs for public protection and remediation worker safety;

- Surface soil removal in a limited portion of the North Pit area for protection of the ecological receptor;
- LNAPL recovery with transition to a MNA remedy (this is further described as Alternative 2);
- Groundwater monitoring including development of a groundwater monitoring plan, installation of a permanent monitoring system, and monitoring for COCs and MNA parameters;
- Operation and maintenance (O&M) of the East Ditch sediment cap constructed in November/December 2017 (BCP, 2018) and extended in February 2020; and
- Institutional controls, land management practices for property owners, and the Institutional Control Implementation and Assurance Plan (ICIAP).

All alternatives (except the "No Action" alternative) incorporate the O&M activities for the East Ditch sediment cap (BCP, 2018a). This sediment cap was constructed in November and December 2017 and extended in February 2020 and is anticipated to remain in place at the Site. Alternatives 2 through 5 include the excavation and offsite disposal of approximately 0.5-acres (1,250 cy) of surface soil (approximately 18 inches deep) in the North Pit area adjacent to the East Ditch (Figure 17).

Additional details about three of the "Common Element" components are discussed below.

Operation and maintenance (O&M) of the East Ditch sediment cap
Estimated Capital Cost – $20,000
Estimated Annual O&M Cost – $37,300
Estimated Present Worth Cost – $490,000
Maintaining the East Ditch sediment cap reduces the migration of LNAPL to Site soil, sediment, and surface water, protecting the East Ditch and downstream ecological receptors.

O&M costs for Alternatives 2 through 5 include inspections, repairs, and reporting for the East Ditch sediment cap. With the budgeted routine inspections and proper maintenance, the longevity of the sediment cap can be expected to last, at a minimum, through the remedial action and the 30 year O&M period. The East Ditch sediment cap was installed as a response action to address hydrocarbon contamination that had the imminent potential to impact sensitive offsite areas. O&M of the sediment cap would not be continued under the Alternative 1 – No Action alternative.

Institutional Controls
Estimated Capital Cost – $132,000
Estimated Annual O&M Cost – $13,600
Estimated Present Worth Cost – $631,000
Institutional controls (ICs) are non-engineered instruments, such as legal and/or administrative controls, that help minimize the potential for exposure to contaminants and/or protect the integrity of a response action by limiting land or resource use. ICs also provide information and notification to interested persons and communities about any residual contamination left at a site and any restrictions as a result of the remaining contamination. ICs typically may also be used in conjunction with engineered controls or measures, such as fencing or locked gates (USEPA, 2005b; USEPA, 2012g). ICs prohibiting groundwater usage in the UTU and STU would be placed on the Site and any impacted offsite properties. An IC requiring commercial/industrial land usage would be placed on the onsite properties. The implementation of the ICs is subject to the approval of the property owners. The requirements for filing land use restrictions in the State of Texas are specified in Title 30, TAC, Chapter 350, Subchapter

F. A restrictive covenant, or deed notice, is an instrument filed in the real property records of the county where the affected property is located.

IC O&M consists of the preparation of an institutional control implementation and assurance plan (ICIAP) which will describe periodic surveys to verify that the controls remain in place and assess whether the controls are functioning to achieve the stated objectives (USEPA, 2005b; USEPA, 2012g). The ICIAP will include requirements, monitoring of commercial/industrial land usage and groundwater usage. Although there is no current unacceptable risk, the vapor intrusion pathway will be addressed through institutional controls that will require an evaluation of risk prior to future building construction in the South Pit area (USEPA, 2012e).

Surface Soil Excavation – North Pit Area
Estimated Capital Cost – $504,000
Estimated Annual O&M Cost – $0
Estimated Present Worth Cost – $504,000
Discount Rate – 7%
Estimated Construction Timeframe – 2 months
Estimated Time to Achieve RAOs – 2 months
Approximately 1,250 cy of soil would be excavated to a depth of 18 inches bgs, containerized, and transported to a regulated offsite disposal facility. The second element listed above describes general improvements, such as Site restoration (grading, fill soil, vegetation). This excavated area would be graded for drainage and backfilled with clean soil and revegetated.

Alternative 1 – No Action
Estimated Capital Cost – $0
Estimated Annual O&M Cost – $0
Estimated Present Worth Cost – $0
Estimated Construction Timeframe – Not applicable
Estimated Time to Achieve RAOs – Not applicable

As required by the NCP, 40 CFR § 300.430(e)(6), the alternatives evaluations must include a No Action Alternative. This alternative is used as the baseline alternative against which the effectiveness of all other remedial alternatives are evaluated. Under this alternative, EPA would take no action at the Site to prevent exposure to the soil and groundwater contamination, including no O&M of the sediment cap. Neither RAOs nor applicable or relevant and appropriate requirements (ARARs) would be met with the no action alternative. The magnitude of risks at the Site is likely to remain the same since contaminated media that pose a risk to human health would remain on the Site.

Alternative 2 – LNAPL Source Control, MNA, and Groundwater Monitoring
This alternative includes the following components:

- LNAPL recovery;
- Groundwater monitoring with a MNA remedy;
- Surface soil removal (North Pit);
- East Ditch sediment cap O&M; and
- Institutional controls.

Estimated Capital Cost – $1,192,000
Estimated Annual O&M Cost – $91,600
Estimated Present Worth Cost – $2,930,000
Discount Rate – 7%
Estimated Construction Timeframe – 2 months
Estimated Time to Achieve RAOs – 30 years

Readily recoverable LNAPL would be removed as a source control measure onsite. Alternative 2 is a component of Alternatives 3, 4, and 5. LNAPL recovery is included in Alternatives 3 and 4 as a pre-treatment to reduce the volume of liquids in the waste materials in order to enhance the effectiveness of the barrier wall installation (Alternative 3) and reduce the mass of reagents to enhance the effectiveness of in-situ solidification (Alternative 4). An LNAPL investigation would be conducted to identify prospective locations of LNAPL recovery wells. The area of the groundwater plume was estimated from the boundaries of the solid blue line (benzene/LNAPL groundwater plume) shown on Figure 17 as approximately 5.1 acres. The area with LNAPL covers approximately 3.1 acres. Recovery wells would be installed, and LNAPL would be removed periodically using manual recovery methods such as bailers, vacuum trucks or skimmer pumps. The manual recovery method used would be evaluated for each recovery well and the most effective method selected.

LNAPL recovery from the sludge and/or reworked soil/waste mixture would be implemented until overall recovery of LNAPL has declined by approximately 50% as indicated by a decline curve. Cost estimates include LNAPL disposal. An LNAPL recovery plan would be developed which would describe the criteria for transition to an MNA remedy. In this alternative, waste materials would remain onsite untreated.

This alternative would also include the use of MNA to address contamination. As part of MNA, EPA would rely on natural processes to decrease or “attenuate” concentrations of contaminants in soil and groundwater, and conditions would be monitored to make sure natural attenuation is working. Specifically, groundwater samples would be collected and analyzed for the presence of contaminants and other Site characteristics.

Following completion of the remedial action, a groundwater monitoring program would be implemented. The groundwater monitoring program would be used to demonstrate groundwater plume stability, to assess exposure to COC concentrations in the UTU exceeding TCEQ Class 3 groundwater PCLs ($^{GW}GW_{Class3}$), and to assess exposure to COC concentrations in the STU over MCLs. This component would include the development of a groundwater monitoring plan and the installation of permanent groundwater monitoring wells. Periodic monitoring would be performed to demonstrate compliance with the groundwater RAOs of limiting COC migration beyond the Site boundaries at concentrations exceeding the $^{GW}GW_{Class3}$ groundwater PCLs (in the UTU) or MCLs (in the STU). Groundwater monitoring would also evaluate the stability of the onsite dissolved phase and LNAPL plumes as well as impacts from the identified off-site and upgradient groundwater plume.

As indicated in the general description of the Site, there is affected groundwater containing benzene and other volatile aromatic hydrocarbons upgradient of the Site on the adjacent western property. Permanent monitoring wells installed on the western side of the Site could be used to characterize offsite groundwater impacts and potential risk as well as evaluate plume stability. Additional monitoring wells

may be needed for upgradient delineation of offsite groundwater impacts along the western boundary of the Site.

Alternative 3 – South Pit Subsurface Barrier Wall and Cap
This alternative consists of the following components:

- LNAPL recovery prior to implementation of barrier wall and cap;
- Groundwater monitoring with MNA remedy;
- Surface soil removal (North Pit);
- East Ditch sediment cap O&M;
- Institutional controls;
- Subsurface barrier wall (South Pit); and
- Multi-component cap (South Pit).

In this containment alternative, waste materials would remain onsite untreated, but would be contained by a subsurface barrier wall and a multi-component cap. Wastes adjacent to and under the Site buildings and beneath and east of the pipeline corridor, to the extent present, would not be capped. In this alternative, approximately 15,000 cy of sludge and 53,000 cy of sludge and reworked soil/waste would be contained by a subsurface barrier wall. The approximately 37,000 cy of soil overburden would be incorporated into a multicomponent cap.

Subsurface barrier walls are used to reduce mobility by isolating the waste or groundwater within an enclosing barrier formed by a vertical trench excavated into an underlying low permeability stratum and filled with slurry material. Materials used in the construction of slurry walls include soil-bentonite, cement-bentonite, plastic concrete, and cement. The most widely used construction material for environmental remediation projects is the soil-bentonite mixture. Materials appropriate for the setting and contaminants inform the slurry wall construction. The soil/bentonite/water mixture is engineered to create a low permeability cutoff wall (1E-07 centimeters/second (cm/sec) to 1E-08 cm/sec).

LNAPL recovery is included in Alternative 3 as a pre-treatment to reduce the volume of liquids in the waste materials in order to enhance the effectiveness of the barrier wall installation. LNAPL recovery from the sludge and/or reworked soil/waste mixture would be discontinued when the overall recovery has declined by approximately 50% as indicated by a decline curve or after six months of recovery.

Annual groundwater monitoring would be conducted to detect movement of contaminants leaching from the capped area. Annual Site inspections would be conducted to evaluate the condition of the ICs, fencing and signs, and to verify the cap integrity. Signs would be posted at the property boundary to provide notification of the capped areas, the presence of contaminants, and to warn against intrusive activities.

Typical single component caps can be constructed from vegetated topsoil, asphalt, concrete, clay, or clay with synthetic liner (FRTR, 2014b). The multicomponent cap relies on compaction and multiple layers to reduce permeability and grading to minimize infiltration and maximize surface water drainage.

Two subsurface barrier wall configurations were evaluated: a “wing” wall installed west of the pipeline corridor (Alternative 3A) or a “360” wall that encircles the South Pit within the pipeline corridor (Alternative 3B).

Alternative 3A – "Wing" Wall barrier wall
Estimated Capital Cost – $9,890,000
Estimated Annual O&M Cost – $99,700
Estimated Present Worth Cost – $11,850,000
Discount Rate – 7%
Estimated Construction Timeframe – 8 months
Estimated Time to Achieve RAOs – 30 years
The "wing" wall would have approximately 45º extensions ("wings") to minimize flow around the ends of the wall to prevent LNAPL and contaminated groundwater from moving downgradient.

Alternative 3B – "360" Wall barrier wall
Estimated Capital Cost – $10,650,000
Estimated Annual O&M Cost (Years 2-5) – $100,200
Estimated Present Worth Cost – $12,610,000
Discount Rate – 7%
Estimated Construction Timeframe – 9 months
Estimated Time to Achieve RAOs – 30 years
A "360" barrier wall installed around the South Pit would prevent or reduce downgradient migration of contaminated groundwater. In addition, the "360" wall would prevent contaminated groundwater from a potential upgradient offsite source from migrating onto the Site and comingling with the affected Site groundwater.

Alternative 4 – South Pit Solidification and Cap
This alternative consists of the following components:

- LNAPL recovery prior to implementation of solidification and cap;
- Groundwater monitoring with MNA remedy;
- Surface soil removal (North Pit);
- East Ditch sediment cap O&M;
- Institutional controls;
- In-situ solidification of sludge and/or reworked soil/waste (South Pit); and
- Single or multi-component cap (South Pit).

In this treatment alternative, some or all of the waste materials would be solidified in-situ. In-situ solidification uses mechanical equipment such as augers or buckets to add/mix binders to the waste leaving the resultant solidified material in place. Wastes adjacent to and under the Site buildings and beneath and east of pipeline corridor, to the extent it exists, would not be solidified or capped. In this alternative, some or all of the approximately 15,000 cy of sludge and the approximately 53,000 cy of sludge and reworked soil/waste would be solidified in situ. The approximately 37,000 cy of soil overburden would be incorporated into a single component or multicomponent cap.

LNAPL recovery is included in Alternative 4 as a pre-treatment to reduce the volume of liquids in the waste materials in order to enhance the effectiveness of solidification and reduce the mass of reagents. LNAPL recovery from the sludge and/or reworked soil/waste mixture would be discontinued when the overall recovery has declined by approximately 50% as indicated by a decline curve or after six months of recovery. LNAPL which may interfere with the solidification process would be removed to the extent

practicable prior to solidification. LNAPL within the soil porosity that is not readily recoverable would be solidified.

Solidification refers to a physical process where a semi-solid material or sludge is transformed to a solid, low-hydraulic conductivity material (USEPA, 2012d). The technology is generally implemented by mixing a pozzolanic reagent, such as organophilic clay, Portland cement, cement kiln dusts, Class C (calcareous) or Class F (siliceous) fly ash, lime, or bentonite into contaminated material. Reagents that enhance surface adsorption (organophilic clay, thermoplastics, or other synthetic polymers) can be used to improve the efficiency of the solidification process for organic compounds (ITRC, 2011).

Preferred reagents for treating organic wastes are Portland cement, circulating fluidized bed (CFB) ash, Class C fly ash, and quicklime. CFB ash is prepared from 100% petroleum coke as the fuel and limestone as a scrubber, which calcines the limestone into lime. This results in about 60% CaO and less than 10% pozzolans (SiO2, Al2O3, and Fe2O3). A Class C coal (fly) ash is approximately 24% CaO and 50 to 70% pozzolans (Smith, 2017). Treatability Study results for the solidification technology evaluation for the Site waste materials is described in Section 12.5.

An isolation trench would be installed prior to mixing to identify utilities within the solidification area. Two basic approaches are utilized for in-situ mixing the reagent with the sludge or soils: vertical auger mixing or in-place mixing with a bucket. Due to the depth of waste materials, bucket mixing would occur in confined cells and would be implemented by solidifying the top half of the waste materials, staging the solidified materials, solidifying the bottom half of the waste, and replacing the staged solidified waste in the cell. Augers incorporate the reagents in-situ, and other than cuttings which may migrate to the soil surface, vapor emissions should be less than bucket mixing. If the auger cannot dislodge the larger debris or has refusal at the deeper intervals, the material can be excavated. At deeper depths, debris can be isolated or encapsulated by solidified material.

As described under Alternative 3, typical single component caps can be constructed from vegetated topsoil, asphalt, concrete, clay, or clay with synthetic liner (FRTR, 2014b). The multicomponent cap relies on compaction and multiple layers to reduce permeability and grading to minimize infiltration and maximize surface water drainage.

Four options for this alternative were evaluated: solidification with a multi-component cap (Alternative 4A), solidification with a single component cap (Alternative 4B), targeted solidification with a multi-component cap (Alternative 4C), and targeted solidification with a single-component cap (Alternative 4D)

<u>Alternative 4A – Solidification with a Multi-Component Cap</u>
Estimated Capital Cost – $15,350,000
Estimated Annual O&M Cost – $71,800
Estimated Present Worth Cost – $16,620,000
Discount Rate – 7%
Estimated Construction Timeframe – 10 months
Estimated Time to Achieve RAOs – 30 years
Alternative 4A would include the in-situ solidification of the South Pit waste materials as denoted by the inferred pit boundary Figure 17) followed by construction of a multi-component cap.

Alternative 4B – Solidification with a Single-Component Cap
Estimated Capital Cost – $14,140,000
Estimated Annual O&M Cost – $71,800
Estimated Present Worth Cost – $15,410,000
Discount Rate – 7%
Estimated Construction Timeframe – 10 months
Estimated Time to Achieve RAOs – 30 years

Alternative 4B would include the in-situ solidification of the South Pit waste materials as denoted by the inferred pit boundary (Figure 17) followed by construction of a single-component cap.

Alternative 4C – Targeted Solidification with a Multi-Component Cap
Estimated Capital Cost – $10,870,000
Estimated Annual O&M Cost – $91,600
Estimated Present Worth Cost - $12,610,000
Discount Rate – 7%
Estimated Construction Timeframe – 9 months
Estimated Time to Achieve RAOs – 30 years

Alternative 4C would include the targeted solidification of the portion of the South Pit with the LNAPL and waste sludge. This alternative would include a multi-component cap. Approximately 25% of the South Pit contains waste materials that would be targeted for solidification. The location and extent of the targeted area would be determined with field studies utilizing a technique suitable for the Site waste materials and LNAPL conducted during the remedial design process.

Alternative 4D – Targeted Solidification with a Single Component Cap
Estimated Capital Cost – $9,940,000
Estimated Annual O&M Cost – $91,600
Estimated Present Worth Cost – $11,680,000
Discount Rate – 7%
Estimated Construction Timeframe – 9 months
Estimated Time to Achieve RAOs – 30 years

Alternative 4D would include the targeted solidification of the portion of the South Pit with the LNAPL and waste sludge. This alternative would include a single component cap. Approximately 25% of the South Pit contains waste materials that would be targeted for solidification. The location and extent of the targeted area would be determined with field studies utilizing a technique suitable for the Site waste materials and LNAPL conducted during the remedial design process.

Alternative 5 – South Pit Excavation and Off-Site Disposal
This alternative includes the following components:

- LNAPL recovery with transition to MNA remedy;
- Groundwater monitoring with MNA
- Surface soil removal (North Pit);
- East Ditch sediment cap O&M;
- Institutional controls; and

- Excavation and offsite disposal of sludge and reworked soil/waste.

Estimated Capital Cost – $37,200,000
Estimated Annual O&M Cost – $55,300
Estimated Present Worth Cost – $38,200,000
Discount Rate – 7%
Estimated Construction Timeframe – 9 months
Estimated Time to Achieve RAOs – 30 years

This alternative would include excavation and removal of approximately 15,000 cy of sludge and 53,000 cy waste sludge and reworked soil/waste. The waste sludge and reworked soil/waste would be excavated, treated, containerized, and transported for offsite disposal.

Excavation involves the removal of waste materials with subsequent disposal in a permitted landfill (USEPA, 2012b). The waste materials are excavated with standard construction equipment such as backhoes or tracked excavator. Excavation can be the first step in a treatment train prior to ex-situ biological or thermal processes or combined with disposal at a permitted offsite landfill (FRTR, 2014a).

Landfills are permitted by the TCEQ to accept hazardous and/or non-hazardous waste. Generators of industrial and hazardous waste must follow state and federal requirements for classifying solid wastes. These requirements include determining if the waste exhibits one or more hazardous characteristics or is a listed waste as defined in 40 CFR § 261. In Texas, nonhazardous industrial waste includes Class 1 waste (for example, materials with TPH concentrations greater than 1,500 milligram per kilogram (mg/kg) or benzene concentrations greater than 10 mg/kg), Class 2 waste (for example, materials with TPH concentrations less than 1,500 mg/kg or benzene concentrations less than 10 mg/kg), and Class 3 waste (materials that are insoluble, do not react with other materials, and do not decompose).

The waste contains hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) and therefore would be subject to the RCRA land disposal restrictions (LDRs) if excavated and treated or removed. This alternative would trigger LDRs, as the waste would be transported offsite for disposal. Further the waste would require classification at the point of generation, i.e., when it is removed from the South Pit area. If the waste is characteristically hazardous, as indicated by the RI data, then RCRA LDRs would apply to the disposal. Characteristically hazardous wastes cannot be land disposed until they meet the universal treatment standards for the waste characteristics and universal treatment standards for underlying hazardous constituents (such as but not limited to ethylbenzene, naphthalene, toluene, xylenes, and benzo(a)pyrene) (40 CFR § 268.48). Depending on the waste characteristics and underlying hazardous constituents, treatment may include thermal recycling or chemical oxidation at the disposal facility prior to land disposal.

While the waste sludge and reworked soil/waste would be excavated, this alternative does not result in a completely “clean” closure for the Site; untreated wastes would remain adjacent to and under the businesses and pipelines. Alternative 2 includes LNAPL recovery and groundwater monitoring with a MNA remedy. Most LNAPL will be recovered with excavation of the sludge, waste sludge and reworked soil/waste. Any LNAPL not addressed through excavation and dissolved phase groundwater COCs would need continued monitoring as described in Alternative 2.

16.2 Common Elements and Distinguishing Features

This section describes common elements and distinguishing features of the alternatives described for each medium. Common elements and distinguishing features unique to each alternative include key ARARs, long-term reliability of the remedy, and quantities of untreated wastes.

Applicable or Relevant and Appropriate Requirements

Alternative 1, the No Action Alternative, would not comply with the ARARs for the Site. All of the other alternatives would meet their respective ARAR.

Long-Term Reliability

Through the FS, a range of remediation technologies appropriate for the Site were developed and fully analyzed for long term reliability in addition to other criteria.

LNAPL Recovery – The technology of LNAPL recovery is established and has been used routinely at petroleum storage tank, corrective action, and CERCLA sites. Extraction can be performed manually or with automated systems.

LNAPL removal is effective for a variety of groundwater conditions (confined, unconfined, and perched). Removal frequencies are based on LNAPL recharge rates and method recovery rates. Manual recovery methods are more appropriate when LNAPL recharge rates are low, such as at the Site. The available drawdown is limited based on the LNAPL thickness, the density difference between LNAPL and water, and the heterogeneity of the adjacent soil. LNAPL removal typically induces a limited radius of influence less than 25 feet in unconfined conditions. Manual LNAPL recovery methods include hand bailing; oleophilic and hydrophobic absorbent pads, tubes, or socks; passive specific gravity collectors; or non-automated pumping.

MNA – Arsenic and benzene are identified as COCs for both the UTU and STU. Natural degradation is occurring in the vicinity of the South Pit. Hydrocarbon degradation consumes oxygen and results in reducing (anaerobic) conditions. The presence of elevated concentrations of arsenic in the Site groundwater is consistent with the expected reducing groundwater conditions. Several geochemical processes may contribute to sorbed naturally occurring arsenic within the aquifer matrix being mobilized into groundwater, including reducing conditions that facilitate reduction of ferric iron and dissolution of hydrous ferrous oxide (Ghosh et.al., 2003). In anaerobic/reducing conditions, ferric iron-reducing microorganisms can cause the reduction of solid-phase Fe(III)-oxides to Fe(II) as a result of the oxidation of petroleum hydrocarbons. When Fe(III)-oxides are reduced, metals such as arsenic that sorb tightly to Fe(III) can be released to groundwater. Reductions in dissolved phase arsenic concentrations are expected as the petroleum hydrocarbons attenuate. A review of quantitative surveys of length and stability of benzene plumes at underground storage tank sites (Connor et. al., 2015), indicated that 94% of the benzene plumes were in a non-expanding condition and the median lengths of the plumes ranged from 101 to 185 feet. The findings appeared to be independent of groundwater hydraulic conductivity and Site lithology.

A demonstration of the long-term reliability and effectiveness of MNA requires a line of evidence approach (USEPA, 1999; USEPA, 2012c, TCEQ, 2010). The following are lines of evidence that can be used to evaluate the effectiveness:

1. Historical groundwater data that demonstrates a clear trend of stable or decreasing concentrations over time and downgradient distance from the source at appropriate monitoring or sampling points (primary).
2. Hydrogeologic and geochemical indicators that indirectly demonstrate natural attenuation processes for the destruction of COCs (secondary). In addition, distance or time-based biodegradation rate calculations should be used to evaluate attenuation rates. Typical indicators of natural attenuation processes for petroleum hydrocarbon plumes are dissolved oxygen, nitrate, and sulfate depletion and ferrous iron, sulfate, manganese and carbon dioxide enrichment.
3. Predictive modeling or laboratory/field studies that demonstrate an understanding of the occurrence of a particular natural attenuation process and its ability to degrade COCs.

The following is an evaluation from the FS of the MNA lines of evidence:

1. *Historical groundwater data demonstrates a trend of stable or decreasing concentrations over time.* The Site groundwater plume is stable. Although waste materials have been in contact with the UTU for approximately 55 years, the impacted groundwater only extends approximately 150 feet beyond the boundary of the waste materials in the South Pit (Figure 17). This is due to the unconfined and locally perched clayey to silty sand that comprises the UTU as well the fact that the UTU is not laterally continuous east of the inferred South Pit boundary. The UTU pinches out east of the East Ditch. The impacts to the STU are limited to the immediate vicinity of the South Pit. There is no groundwater usage for the UTU and STU. Local businesses are supplied drinking water by the City of Corpus Christi.
2. *Hydrogeologic and geochemical indicators indirectly demonstrate natural attenuation processes for the destruction of COCs.* Geochemical indicators for degradation of benzene and other hydrocarbons are decreases in electron acceptor reactant, dissolved oxygen (DO), nitrate (NO^{3-}), and sulfate ($SO4^{2-}$), concentrations and increases in electron receptor product, manganese (Mn^{2+}) and ferrous iron (Fe^{2+}) concentrations. Increases in dissolved methane (CH^4) and carbon dioxide (CO^2, measured as alkalinity) concentrations between up- and downgradient monitoring wells is evidence of methanogenesis. The geochemical data indicate that natural attenuation is occurring around the perimeter of the South Pit waste materials. Multiple parameters have positive indicators of natural attenuation relative to the upgradient monitoring well. In contrast, the monitoring wells in the North Pit area, downgradient and outside the perimeter of the South Pit waste, and the STU, have fewer positive indicators of natural attenuation relative to the upgradient monitoring well. Since these areas have lower COC concentrations, there may be insufficient mass to produce measurable increases or decreases in electron acceptor reactants or products.

Caps – Caps are an established method for isolating wastes, limiting infiltration of surface water to reduce leaching of COCs to groundwater, and preventing human and ecological receptors from contacting the waste. Caps can be constructed of a single component or multiple components (USEPA, 2012a). The caps considered meet the RCRA cap requirements at 40 CFR § 264.19.

Typical single component caps can be constructed from vegetated topsoil, asphalt, concrete, clay, or clay with synthetic liner (FRTR, 2014). Asphalt and concrete caps can be designed to accommodate vehicular traffic. An asphalt cap typically consists of a low permeability layer placed on top of a high-permeability foundation layer (NAVFAC, 2014). The foundation layer enhances drainage and reduces the effects of differential settling. An asphalt paving mixture used for capping requires a more tightly

controlled particle size distribution and a higher bitumen content in comparison to standard road asphalt. Clay caps can be used to isolate waste materials from direct exposure to human or ecological receptors. Clay caps can reduce the diffusive transport of benzene by increasing the uncontaminated soil column (ITRC, 2009a, 2009b). Clay can be compacted to minimize permeability to control infiltration to the underlying soils or waste materials.

Multi-component caps are constructed to 1) provide long-term minimization of liquid migration through the waste materials and have a permeability equal to or greater than the natural subsoils; 2) function with minimum maintenance; 3) promote drainage and minimize erosion or abrasion of the cover; and 4) accommodate settling and subsidence so the cap integrity is maintained. The multicomponent cap relies on compaction and multiple layers to reduce permeability and grading to minimize infiltration and maximize surface water drainage. The critical components of the cap are the barrier layer and drainage layer. The drainage layer is designed to transport water from the underlying materials to dissipate seepage. The drainage layer can be a granular soil with higher permeability, a geosynthetic drainage grid, or geonet sandwiched between porous geotextile layers. The barrier layer is designed to reduce further leaching of waste by minimizing infiltration. The barrier layer can be low permeability clay and/or a geosynthetic clay liner (GCL). The GCL is a manufactured barrier consisting of a layer of bentonite or other very low-permeability material supported by geotextiles and/or geomembranes. The engineering function of a GCL is a hydraulic barrier to water and a replacement for compacted clay liners.

Barrier Walls – Barrier walls are a technology that utilizes subsurface materials constructed to impede or redirect the flow of groundwater. Barrier walls have been used for over 50 years in the construction industry and for pollution control since 1970. Barrier walls can also be installed to minimize groundwater intrusion into subsurface wastes during remediation. The alternative uses readily available construction equipment, and numerous remediation contractors are available with experience installing subsurface barrier walls and multi-component caps (USEPA, 2012f).

In-situ Solidification – In-situ solidification is an established technology that has been used for more than 35 years to treat a variety of wastes at Superfund sites. Bucket mixing uses readily available construction equipment, and remediation contractors are available with experience solidifying waste and installing caps. Auger mixing equipment is also available. The reagent chosen for solidification will need to be transported to the Site and stored. Long-term effectiveness of this alternative was evaluated for sites with solidification/cap as a source control remedy (USEPA, 2012d).

Excavation and Off-Site Disposal – This alternative uses technologies established for more than 30 years to treat a variety of wastes at Superfund sites. This alternative provides the greatest degree of long-term effectiveness for the Site since excavation and disposal reduces mobility and volume of wastes. Excavation and disposal will reduce future aquatic ecological exposure through mitigation of overland transport of surface soil located in habitat areas adjacent to the East Ditch. It is assumed that the permitted disposal facility has a RCRA Subtitle C liner and leachate collection system and that wastes will be treated as necessary for disposal so that the mobility of waste materials and toxicity is reduced. However, the volume of wastes is not reduced since it is only being relocated. Wastes adjacent to and under the Site buildings and pipeline corridor would not be excavated (USEPA, 2012b).

Quantities of Untreated Waste
Alternative 1, the No Action Alternative, does not include a treatment component and approximately 53,000 cy of sludge and reworked soil/waste (15,000 cy is estimated to be sludge), 3.1 acres of LNAPL on groundwater, and 5.1 acres of contaminated groundwater would remain unaddressed. The 1,250 cy of surface soil, with risk to the ecological receptor, would remain unaddressed. Additionally, the East Ditch sediment cap would not be maintained under Alternative 1.

For Alternatives 2-5, the LNAPL would be removed and disposed of offsite and 1,250 cy of surface soil, with risk to the ecological receptor, would be excavated and disposed offsite.

In Alternative 2, LNAPL Source Control, MNA, and Groundwater Monitoring, approximately 15,000 cy of sludge and 53,000 cy of sludge and reworked soil/waste would remain onsite untreated. The waste contains hazardous waste as defined by RCRA.

In Alternative 3, South Pit Subsurface Barrier Wall and Cap, approximately 15,000 cy of sludge and 53,000 cy of sludge and reworked soil/waste would remain onsite untreated, but contained within barrier walls and covered by a cap. The waste contains hazardous waste as defined by RCRA.

In Alternative 4, South Pit Solidification and Cap, some or all of the approximately 15,000 cy of sludge and 53,000 cy of sludge and reworked soil/waste would be either treated through in-situ solidification or remain onsite untreated and covered by a cap.

In Alternative 5, South Pit Excavation and Offsite Disposal, approximately 15,000 cy of sludge and 53,000 cy of sludge and reworked soil/waste would be excavated, treated, containerized, and transported for offsite disposal. The waste contains hazardous waste as defined by RCRA and would have to be treated for disposal.

16.3 Expected Outcomes of Each Alternative
The “no action” alternative would not reduce the risks currently present at the Site. It would not allow the Site to be available for a reasonably anticipated reuse. Contamination migration would be expected to continue.

Alternatives 2-5 have estimated construction periods of two to ten months. Capping, barrier walls, and in-situ solidification would eliminate exposure pathways but also would reduce the amount of Site property available for appropriate reuse. Alternative 5 would permanently remove contaminated material from the Site and would reduce risk by minimizing receptor contact with hazardous substances in the South Pit. Alternative 5 would make more of the Site available for appropriate reuse; however, this alternative has increased short-term risks to the community and businesses and a much higher capital cost. Time to achieve RAOs is 30 years for Alternatives 2-5.

17.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES
The NCP provides that the ROD must explain how the nine criteria at 40 CFR § 300.430(f)(5)(i) were used to select the remedy. These nine criteria are categorized into three groups: threshold, balancing, and modifying. The threshold criteria must be met in order for an alternative to be eligible for selection. The threshold criteria are overall protection of human health and the environment and compliance with ARARs. The balancing criteria are used to weigh major tradeoffs among alternatives. The five balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility or volume through

treatment; short-term effectiveness; implementability; and cost. The modifying criteria are state acceptance and community acceptance.

In addition to a site-wide No Action Alternative, four alternatives were evaluated for cleanup of the Site. Following is a comparative analysis of the remedial alternatives.

17.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment. This is a threshold criterion.

All alternatives except Alternative 1, the No Action Alternative, would provide adequate protection of human health and the environment by eliminating, reducing, or controlling risk through treatment, containment, engineering controls, and/or institutional controls.

Because the “no action” alternative is not protective of human health and the environment, it is eliminated from consideration under the remaining eight criteria.

17.2 Compliance with ARARs

Section 121(d) of CERCLA and 40 CFR § 300.430(f)(1)(ii)(B) of the NCP require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA §121(d)(4). This is a threshold criterion.

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be relevant and appropriate. Tables 5 through 7 list the Location-Specific, Chemical-Specific, and Action-Specific ARARs evaluated for the Site.

Alternative 1 does not comply with ARARs. Because the No Action Alternative is not protective of human health and the environment and does not comply with ARARs, it was eliminated from consideration under the remaining seven criteria. Because Alternative 1 does not comply with either of the threshold criteria, it cannot be selected as a remedy.

All remaining alternatives will comply with all ARARs through the use of standard engineering and waste management techniques as well as through the implementation of a site-specific Health and Safety Plan. All alternatives would meet their respective ARARs. Consistent with EPA guidance (USEPA,

1988b), the substantive ARARs are divided into the three categories: 1) location specific, 2) chemical-specific, and 3) action specific.

The Endangered Species Act is not triggered as no endangered or threatened species are known to utilize the Site for foraging or nesting. Additionally, the alternatives would meet state requirements in the Texas Administrative Code for threatened and endangered species. See 31 TAC §§ 65.171-65.177.

The alternatives would meet substantive requirements of the National Emission Standards for Hazardous Air Pollutants and 30 TAC § 101.4 relevant to particulate matter and other air pollutants. The alternatives would meet requirements related to the transportation of contamination and wastes to an offsite disposal facility, including, as applicable, Department of Transportation requirements governing the transportation of hazardous materials in 49 CFR §§ 171 through 180.

Waste transportation and disposal are required to meet 40 CFR Parts 263 and 264. Facilities accepting these wastes would be certified to accept the respective wastes in accordance with Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities 40 CFR Part 264. Only Alternative 5 includes offsite disposal of hazardous waste.

Alternative 2

While Alternative 2 would meet its respective ARARs, it would only meet RAOs for LNAPL, groundwater and surface soil. This alternative would not address the RAOs for subsurface soil and waste materials. In addition to the location-specific and chemical-specific ARARs and other criteria and guidance, the action-specific ARARs for general remediation, caps, groundwater management, landfills, offsite disposal (North Pit surface soils and excess soil overlying the South Pit) described in Table 7 are relevant to this alternative. The action-specific ARARs for water discharge are relevant if surface water in contact with the waste materials or construction activities is discharged from the Site. Because waste would be left in place in the South Pit, landfill disposal requirements would not apply. LDRs are neither applicable nor relevant and appropriate to any remedial alternative at the Site that does not involve "placement" of hazardous waste. Wastes may be left in-place, treated in-situ, consolidated or processed within an area of contamination without triggering LDRs (USEPA, 1995).

Alternatives 3 and 4

For Alternatives 3 and 4, in addition to the location-specific and chemical-specific ARARs identified for Alternative 2, the action-specific ARARs for general remediation, caps, groundwater management, landfills, and offsite disposal (North Pit surface soils and excess soil overlying the South Pit) are relevant to these alternatives. The action-specific ARARs for water discharge are relevant if surface water in contact with the waste materials or construction activities is discharged from the Site. Because waste would be left in place in the South Pit, landfill disposal requirements would not apply.

Alternative 5

LDRs would be triggered with Alternative 5. Because the waste would be transported offsite for disposal, it would require classification at the point of generation, i.e., when it is removed from the South Pit area. This alternative requires transportation of contamination and wastes to an offsite disposal facility and would be conducted pursuant to federal requirements regarding transportation of hazardous materials. Facilities accepting these wastes would be certified to accept the respective wastes.

17.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refer to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

Each alternative, except the No Action Alternative, would be effective and permanent in the long-term if O&M and institutional and engineering controls are enforced. Reviews at least every five years, as required, would be necessary to evaluate the effectiveness of any of these alternatives because hazardous substances, pollutants, or contaminants would remain onsite above levels that allow for unlimited use and unrestricted exposure.

Alternative 2

Alternative 2 only meets RAOs for LNAPL, groundwater and surface soil. This alternative does not address RAOs for subsurface soil and waste materials. Reworked soil/waste and waste material including sludge would remain untreated and may continue to leach COCs (although evidence suggests the reworked soil/waste and waste material including sludge is currently in equilibrium with the groundwater). While increased COC concentrations or LNAPL are not expected, the long-term effectiveness of this alternative is unreliable. LNAPL would be recovered to the extent practicable but LNAPL would still be present in the subsurface and the cleanup levels may not be attained within a reasonable time frame.

Excavation and disposal of contaminated soil in the North Pit would reduce future aquatic ecological exposure through mitigation of overland transport of surface soil located in habitat areas adjacent to the East Ditch. This applies to Alternatives 2 through 5.

Alternative 3

The long-term effectiveness of Alternative 3 was evaluated using five-year reviews conducted for sites with barrier wall/cap as a source control remedy. Sites were selected with similar hydrogeological settings along the Gulf Coast. The five-year reviews for the sites evaluated indicate containment of site contamination is effective and permanent.

The performance of the subsurface barrier wall could be monitored by measuring groundwater levels at piezometers or nested UTU/STU monitoring wells that would be installed inside and outside the subsurface barrier wall. Residual risk is nominal provided that routine inspections and maintenance of the cap are conducted to ensure the integrity of the remedy. The cap will prevent direct contact with, inhalation, or ingestion of COCs in waste materials or subsurface soils.

Alternative 4

Alternative 4's single component or multicomponent cap would prevent direct contact with, inhalation, or ingestion of COCs in waste materials or subsurface soils in the South Pit area. The North Pit excavation and the South Pit cap in this alternative would reduce future aquatic ecological exposure through mitigation of overland transport of surface soil in habitat areas adjacent to the East Ditch. In addition, the cap would address RAOs for migration by limiting infiltration through solidified waste materials. To limit infiltration, the clay in the single component cap should be compacted to a maximum hydraulic conductivity of 1E-06 centimeters per second (cm/sec). The two protective layers in a multi-component cap, the overlying clay and the GCL, provide additional infiltration protection.

Alternative 5
Alternative 5 addresses all the RAOs. This alternative uses technologies established for more than 30 years to treat a variety of wastes at Superfund sites. This alternative provides the greatest degree of long-term effectiveness for the Site since excavation and disposal reduces mobility and volume of wastes.

17.4 Reduction in Toxicity, Mobility, and Volume

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternative 2
With Alternative 2, reduction in toxicity, mobility, and volume of wastes would be restricted to the amount of LNAPL recovered and natural degradation of the groundwater COCs. For the North Pit surface soils, the mobility of metals via surface transport and volume would be reduced by excavation. This also applies to Alternatives 3 through 5.

Alternative 3
Alternative 3 achieves reduction of mobility of waste materials and groundwater through containment with the barrier wall. The multi-component cap would reduce leaching by limiting water infiltration through waste materials with subsequent migration to groundwater. The “wing” wall option installed west of the pipeline corridor would reduce downgradient migration of COCs in UTU groundwater. The “360” wall option encircling the South Pit inside the pipeline corridor would reduce migration of residual waste materials and leachate into the UTU located adjacent to the South Pit.

Alternative 4
Alternative 4 would reduce toxicity and mobility through treatment. Solidification with a single or multi-component cap would reduce mobility and toxicity of wastes. As described in Section 12.5, the benzene concentration was reduced from 54 mg/kg to 0.78 mg/L 26 days after the Treatability Study mix was prepared. A comparison of the untreated and treated waste samples indicates that the solidification reagents reduce the overall hydrocarbon composition of the LNAPL plume which would render the treatment area less toxic. For example, the total petroleum hydrocarbon concentrations were reduced from a total concentration of 11,600 mg/kg to a leachable concentration of 5 mg/L in MWGW09. The reagents tested are not expected to react chemically with the organic constituents in the waste but will bind metals such as arsenic and lead. Reduction in the volume of wastes would occur with LNAPL removal and natural degradation of the groundwater COCs. The cap would reduce leaching by limiting water infiltration through waste materials with potential subsequent migration to groundwater.

Alternative 5
Alternative 5 would reduce toxicity and mobility through treatment. Wastes under Alternative 5 would be treated as necessary for disposal so that the mobility of waste materials and toxicity is reduced. The total volume of wastes is not reduced since it is being relocated.

17.5 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved. All of the alternatives, except the No Action Alternative, are effective in the short-term but vary in the amount of time to reach RAOs and prevent potential exposure.

Alternative 2
An advantage to Alternative 2 is the minimal short-term risks to the community and businesses. Because no waste materials would be exposed, ambient air concentrations should be similar to existing ambient air concentrations, and minimal, if any, disruptions would occur in business operations.

Alternative 3
Waste materials may be exposed during the installation of the subsurface barrier which may pose a short-term risk to the community and businesses. Waste would not be exposed during the installation of the cap. Rather, the primary risks to the community during the remedial action would be from VOCs emitted during the installation of the barrier wall. In general, this alternative has minimal impact on the community. This alternative may have some impacts to the onsite businesses due to construction safety requirements. FS data indicate the potential for volatile emissions that may require protection measures for both business and the remediation contractor personnel. Real-time monitoring can be used during the remedial action to assess the emissions in order to implement mitigation measures.

Alternative 4
Some short-term risks are associated with Alternative 4 from traffic and the operation of heavy-duty trucks and equipment. Approximately five truckloads of reagents could be transported to the Site daily (approximately 300 truckloads over 10 weeks). This alternative may have some impacts to the onsite businesses due to construction safety requirements. FS data indicate the potential for volatile emissions that may require protection measures for both business and the remediation contractor personnel. Real-time monitoring can be used during the remedial action to assess the emissions in order to implement mitigation measures. The mixing methodology would determine the extent of waste exposure and the amount of short-term risk to the community, businesses, and remediation workers. Waste should not be exposed during the installation of the cap. The areal extent of the waste solidification and the design of the cap will dictate the extent of disruptions in onsite business operations.

Alternative 5
A primary disadvantage to Alternative 5 is the increased short-term risks to the community and businesses. The primary short-term risk is the potential for exposure to employees and customers at the onsite and adjacent businesses. The removal of the soil overburden will increase VOC emissions and odors. Air data indicate that benzene concentrations could, in the short-term, exceed air screening criteria when waste materials are exposed during the excavation. Field personnel may be required to upgrade personal protective equipment to full face respirators and other protective clothing during intrusive work in certain areas of the Site in accordance with contractor health and safety requirements. Additionally, short-term risks are increased from traffic and the operation of heavy-duty trucks. Approximately 54 truckloads of waste would be removed from the Site daily (approximately 3,300 truckloads over 10 weeks) to the waste disposal facility. The 2016 traffic survey (TAMTI, 2016) indicated 88 trucks on Up River Road and 184 trucks on Suntide Road were placarded for hazardous wastes. This alternative would increase the commercial truck traffic in the area by approximately 10% and increase the number of placarded truckloads by 30% to 60%. The additional traffic would be disruptive to the onsite and adjacent businesses and would potentially damage the asphalt 2-lane Goldston Road. Alternative 5 would have higher greenhouse gas emissions than the other alternatives due to the estimated 3,300 truckloads of waste to the waste disposal facility. There are also increased risks to the local population due to increased truck traffic.

17.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

For all alternatives, except the No Action Alternative, administrative coordination, labor, equipment, materials, and outside services will be required. These alternatives utilize conventional material and equipment which are widely used and accepted in the construction industry.

Alternative 2

Alternative 2 would use process options implemented during the RI. Specifically this will include recovery wells to remove LNAPL and monitoring wells for collection of groundwater samples for analysis in an environmental laboratory. Additional recovery wells would be installed to achieve LNAPL removal to the extent practicable in a timely manner. A variety of removal options such as bailers, hand-held free product skimming systems, or automated free phase petroleum contamination pumping systems are readily available. In addition, recovery systems are available for higher viscosity LNAPL. Recovered LNAPL would be stored in drums or bladder tanks prior to removal from the Site. The technology of MNA is established at multiple corrective action sites across Texas. The Site geochemical data indicate that natural attenuation is occurring around the perimeter of the South Pit waste materials. These implementability considerations also apply to Alternatives 3 through 5.

Alternative 3

The barrier walls and caps that would be used with Alternative 3 are well-established technologies. Approximately 84 vertical barrier walls have been selected as a CERCLA technology from 1982 to 2014 and 632 caps/covers were selected between 1982 and 2005 (USEPA, 2007; USEPA, 2017). The pre-design investigation would include the geotechnical evaluation of the soils for the barrier wall installation and a more detailed subsurface investigation to finalize the target barrier wall depth. Investigations would also include the initial compatibility testing of the groundwater and LNAPL/waste with the soil-bentonite mixture to optimize permeability and compatibility considerations.

Administrative feasibility is addressed by evaluating the necessity to coordinate with other agencies and the pipeline operators. Coordination with the pipeline operators to comply with the requirements of the encroachment agreements would be needed for this alternative, including working with Site businesses for employee, customer, and worker safety. A component of the remedy would be the real-time evaluation of air emissions so that mitigation measures could be implemented to reduce business disruption and employee exposure. These considerations also apply to Alternatives 4 and 5.

Alternative 4

Alternative 4's in-situ stabilization and solidification are well established technologies. Pilot test studies to finalize the solidification reagents would occur during the remedial design. The objective of pilot test studies would be to determine the ratio of the reagent components and waste material including sludge that would best meet a performance criterion and to evaluate the mixing approach. Procedures would be implemented during the remedial action to verify that performance criteria are being met. The mixing approaches (bucket or auger) use readily available construction equipment and remediation contractors are available with experience solidifying waste and installing caps.

Alternative 5
Alternative 5 uses readily available construction equipment, and numerous remediation contractors are available with experience excavating hazardous and non-hazardous waste.

17.7 Cost

Alternative 2
Alternative 2 is the least costly of alternatives 2 through 5 but does not achieve all of the RAOs. Further, achievement of the PRGs may not be attained within a reasonable time frame.

Alternative 3
The capital costs for the "Wing Wall" and "360 Wall" are $9,890,000 and $10,650,000, respectively. The variation in O&M costs between the two options reflects a difference in the groundwater monitoring programs. It was assumed that groundwater monitoring for the "wing" wall option would be more frequent initially to verify plume stability.

Alternative 4
The capital costs for the solidification remedy alternatives are $15,350,000 for solidifying the South Pit area with a multi-component cap; $14,410,000 for solidifying the South Pit area with a single component cap; $10,870,000 for targeted solidification of the South Pit area with a multi component cap; and $9,940,000 for targeted solidification of the South Pit area with a single component cap. For the cost estimates, it is assumed that Alternative 4 uses the auger technology to solidify the waste. The variation in O&M costs between the three options for this alternative as listed below reflects a difference in the groundwater monitoring programs. It was assumed that groundwater monitoring for the targeted solidification option would be more frequent initially to verify plume stability. The cost of this alternative depends on energy prices for the fuel transporting the solidification reagents.

Alternative 5
The estimated present worth cost of Alternative 5 is two to three times greater than the costs for Alternatives 2 through 4. The cost of Alternative 5 depends on energy prices for the fuel transporting the waste materials. The impact of rising energy costs was not evaluated but could have a significant bearing on the cost of Alternative 5.

17.8 State Acceptance

The State of Texas, through the TCEQ, supports the Selected Alternative.

17.9 Community Acceptance

The TCEQ and EPA jointly conducted a public meeting on September 10, 2019, to present the Proposed Plan to the public. The TCEQ and EPA presented Alternative 4D as the preferred alternatives.

A request was received to extend the 30-day comment period. The Proposed Plan comment period was extended through December 10, 2019. Based on comments received during the public meeting and those received during the 90-day public comment period, the community accepts the alternatives presented in the Proposed Plan.

18.0 PRINCIPAL THREAT WASTES

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (40 CFR § 300.430(a)(1)(iii)(A)). The “principal threat” concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water or air, or acts as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material; however, non-aqueous phase liquids (NAPLs) in groundwater may be viewed as source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

The LNAPL in groundwater and residual waste material including sludge are considered to be “principal threat wastes” because the COCs are present at concentrations that cause the waste material to be classified as a hazardous waste and are “source materials” that act as a reservoir for potential migration of contamination to groundwater, surface water or air.

19.0 SELECTED REMEDY

The selected remedy for cleaning up the Brine Service Site is Alternative 4D – Targeted Solidification with a Single Component Cap. Alternative 2 – LNAPL Source Control, MNA, and Groundwater Monitoring is a component of Selected Remedy Alternative 4D.

19.1 Summary of the Rationale for the Selected Remedy

The Selected Remedy is protective of human health and environment and complies with ARARs. ICs are a component of the Selected Remedy. These controls will be required to aid in the management of the wastes left onsite and to ensure that only appropriate reuse options are implemented.

O&M activities and five-year reviews will be required since hazardous substances, pollutants, or contaminants would remain onsite above levels that would allow for unlimited use and unrestricted exposure. ICs will protect the remedy, inform for appropriate and protective future use, and require commercial/industrial future land usage. The alternative selected provides the best balance of tradeoffs between alternatives with respect to the balancing and modifying criteria. Based on public comments received during the public meeting held to present the Proposed Plan and comments received during the public comment period, the public voiced no defining preference for any particular alternative.

Alternative 4D – Targeted Solidification with a Single Component Cap uses treatment as a principal element to address the waste material including sludge in the South Pit and reduce the toxicity and mobility of these source materials that constitute the principal threat wastes at the Site. All RAOs are met with Alternative 4D. The costs for Alternative 4D are not the lowest of the alternatives evaluated, but Alternative 4D provides for treatment of the sludge and/or reworked soil/waste combined with groundwater contamination control through a single-component cap. Alternative 4D protects the outdoor worker and construction worker receptor. Since Alternative 4D also includes the components of Alternative 2, the remedy address RAOs for onsite and offsite groundwater

19.2 Description of the Selected Remedy

Following is a description of each component of the Selected Remedy. Although the EPA does not expect significant changes to this remedy, minor changes may occur as a result of the remedial design and construction processes. Any changes to the remedy described in this ROD would be documented using a technical memorandum in the Administrative Record, an Explanation of Significant Differences, or a ROD Amendment, as appropriate and consistent with the applicable regulations.

The Selected Remedy, Alternative 4D – Targeted Solidification with a Single Component Cap, consists of the following components:

- LNAPL recovery;
- Groundwater monitoring with MNA remedy;
- Surface soil removal (North Pit);
- East Ditch sediment cap O&M;
- Institutional controls;
- Targeted in-situ solidification of sludge and/or reworked soil/waste (South Pit); and
- Single-component cap (South Pit).

Common Elements

The Common Elements were common to Alternatives 2-5 with additional information included here for the Selected Remedy Alternative 4D description:

- Pre-construction activities including bench and pilot-scale tests as needed to finalize the remedial designs, preparation of submittals, and construction of project facilities and utilities:
    - Pilot studies to finalize the reagents and mixing methodology may be planned. Field studies utilizing techniques to identify areas with hydrocarbons present above residual saturation can provide data for the placement of LNAPL recovery wells and for the limits of solidification. A pilot test for solidification technology could be implemented to determine the ratio of the reagent components and sludge that would best meet an UCS performance criterion and to evaluate the mixing approach.
    - Pipeline Corridor
        - The Site has a pipeline corridor located within the limits of the South Pit (Figure 4). The pipeline corridor consists of eight pipelines and two fiber optic cables. The eight pipelines are bundled within the pipe gallery, with four pipelines stacked over the other four pipelines; the fiber optic cables are situated in between the pipeline stacks. The pipelines are separated vertically by approximately two feet and horizontally by approximately two feet. The top row of pipelines has roughly 5 to 7 feet of overburden soil.
        - The remedy will be designed with the participation of the pipeline companies to ensure construction practices are protective of the pipelines. The design will include providing the construction schedule to the pipeline operators 30 calendar days prior to initiation of construction activities. The 811 “Call Before You Dig” program will be notified at a minimum of 48 hours prior to intrusive activities. The pipeline companies will mark the approximate location of their pipelines with a combination of paint, flags or stakes.
        - Remedial Action construction will observe an exclusion zone along the boundaries of the pipeline corridor. The lateral limits of the exclusion zone, a distance from the outer pipeline, will be defined in the encroachment agreement

as negotiated with the pipeline companies. Depending on the position of the pipelines, the exclusion zone may be interior or exterior of the easement boundary. The exclusion zone will laterally limit the extent of excavation or treatment. The movement of heavy equipment over the exclusion zone will be limited to areas which have temporary weight displacement mats.

- General improvements such as Site restoration (grading, fill soil, vegetation):
  - Common activities for general site improvements are mobilization/demobilization and abandoning monitoring wells.
  - Ordinary site restoration includes general grading, fill soil, and revegetation of areas where excavation or earthwork was conducted.
  - Site grading will be conducted to minimize accumulation of storm water during construction activities and construction of drainage ditches for storm water management.

- Air monitoring programs for public protection and remediation worker safety:
  - Air monitoring will be implemented during the remedy pre-design investigation. The goal of the air monitoring program during the pre-design investigation is to evaluate the potential for releases to ambient air and to develop monitoring programs for the protection of business employees and customers during remedy implementation.
  - In addition to ambient air monitoring, worker safety air monitoring programs would be implemented by remediation contractors.

- Surface soil removal (North Pit):
  - Surface soil removal in a limited portion of the North Pit area will be completed for protection of the ecological receptor. Approximately 1,250 cy of soil (approximately 18 inches deep) would be excavated, containerized, and transported to a regulated offsite disposal facility. An excavation depth of 18 inches soil will address the biologically active horizon of the soils adjacent to the East Ditch.
  - The final limits of the excavation will be determined after the encroachment agreements are finalized with the pipeline companies.
  - The contaminated soil would be excavated and loaded onto trucks and transported to an offsite permitted waste landfill for disposal. Confirmation sampling would occur during remedial activities to verify the classification of the waste for disposal.
  - The excavated areas would be backfilled with clean soil, with the top six inches being of topsoil quality ("topsoil quality" defined by the A soil horizon and able to support vegetational growth), graded for adequate drainage, and re-vegetated using TXDOT's permanent rural seed mixture from their latest standard specification guidance for the Corpus Christi district.

- Operation and maintenance (O&M) of the East Ditch sediment cap constructed in November/December 2017 (BCP, 2018a) and extended in February 2020:
  - O&M includes inspections, repairs, and reporting for the East Ditch sediment cap.
  - O&M also includes control of *Arundo donax* growth. *Arundo donax*, also known as giant reed or carrizo cane, is native to Mediterranean Europe. Genetic studies of *Arundo donax* indicate it was introduced into the Rio Grande Basin of Texas and Northern Mexico from Spain and has become invasive in the riparian habitats of the southwestern United States and northern Mexico. In the Rio Grande Basin, *Arundo donax* has historically dominated

these habitats where it competes for scarce water resources, lowers riparian biodiversity, reduces access and visibility for law enforcement, and facilitates the invasion and survival of cattle fever ticks, *Rhipicephalus microplus* and *Rhipicephalus annulatus* from Mexico.
    - With routine inspections and proper maintenance, the longevity of the sediment cap can be expected to last, at a minimum, through the remedial action and the 30-year O&M period.

- ICs, land management practices for property owners, and the ICIAP:
    - ICs prohibiting groundwater usage in the UTU and STU would be placed on the Site and any impacted offsite properties. An IC requiring commercial/industrial land usage would be placed on the onsite properties. ICs would prohibit disturbance of the soil cap. ICs would require an evaluation of vapor intrusion for any future construction.
    - The implementation of the ICs is subject to the approval of the property owners. The requirements for filing land use restrictions in the State of Texas are specified in Title 30, TAC, Chapter 350, Subchapter F. A restrictive covenant, or deed notice, is an instrument filed in the real property records of the county where the affected property is located.
    - IC O&M consists of the preparation of an ICIAP which will describe periodic surveys to verify that the controls remain in place and assess whether the controls are functioning to achieve the stated objectives (EPA, 2012g). The ICIAP will include requirements, monitoring of commercial/industrial land usage and groundwater usage. Although there is no current unacceptable risk, the vapor intrusion pathway will be addressed through institutional controls that will require an evaluation of risk prior to future building construction in the South Pit area.

LNAPL Source Control, MNA, and Groundwater Monitoring

Readily recoverable LNAPL would be removed as a source control measure onsite prior to implementation of targeted solidification. Prior to implementing the program, an LNAPL investigation would be conducted to identify prospective locations of recovery wells. The investigation may use laser induced fluorescence (LIF) tools such as rapid optical scanning, ultraviolet rapid optical scanning, or membrane interface probe techniques to identify areas with hydrocarbons present above residual saturation. These tools can be combined with other tools such as cone penetrometer technology, hydraulic profiling, or electrical conductivity to obtain lithologic data simultaneously. Other suitable methods for evaluating LNAPL recovery include laboratory analysis of residual saturation or LNAPL mobility in soil cores.

Recovery wells would be installed, and LNAPL would be removed periodically using manual recovery methods such as bailers, vacuum trucks or skimmer pumps. Recovered LNAPL can be stored in drums or bladder tanks prior to removal from the Site for disposal or recycling.

LNAPL recovery is included in Alternative 4 as a pre-treatment to reduce the volume of liquids in the waste materials in order to enhance the effectiveness of solidification and reduce the mass of reagents. LNAPL recovery from the sludge and/or reworked soil/waste mixture would be discontinued when the overall LNAPL recovery has declined by approximately 50% as indicated by a decline curve or after six months of recovery. LNAPL which may interfere with the solidification process would be removed to the extent practicable prior to solidification. LNAPL within the soil porosity that is not readily recoverable would be solidified.

An LNAPL recovery plan would be developed which would describe the criteria for transition to an MNA remedy. Following completion of the remedial action, a groundwater monitoring program would be implemented. Monitoring involves the installation of a groundwater monitoring well system designed to detect potential leaks from containment actions, migration of impacted groundwater to Site boundaries, or COC concentrations in the UTU and STU. In addition, the monitoring system will be utilized to evaluate MNA and to support the effectiveness evaluation of the groundwater institutional control.

The groundwater monitoring program would be used to demonstrate groundwater plume stability, to assess exposure to COC concentrations in the UTU exceeding TCEQ Class 3 groundwater PCLs ($^{GW}GW_{Class3}$), and to assess exposure to COC concentrations in the STU over MCLs. This component would include the development of a groundwater monitoring plan and the installation of permanent groundwater monitoring wells. Periodic monitoring would be performed to demonstrate compliance with the groundwater RAOs of limiting COC migration beyond the Site boundaries at concentrations exceeding the $^{GW}GW_{Class3}$ groundwater PCLs (UTU) or MCLs (STU). Groundwater monitoring would also evaluate the stability of the onsite dissolved phase and LNAPL plumes as well as impacts from the identified offsite and upgradient groundwater plume.

As indicated in the general description of the Site, there is affected groundwater containing benzene and other volatile aromatic hydrocarbons upgradient of the Site on the adjacent western property. Permanent monitoring wells installed on the western side of the Site could be used to characterize offsite groundwater impacts and potential risk as well as evaluate plume stability. Additional monitoring wells may be needed for upgradient delineation of offsite groundwater impacts along the western boundary of the Site.

Alternative 4D – Targeted Solidification with a Single Component Cap.

Alternative 4D includes the targeted solidification in-situ of the portion of the South Pit with the LNAPL and waste sludge. This alternative includes a single component cap. Approximately 25% of the South Pit contains waste materials that would be targeted for solidification. The location and extent of the targeted area would be determined with field studies utilizing a technique suitable for the Site waste materials and LNAPL conducted during the remedial design process.

An isolation trench would be installed prior to mixing to identify utilities within the solidification area. Two basic approaches are utilized for in-situ mixing the reagent with the sludge or soils: vertical auger mixing or in-place mixing with a bucket. Targeted areas of the approximately 15,000 cy of sludge and 53,000 cy of sludge and reworked soil/waste would be solidified in situ. The approximately 37,000 cy of soil overburden would be incorporated into a single component cap. Due to the depth of waste materials, bucket mixing would occur in confined cells and would be implemented by solidifying the top half of the waste materials, staging the solidified materials, solidifying the bottom half of the waste, and replacing the staged solidified waste in the cell. Augers incorporate the reagents in-situ, and other than cuttings which may migrate to the soil surface, vapor emissions should be less than bucket mixing. If the auger cannot dislodge the larger debris or has refusal at the deeper intervals, the material can be excavated. At deeper depths, debris can be isolated or encapsulated by solidified material.

The auger diameter, which can range up to several feet, determines the number of holes that need to be drilled. During auger mixing, reagent is injected at sufficient, but not excessive, pressure to ensure that it

feeds through the hollow stem of the auger and into the mixing zone. Pressures are minimized which may migrate waste material out of the treatment zones. The preferred approach using this process is to delineate the waste perimeter and begin the solidification process at the outer perimeters and work inward.

In-place mixing involves spreading and mixing reagents with the waste using conventional earthmoving equipment such as draglines, backhoes, or clamshell buckets. The waste area is divided into treatment cells. The reagents are spread over the surface of the cell and the equipment operator uses the bucket to mix reagents in place, until homogenous.

The treatability study indicated that 5% reagent will achieve strength and minimize leaching which will result in a minimal volume expansion. Overburden surface soil at the South Pit Area will likely be excavated prior to cap placement. A limited volume expansion from targeted solidification in-situ was considered as part of the rationale for excavating surface soil prior to installing the cap. Wastes adjacent to and under the Site buildings and beneath and east of pipeline corridor, to the extent it exists, would not be solidified or capped.

Coordination with the pipeline operators and onsite businesses is needed for this alternative. Current single component cap construction plans include installation of a vegetated topsoil cap. The vegetated topsoil cap is protective with a lower risk of damage to pipelines than other single-component cap materials.

Since this ROD assumes the onsite businesses will remain, the remediation plans will accommodate the parking area at Adult Video, the material stored at Robert's Equipment, and the pipeline corridors in order to maximize the areal extent of the cap. A portion of the parking lot at Adult Video will be removed and then replaced after the cap is installed. The equipment and other items located on the Robert's Equipment lot will be temporarily relocated. To minimize damage to the cap from equipment storage, a concrete parking area could be constructed at Robert's Equipment. In addition, the cost estimation includes provisions to connect the Site businesses to the City sanitary sewer.

The capped areas will be graded for adequate drainage and re-vegetated. While it is anticipated that all sludge and/or reworked soil/waste will remain in the South Pit Area, confirmation sampling will occur during remedial activities to verify the classification of waste or soil sent offsite for disposal.

19.3 Summary of the Estimated Remedy Costs

The estimated costs for the selected remedy are presented in Table 8. The estimated capital cost to implement and construct the selected remedy presented in this ROD is $9,940,000 and the estimated present worth is $11,680,000.

The cost summary table is based on the best available information regarding the anticipated scope of the remedial action. Changes in the cost elements may occur as a result of the new information and data collected during the remedial design phase. Major changes may be documented in the form of a memorandum to the Administrative Record file, an Explanation of Significant Differences (ESD), or a ROD amendment. The projected cost is based on an order-of-magnitude engineering cost estimate that is expected to be within +50 or -30 percent of the actual project cost.

19.4 Expected Outcomes of the Selected Remedy

Because hazardous substances, pollutants, or contaminants will remain onsite above levels that allow for unlimited use and unrestricted exposure, ICs will be required. ICs prohibiting groundwater usage in the UTU and STU would be placed on the Site and any impacted offsite properties. An IC requiring commercial/industrial land usage would be placed on the onsite properties. ICs would prohibit disturbance of the soil cap. ICs would require an evaluation of vapor intrusion for any future construction.

As described in Section 13.2, the STU is classified as a Class II groundwater resource; however, it has limited value as a drinking water source. While the average naturally occurring TDS concentrations in the STU are less than 10,000 mg/L, the lowest measured TDS concentration on the Site is 4,980 mg/L. Groundwater with TDS concentrations greater than 1,000 mg/L would have an unacceptable taste and would require extensive treatment for drinking water purposes. Monitoring wells screened in the shallow portions of the STU on the northeast side of the Site have TDS levels at or above 10,000 and may be influenced by the estuarine conditions north of the Site.

There are no current plans for use of groundwater at the Site. The City of Corpus Christi provides drinking water to the Brine site and to the surrounding area. However, the Site cleanup levels would meet drinking water standards for the STU.

The final cleanup levels for the Site are in the following table:

Cleanup Levels for Chemicals/Contaminants of Concern		
Media: Groundwater Site Area: UTU Available Use: Commercial/Industrial Controls to Ensure Restricted Use: Deed Notices and Groundwater Use Restrictions		
Chemical of Concern	**Cleanup Level**	**Basis for Cleanup Level**
Benzene	0.50 mg/L	Risk Assessment*
Arsenic	1.0 mg/L	Risk Assessment*
3&4 Methylphenol	37 mg/L	Risk Assessment*
Media: Groundwater Site Area: STU Available Use: Commercial/Industrial Controls to Ensure Restricted Use: Deed Notices & Ground Water Use Restrictions		
Benzene	0.005 mg/L	MCL
Arsenic	0.01 mg/L	MCL
Notes: * Based on TRRP commercial/industrial Tier I Class 3 groundwater PCLs criteria providing risk-based endpoint concentrations to address the non-cancer HI of 28 for the construction worker receptor. MCL= Federal maximum contaminant level mg/L= Milligram per liter		

The selected remedy will be protective of the construction worker and outdoor worker receptors. The TCEQ Class 3 groundwater PCLs ($^{GW}GW_{Class3}$) are risk-based cleanup levels that provide for protection of the construction worker and outdoor worker receptors. Reuse of the Site will be available for a commercial/industrial reuse. As indicated in Section 15.3, after remediation of the accessible ecological

habitat areas adjacent to the East Ditch exhibiting lead, mercury, selenium, and zinc concentrations that have the potential for acute toxicity, an 84% sitewide reduction in mercury risk was estimated.

20.0 STATUTORY DETERMINATIONS

Under CERCLA §121 and the NCP §300.430(f)(5)(ii), the EPA must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against offsite disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

Protection of Human Health and the Environment

As indicated previously, the Selected Remedy will be protective of the construction worker and outdoor worker receptors. Achieving the TRRP commercial/industrial Tier I Class 3 groundwater PCL criteria for the UTU groundwater provides risk-based cleanup levels for protection of the construction worker receptor from dermal exposure and incidental ingestion. Achieving the MCL in the STU will protect the outdoor worker receptor from exposure through ingestion. Reuse of the Site will be available for a commercial/industrial reuse.

As indicated in Section 15.3, after remediation of the accessible ecological habitat areas adjacent to the East Ditch exhibiting lead, mercury, selenium, and zinc concentrations that have the potential for acute toxicity, an 84% sitewide reduction in mercury risk was estimated. An excavation depth of 18 inches soil will address the biologically active horizon of the soils adjacent to the East Ditch and be protective of the ecological receptor.

There are no short-term threats associated with the media-specific selected remedies that cannot be controlled. In addition, no adverse cross-media impacts are expected from the Selected Remedy.

Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and 40 CFR § 300.430(f)(l)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA §121(d)(4). Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Relevant and appropriate requirements are requirements that, while not legally “applicable” to circumstances at a particular CERCLA site, address problems or situations sufficiently similar to those encountered at the Site that their use is relevant and appropriate. Tables 5 through 7 present the Location-Specific, Chemical-Specific, and Action-Specific ARARs for the Site.

In addition to ARARs, non-promulgated advisories, proposed standards, criteria, guidance or policy documents developed by the federal or state government, or other information may also be used in conjunction with, or in lieu of, ARARs to achieve an acceptable level of risk at a site. These advisories, proposed standards, criteria, guidance or policy may be used when determining risk-based protective

cleanup levels or response actions where no ARARs exist, or where ARARS alone would not be sufficiently protective of human health and the environment.

The Selected Remedy will comply with all ARARs through the use of standard engineering and waste management techniques as well as through the implementation of a site-specific Health and Safety Plan. The Selected Remedy will meet respective ARARs from Federal and State laws.

Transportation of contamination and wastes to an offsite disposal facility will have to be conducted pursuant to Federal and State transportation and disposal regulations. Facilities accepting these wastes would have to be certified to accept the respective wastes. LDRs would not apply to offsite disposal alternatives of non-hazardous wastes.

The Selected Remedy will comply with National Emission Standards for Hazardous Air Pollutants and 30 TAC § 101.4 relevant to particulate matter and other air pollutants. It would meet requirements related to the transportation of contamination and wastes to an offsite disposal facility, including, as applicable, Department of Transportation requirements governing the transportation of hazardous materials in 49 CFR §§ 171 through 180; Standards Applicable to Generators of Hazardous Waste.

The chemical-specific ARARs include Safe Drinking Water Act requirements (40 CFR 141-149), Primary Drinking Water Standards (MCLs and MCL Goals) (40 CFR 141). Chemical-specific advisories, proposed standards, criteria, guidance or policy include risk-based Tier I Class 3 groundwater PCLs (30 TAC 350).

The action-specific ARARs for general remediation, RCRA-compliant caps (40 CFR § 264.19), groundwater management (16 TAC § 76.104), landfills (40 CFR §§ 264.270 to 264.280, 40 CFR § 264.300 to 264.314, and 30 TAC § 335.5), and offsite disposal (North Pit surface soils and excess soil overlying the South Pit) are applicable to the Selected Remedy. The action-specific ARARs for water discharge (40 CFR §§ 122.41 and 122.44) are applicable if surface water in contact with the waste materials or construction activities is discharged from the Site. Because waste would be left in place in the South Pit, LDRs would not apply.

Groundwater cleanup will be in compliance with ARARs. The risk-based PCLs at 30 TAC 350 provide concentrations protective of groundwater from COCs leaching from soil and concentrations protective of exposure to Class 3 groundwater. Because STU groundwater meets the characteristics of a potential drinking water supply, the MCL drinking water standards are relevant and appropriate.

TXDOT's "Use of Right-of-Way by Others Manual" (TXDOT, 2015) specifies action-specific procedures and agreements to conduct investigations and remediation activities in highway rights-of-way.

Cost-Effectiveness

The Selected Remedy is cost-effective because the remedy's costs are proportional to its overall effectiveness (see 40 CFR §300.430(f)(l)(ii)(D)). This determination was made by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (i.e., that are protective of human health and the environment and comply with all federal and any more stringent state ARARs). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-

term effectiveness). The overall effectiveness of each alternative was then compared to each alternative's costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence represents a reasonable value for the money to be spent.

The Selected Remedy, Alternative 4D – Targeted solidification with a vegetated topsoil cap is protective and cost-effective with a lower risk of damage to pipelines. Table 9 presents a matrix of cost and effectiveness.

Utilization of Permanent Solutions to the Maximum Extent Practicable
EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, the EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and considering State and community acceptance.

Preference for Treatment as a Principal Element
The Selected Remedy satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduce the toxicity, mobility, or volume of hazardous substances through treatment) for South Pit sludge and/or reworked soil/waste and LNAPL.

Five-Year Review Requirements
Section 121(c) of CERCLA and the NCP §300.430(f)(5)(iii)(C) provide the statutory and legal bases for conducting five-year reviews. Because this remedy will result in hazardous substances remaining onsite in the ground water and in the soils above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy is, or will continue to be, protective of human health and the environment.

21.0 DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN

To fulfill CERCLA § 117(b) and NCP §§ 300.430(f)(5)(iii)(B) and 300.430(f)(3)(ii)(A), the ROD must document and discuss the reasons for any significant changes made to the Selected Remedy. Changes described in this section must be limited to those that could have been reasonably anticipated by the public from the time the Proposed Plan and RI/FS Report were released for public comment to the final selection of the remedy.

The proposed plan for the Brine Service Company Superfund Site was released on September 9, 2019. The Proposed Plan identified Alternative 4D (Alternative 4 – South Pit Solidification and Cap, Alternative 4D – Targeted Solidification with a Single Component Cap) as the preferred alternative. The public comment period was held from September 9, 2019, to December 10, 2019. EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the proposed plan, were necessary.

PART III: RESPONSIVENESS SUMMARY

22.0 RESPONSE SUMMARY

The Responsiveness Summary provides information about the views of the public and the support agency regarding both the remedial alternatives and general concerns about the Site submitted during the public comment period.

The original public comment period for the Proposed Plan was held from September 9, 2019, through October 10, 2019. The comment period was extended through December 10, 2019, as requested by the Boomerang Corporation. A public meeting was held on September 10, 2019, to present the preferred alternative in the Proposed Plan. Based on the comments received at the public meeting and during the comment period, the public agree with the preferred alternative. During the public meeting EPA answered questions from the public. The questions and answers discussed during this meeting can be found in the meeting transcript as part of the Administrative Record. Formal answers to the questions raised during the public meeting are addressed below.

22.1 Stakeholder Issues and Lead Agency Responses

During the public comment period, three letters were received via electronic mail. EPA's responses to the verbal and written comments are as follows.

1. **Written comments submitted by the Port of Corpus Christi Authority (PCCA) were received by EPA via electronic mail on October 9, 2019:**

Comment: The PCCA comments identify concern for impacts to Tule Lake due to discharges from the Site. The PCCA references sampling results in the February 2019 *Tule Lake Sediment Sampling Final Letter Report* (Report) prepared by Parsons for TCEQ Natural Resource Damage Assessment Program (Parsons, 2019). A total of 27 sediment samples were collected from Tule Lake sediment and drainage channels during a November-December 2018 sediment sampling event conducted by Parsons. Sediment samples were collected from depths of 0 to 6 inches below the water-sediment interface and from 6 to 12 inches below the water-sediment interface. The results for the sediment samples were compared to the "level of required performance" (LORP), which is the lowest of either the marine ecological benchmark or the Tier 1 Sediment Human Health PCL. The PCCA comment letter included tables from the Report.

The PCCA letter included a table with PAH results above the LORP for the field duplicate (FD) sample for 2018TLSS03-0 (parent) / 2018TLSS97 (FD).

Analyte	Concentration (mg/kg)	LORP (mg/kg)
Fluoranthene	0.833	0.600
Fluorene	0.0427	0.019
Phenanthrene	0.486	0.240
Pyrene	0.735	0.528
High Molecular Weight PAHs	3.73	1.70
Low Molecular Weight PAHs	0.619	0.160
Total PAHs	4.35	4.022

The PCCA letter also included a table with metals results above the LORP for three sampling locations 2018TLSS13-6, 2018TLSS15-0, and 2018TLSS07-6.

Analyte	LORP (mg/kg)	Number of LORP exceedances (out of 25)	Max Concentration (mg/kg)	Sample
Aluminum	18000	15	39600	2018TLSS13-6
Arsenic	8.2	2	9.85	2018TLSS13-6
Cadmium	1.2	16	8.78	2018TLSS13-6
Copper	34	4	37.3	2018TLSS15-0
Lead	46.7	7	67.6	2018TLSS13-6
Selenium	1.0	25	27.5	2018TLSS07-6
Zinc	150	19	375	2018TLSS15-0

The PCCA letter also describes from the Report, mercury exceeded the LORP of 0.15 mg/kg, associated with the marine ecological benchmark, in 13 samples. The highest concentration was measured in Sample SS13-6 at 0.329 mg/kg.

PCCA does not have any objections to the planned activities for the Superfund Site. However, the existing information does suggest that there have been releases from the Superfund Site that have impacted Tule Lake and that there are concentrations of metals and PAHs above ecological risk-based value in Tule Lake sediments. We respectfully request that further evaluation of the impacts to Tule Lake be performed and that any impacts from the Superfund Site on Tule Lake be also addressed in this Proposed Plan.

EPA Response:
An investigation of Tule Lake was not within the scope of the AOC; however, sediment samples were collected as part of the RI along the East Ditch from south of I-37 to the point where the East Ditch connects with the ditch that runs east and west and lies north of Up River Road. Sediment samples were also collected in the drainage ditch south of Up River Road both east and west of the East Ditch (See Figures 10 and 11).

While the source of the PAHs 2018TLSS03-0 (parent) / 2018TLSS97 (FD) cannot be determined within the scope of the Site RI, sediment samples collected during the RI indicate that the source is not likely from the Site. As indicated in Figures 10 and 11, PAHs were low in the East Ditch sediment sampling until it intersects with Up River Road ditches and the ditch that runs north of Up River Road. The highest measured PAH results in sediment were found in sample UPSD02 (sample date 2-2012) west of the Site at the intersection of Hunter Road and Up River Road and EDDSD09 (sample date 10-2017) at the confluence of East Ditch and the Up River Road Ditch.

An evaluation of PAH data was conducted and reported in the RI. The distribution data indicate that PAHs are not accumulating in Site sediments. The elevated PAH concentrations in the sediments along Up River Road can be attributed to vehicular traffic and runoff from the asphaltic surface. Studies evaluated in the RI indicates that mean PAH concentrations in surface water particulates from runoff in unsealed and asphalt or coal-tar sealed parking lots ranged from 54 to 3,600 mg/kg (Mahler, et. al., 2005). The fluoranthene/pyrene (F/P) and phenanthrene/anthracene (P/A) ratios in the sediments is a second line of evidence. F/P and P/A ratios are used as an indicator of pyrogenic or petrogenic origin of

PAHs. F/P ratios greater than 1 and P/A ratios less than 10 indicate a pyrogenic source, such as engine combustion, while F/P ratios less than 1 and P/A ratios greater than 10 indicate a petroleum origin (Wang, 2001). The F/P ratios for the marine segment of the East Ditch and Up River Road Ditch range from 0.86 to 1.6. The P/A ratios for the marine portion of the East Ditch and for Up River Road Ditch range from 1.00 to 8.39. This information provides another line of evidence for pyrogenic origin of the PAHs in the East Ditch and Up River Road.

Additionally, the source of the metals in Report samples, and specifically sediment samples 2018TLSS13-6, 2018TLSS15-0, and 2018TLSS07-6, cannot be determined within the scope of the Site RI. These specific samples are located in the main portion of Tule Lake and not in the depositional area east of the point where the East Ditch intersects with the drainage ditch that lies north of Up River Road.

As indicated in the RI, surface water and sediment discharges appeared to have entered Tule Lake from multiple sources from 1956 to the present. Aerial photographs from the RI have been included in Appendix C,). (Lanmon, 2010) Based on review of Site sediment sample results, examination of the aerial photographs, and evaluation of the location of Report sediment samples 2018TLSS13-6, 2018TLSS15-0, and 2018TLSS07-6, the source of metals in these locations is not likely from the Site. Based on examination of the aerial photographs (predominately the 1975 aerial photograph), the source of metals in these samples is likely due to sources unrelated to the Site. Two figures from the Parsons Report have been included as Figures 18 and 19 for reference. The Report has been added to the Administrative Record.

The following outlines the examination of the aerial photographs:

- The 1956 photograph appears to depict the East Ditch draining into Tule Lake through a shallow depositional area on the southwest side. A second drainage area can be observed just north of the juncture of Up River Road and Southern Minerals Road where approximately 2.5 acres of delta sedimentation is observed forming in Tule Lake. Approximately 1,000 feet upstream (south) of this discharge point, tanks, pits, and petroleum production activities near the Site are evident. Oil and gas wells are noted at this location in the Texas Railroad Commission records (TRRC, 2017). Additional inflows to Tule Lake are observed on the north and east of the water body.
- By 1965, a third drainage/depositional area between the East Ditch and Southern Minerals Road was present on the north side of Up River Road, across from the industrial area being developed east of the Site.
- The 1966 aerial photograph showed construction of an apparent enclosed drainage pipe or culvert just north of Southern Minerals Road, with active discharge and expansion of the east depositional area evident in the 1970 photograph. The 1970 aerial photograph shows an increase in the depositional areas in the southern part of Tule Lake from a southwest depositional area associated with the East Ditch, a drainage/depositional area north of the industrial area east of the Site, drainage from the area north of Up River Road northwest of the Site, and drainage/depositional area north of Southern Minerals Road.
- The 1975 aerial photographs show extensive changes in Tule Lake related to dredging activities in the Inner Harbor. Dredge spoils were pumped into two disposal areas in the northeast part of Tule Lake. Tule Lake has become cloudy with suspended sediment with input from the disposal areas and from drainage pipe or culvert just north of Southern Minerals Road. There does not appear to be any cloudiness coming from the Site through the East Ditch.
- By 1980 a large containment area of dredge spoils was created to the west of Tule Lake, with at least some hydraulic communication between the dredge spoils area and Tule Lake as evidenced

by the deposition patterns in Tule Lake. By this time, the northwest drainage ditch was created, channeling surface water and sediment from the properties to the west including an industrial complex and an area with large aboveground storage tanks west of the spoil banks. In 1983 and 1997, additional areas of dredge spoils appeared in the Inner Harbor northwest of the mouth of Tule Lake, which suggests that continued dredging activities may have occurred in the vicinity of Tule Lake during this time period. The 1983 aerial photograph appeared to show drainage into the northwest drainage ditch from the East Ditch, the area of Hunter Road west of the East Ditch, and from upstream. By the 1997 aerial photograph, it appeared that upstream drainage from the northwest drainage ditch was routed underneath a road leading to the dredge spoils area. In the 2000 aerial photograph, it appeared that additional discharge into the northwest drainage ditch was occurring between the Hunter Road and the East Ditch.

2. Written comments submitted by the Boomerang Corporation were received by EPA via electronic mail on December 10, 2019:

Comment: The Boomerang Corporation requests:

- Confirmation that the Selected Remedy requires a vegetated topsoil cap;
- Asphalt or concrete be used as the single-component cap (instead of a soil cap in Selected Alternative 4D) as more compatible with current and potential future uses of the property;
- Clarification that any excavations will be filled; and
- Maintenance of the East Ditch for stormwater runoff control.

EPA Response:
Vegetated Topsoil Cap – Current single component cap construction plans include installation of a vegetated topsoil cap. Coordination with the pipeline operators and onsite businesses is needed for this alternative. The vegetated topsoil cap is protective with a lower risk of damage to pipelines than other single-component cap materials.

Single Component Cap Material – EPA directive, "Considering Reasonably Anticipated Future Land Use and Reducing Barriers to Reuse at EPA-lead Superfund Remedial Sites" OSWER Directive 9355.7-19, describes, "…actions that help ensure the protectiveness of the remedy or are otherwise needed to carry out the cleanup normally should not constitute unauthorized "enhancements. See NCP 300.515(f)." EPA guidance, "Reusing Cleaned Up Superfund Sites: Ecological Use Where Waste is Left on Site" OSWER 9202.1-27-D July 2006, states, "EPA cannot fund, nor require PRPs or others, to fund certain "betterments" or "enhancements" of a remedy. Generally, a prohibited enhancement is an action that is not necessary to support the effectiveness of a remedy in protecting human health or the environment. Examples of actions that typically may not be funded include the installation of lights for a parking lot and the addition of extra clean fill beyond that required to make a remedy protective." Because EPA cannot require the PRPs to fund "betterments" or "enhancements" of a remedy, any additional cost or work above that of the vegetated topsoil cap is prohibited.

Excavation Backfill – One of the "Common Elements" – General improvements such as Site restoration (grading, fill soil, vegetation) identifies grading and fill. This element has been further clarified to indicate that ordinary site restoration includes general grading, fill soil, and revegetation of areas where excavation or earthwork was conducted. Additionally, the description for the surface soil removal in Section 19.2 indicates that the excavated areas would be backfilled with clean soil, with the top 6 inches being of topsoil quality ("topsoil quality" defined by the A soil horizon and able to support vegetational

growth), graded for adequate drainage, and re-vegetated using TXDOT's permanent rural seed mixture from their latest standard specification guidance for the Corpus Christi district.

Maintenance of the East Ditch – The sediment cap now covers the East Ditch for most of the length of the South Pit area. The sediment cap is currently maintained, and the Selected Remedy continues operation and maintenance of the sediment cap. The area covered by the sediment cap is controlled for stormwater runoff. EPA will coordinate with TXDOT so that they can address such maintenance should TXDOT identify that ditch maintenance north or south of the sediment cap is required for stormwater control.

3. Written comments submitted by the Brine Working Group ("BWG'") (sometimes referred to as the "Brine Cooperating Parties"), were received by EPA via electronic mail on December 10, 2019:

Comment: The BWG supports EPA's proposed selection of Alternative 4D. Based on the information presented in the reports approved by EPA for the Brine Site, Alternative 4D was recommended as the alternative that will protect human health and the environment, meet applicable or relevant and appropriate requirements ("ARARs"), and provide the best balance of long-term effectiveness, short-term effectiveness, implementability, and cost effectiveness among the alternatives analyzed. Alternative 4D addresses principal threat waste through a combination of treatment, engineering controls, and institutional controls. The alternative selected also reduces Site air emissions and minimizes construction traffic on local roads.

EPA Response:
EPA thanks the BWG for its comments in support of Alternative 4D.

4. Verbal comments were received at the Proposed Plan public meeting held September 10, 2019:

Comment 4.a:
A public meeting attendee asked which six companies did the RI and FS work. They also asked who will be paying for the cleanup; requesting confirmation that it will not be the taxpayers.

EPA Response:
The following six companies conducted the RI/FS pursuant to the AOC: Anadarko, Conoco Phillips, El Paso Merchant Energy Petroleum Company (represented by Kinder Morgan), Hess Corporation, Sunoco (represented by Evergreen Resources Management Operation), and Texaco (represented by Chevron, Inc.).

EPA works to ensure that potentially responsible parties pay for and conduct the Site cleanup (remedial action). After the ROD is published, EPA will seek to negotiate an agreement with potentially responsible parties for cleanup of the Site in accordance with the ROD. Once an agreement is finalized, cleanup design can start.

Comment 4.b:
A public meeting attendee asked how long it will be before the Site becomes a big issue for the community.

EPA Response:
The Site is located within an industrial corridor. The Site is not expected to impact community/residential receptors. Onsite human health risk was to the outdoor worker and construction worker receptors. The outdoor worker receptor experienced risk for ingestion exposure to onsite and offsite STU groundwater.

While STU has contamination that poses human health risk, Site groundwater flows to the northeast where it enters brackish areas of the Port of Corpus Christi. No Site impacts are indicated south of I-37; hence, there are no Site-related risks to any community areas south of I-37. See Figures 16 and 17 for the groundwater flow direction and the extent of the Site groundwater contamination. Additionally, the Selected Remedy does not require that waste sludge or reworked soil/waste be transported from the site potentially impacting the community along the transportation route.

Comment 4.c:
A public meeting attendee asked if the cap is what reduces water moving though the contaminated material in the South Pit.

EPA Response:
The cap is expected to help reduce infiltration and water moving through the contaminated material in the South Pit and solidification of waste material within the South Pit will also help limit water movement in the South Pit.

Comment 4.d:
A public meeting attendee asked if somebody wanted to put a building in the South Pit area and puts footings and pilings in, which is not abnormal in our soils in this part of Texas, how is that going to fit in there?

EPA Response:
Building on top of the South Pit area is a future reuse scenario. After Site cleanup, ICs, in the form of deed restrictions, will be placed on the property. These ICs will inform future buyers and developers about the contamination and limitations on redevelopment. The remedy, the cap, would need to be protected. Construction workers working in the South Pit area would need to use proper safety protocols for worker safety. Footings and pilings may be possible as long as ICs are met.

Also, if a structure or building is built over any South Pit waste areas, the occupants of that building would need to be protected. A vapor barrier or mitigation system should be installed to limit the potential for contamination vapors from moving into an indoor space.

Comment 4.e:
A public meeting attendee asked if an interested party needs additional time to comment on the Proposed Plan can the comment period be extended.

EPA Response:
Yes, the Proposed Plan comment period can be extended. If an interested party wishes for the agency to consider extending the comment period, they can submit the request in writing. A request was received, and the Proposed Plan comment period was extended for an additional 60 days.

Comment 4.f:
A public meeting attendee asked where they could find subsurface characterization of the Site and characterization of the potential for contamination to migrate.

EPA Response:
The RI Report has information on subsurface characterization of the Site and characterization of the potential for contamination to migrate. During the meeting the EPA RPM described where the attendee could find the report online and that the RI date was July 2018 to help pinpoint the document in the online Administrative Record (AR). The RPM also indicated that the report is part of the AR and that a copy of the AR was located in the Site Repository at the library where the Proposed Plan public meeting was being held.

22.2 Technical and Legal Issues

There are no outstanding technical or legal issues for the Selected Remedy.

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APPENDIX A TABLES

Table 1A: Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil and Subsurface Soil

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
South Pit Exposure Area	Arsenic	0.766 J	94.5	mg/kg	118/118	11.58	mg/kg	95% Chebyshev UCL
	Heptachlor epoxide[2]	0.0084 J	0.79 J	mg/kg	11/108	0.79	mg/kg	Max

Key
95% UCL: 95 percent upper confidence limit
J: Estimated value
Mg/kg: milligram/kilogram
Max: Maximum detected concentration
[2]The maximum concentration is used when the frequency of the detection is less than 20 percent and/or the estimated UCL is below the arithmetic mean of the detected analytical results

Table 1B: Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater (Class 3)

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
On-Site Groundwater UTU South Pit Exposure Area	Arsenic	0.0829	2.4	mg/l	7/7	2.4	mg/l	Max
	alpha-BHC	0.0075	0.0075	mg/l	1/6	0.0075	mg/l	Max
	Dieldrin	0.0049	0.0049	mg/l	1/6	0.0049	mg/l	Max
	Benzene	0.0019	5.8	mg/l	7/7	5.8	mg/l	Max
	3&4-Methylphenol	0.0026	57	mg/l	7/7	57	mg/l	Max

Key
Mg/l: milligram/liter
Max: Maximum Concentration

Table 1C: Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Air (Inhalation)

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
On-Site Groundwater UTU South Pit Exposure Area	Benzene	0.0019	5.8	mg/l	7/7	5.8	mg/l	Max

Key
Mg/l: milligram/liter
Max: Maximum Concentration

Table 1D: Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water Use

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
On-Site Groundwater STU South Pit Exposure Area	Arsenic	0.00377 J	0.0177	mg/l	8/8	0.0177	mg/l	Max

Key
J: Estimated value
Mg/l: milligram/liter
Max: Maximum Concentration

Table 1E: Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current/Future
Medium: Surface Groundwater
Exposure Medium: Groundwater (Class 3)

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
Off-Site Exposure Area UTU	Benzene	0.00247	3.5	mg/l	4/6	3.5	mg/l	Max

Key
Mg/l: milligram/liter
Max: Maximum Concentration

Table 1F: Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water Use

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
Off-Site Exposure Area STU	Arsenic	0.00561	0.0105	mg/l	3/3	0.105	mg/l	Max
	Heptachlor expoxide	0.0000022	0.00019	mg/l	2/3	0.00019	mg/l	Max
	Benzene	0.05	0.05	mg/l	1/3	0.05	mg/l	Max
	Ethylbenzene	0.058	0.058	mg/l	1/3	0.058	mg/l	Max

Key
Mg/l: milligram/liter
Max: Maximum Concentration

Table 2A: Values Used in Risk Assessment

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route/ Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Equation
Ingestion/ Outdoor Worker	Adult	On-site groundwater – STU tap water use	CGW	Chemical concentration in groundwater	Site-Specific	mg/l	Intake (mg/kg/day) = CGW x IRW x EF x ED / (BW x AT)
			IRW	Ingestion rate of water	1	L/day	
			EF	Exposure frequency	250	days/year	
			ED	Exposure duration	25	years	
			BW	Body weight	70	kg	
			AT-NC	Averaging time–noncancer effects	9125	days	
			AT-C	Averaging time-cancer effects	25550	days	

References:
USEPA, 1989. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response. Washington, DC. December.
USEPA, 1991a. Risk Assessment Guidance for Superfund: Volume 1: Human Health Evaluation Manual (Part B), Development of Risk-Based Preliminary Remediation Goals. Interim. Washington, DC. December.
USEPA, 1991b. Risk Assessment Guidance for Superfund: Volume 1: Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors. Interim Final Washington, DC. OSWER Directive 9285.6-03. April.
USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response. December.
USEPA, 2004. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E) Supplemental Guidance for Dermal Risk Assessment. Office of Emergency and Remedial Response. Washington, DC.

Table 2B: Values Used in Risk Assessment

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Outdoor Air, Vapors

Exposure Route/ Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Equation
Inhalation/ Outdoor Worker	Adult	On-site groundwater – UTU vapors from groundwater	CAIR	Chemical concentration in air	Site-Specific	mg/m^3	$EC\ (mg/m^3) = CAIR \times ET \times EF \times ED / AT$
			CGW	Chemical concentration in groundwater	Site-Specific	mg/L	
			ET	Exposure Time	8	hr/day	EC = Exposure Concentration
			EF	Exposure frequency	250	days/year	
			ED	Exposure duration	25	years	$CAIR\ (mg/m^3) = CGW \times VFWAMB$
			AT-NC	Averaging time–noncancer effects	219000	hours	
			AT-C	Averaging time-cancer effects	613200	hours	
			VFWAMB	Volatilization factor, groundwater to ambient air	Chem.Specific	L/m^3	$VFWAMB\ [(mg/m^3 – air) / (mg/L – H2O)] = H' / 1 + [(UAIR \times \delta AIR \times LGW) / (WG \times DEFFWS)] \times [10^3 \times L/m^3]$
			H'	Henry's Law constant	Chem.Specific	unitless	
			UAIR	Windspeed above ground surface in ambient	$2.4x10^2$	cm/s	$DEFFWS\ [cm^2 / s] = (HCAP + HV) \times [HCAP / DEFFCAP + HV / DEFFS]^{-1}$
			DAIR	Ambient air mixing zone height	200	cm	
			LGW	Depth to groundwater, LGW = HCAP + HV	300	cm	
			HCAP	Thickness of capillary fringe	5	cm	$DEFFCAP\ [cm^2/s] = DAIR \times \theta ACAP^{3.33} / \theta T^2 + [DW / H'] \times [\theta WCAP^{3.33} / \theta T^2]$
			HV	Thickness of vadose zone	295	cm	
			WG	Width of GW source in the direction of the closest off-site property line (30-acre default)	34800	cm	
			DEFFWS	Effective diffusivity above water table	Chem.Specific	cm^2/s	$DEFFS\ [cm^2/s] = DAIR \times \theta AS^{3.33} / \theta T^2 + [DW / H'] \times [\theta WS^{3.33} / \theta T^2]$
			DEFFCAP	Effective diffusivity in the capillary fringe	Chem.Specific	cm^2/s	
			DEFFS	Effective diffusivity in the vadose zone soils	Chem.Specific	cm^2/s	
			θACAP	Volumetric air content of capillary fringe soils	0.037	cm^3-air/cm^3-soil	
			θWCAP	Volumetric water content of capillary fringe soils	0.333	cm^3-H2O/cm^3-soil	
			θAS	Volumetric air content in vadose zone soils	0.21	cm^3-air/cm^3-soil	
			θWS	Volumetric water content in vadose zone soils	0.16	cm^3-H2O/cm^3-soil	
			θT	Total soil porosity	0.37	cm^3-pore-space/cm^3-soil	
			DW	Chemical diffusivity in water	Chem.Specific	cm^2/s	

References:
TCEQ, 2007a. Texas Risk Reduction Program (TRRP) Rule, 30 Texas Administrative Code (TAC) 350. Effective August 17, 2000.
USEPA, 1991a. Risk Assessment Guidance for Superfund: Volume 1: Human Health Evaluation Manual (Part B), Development of Risk-Based Preliminary Remediation Goals. Interim. Washington, DC. December.
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USEPA, 2004. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E) Supplemental Guidance for Dermal Risk Assessment. Office of Emergency and Remedial Response. Washington, DC.
USEPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F) Supplemental Guidance for Inhalation Risk Assessment. OSWR 9285.7-82. Washington, DC. January.

Table 2C: Values Used in Risk Assessment

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route/ Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Equation
Ingestion/ Outdoor Worker	Adult	Off-site groundwater – STU tap water use	CGW IRW EF ED BW AT-NC AT-C	Chemical concentration in groundwater Ingestion rate of water Exposure frequency Exposure duration Body weight Averaging time–noncancer effects Averaging time-cancer effects	Site-Specific 1 250 25 70 9125 25550	mg/L L/day days/year years kg days days	Intake (mg/kg/day) = CGW x IRW x EF x ED / (BW x AT)

References:
USEPA, 1989. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response. Washington, DC. December.
USEPA, 1991a. Risk Assessment Guidance for Superfund: Volume 1: Human Health Evaluation Manual (Part B), Development of Risk-Based Preliminary Remediation Goals. Interim. Washington, DC. December.
USEPA, 1991b. Risk Assessment Guidance for Superfund: Volume 1: Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors. Interim Final Washington, DC. OSWER Directive 9285.6-03. April.
USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response. December.
USEPA, 2004. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E) Supplemental Guidance for Dermal Risk Assessment. Office of Emergency and Remedial Response. Washington, DC.

Table 2D: Values Used in Risk Assessment

Scenario Timeframe: Current/Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil

Exposure Route/ Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Equation
Ingestion/ Construction Worker	Adult	On-site surface and subsurface soil 0-10 feet bgs	CSOIL IRSOIL FISOIL EF ED BW AT-NC AT-C	Chemical concentration in soil Ingestion rate of soil Fraction ingested, soil Exposure frequency Exposure duration Body weight Averaging time–noncancer effects Averaging time-cancer effects	Site-Specific 330 1 60 1 70 365 25550	mg/kg mg/day unitless days/year years kg days days	Intake (mg/kg/day) = CSOIL x IRSOIL x FI x EF x ED X 10^{-6} / (BW x AT)
Dermal/ Construction Worker	Adult	On-site surface and subsurface soil 0-10 feet bgs	CSOIL AF ABSD EF ED EV SAS BW AT-NC AT-C	Chemical concentration in soil Adherence factor of soil to skin Dermal absorption fraction Exposure frequency Exposure duration Event frequency Skin surface area available for contact soil Body weight Averaging time–noncancer effects Averaging time-cancer effects	Site-Specific 0.3 Chem.Specific 60 1 1 3300 70 365 25550	mg/kg mg/cm^2-event unitless days/year years events/day cm^2 kg days days	DAD(mg/kg – day) = DAevent x EF x ED x EV x SA / BW x AT DAevent(mg/cm^2 – event) = CSOIL x AF x ABSD x 10^{-6} kg/mg DAD = Dermal Adsorbed Dose DAevent = Absorbed dose per event

References:
USEPA, 1989. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response. Washington, DC. December.
USEPA, 1997. Exposure Factors Handbook. EPA/600/P-95/002Fa. Office of Research and Development. Washington, DC. August.
USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response. December
USEPA, 2004. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E) Supplemental Guidance for Dermal Risk Assessment. Office of Emergency and Remedial Response. Washington, DC.

Table 2E: Values Used in Risk Assessment

Scenario Timeframe: Current/Future
Medium: Surface and Subsurface Soil
Exposure Medium: Outdoor Air, Vapors and particulates

Exposure Route/ Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Equation
Inhalation/ Construction Worker	Adult	On-site outdoor air vapors and particulates 0-10 feet bgs	CAIR	Chemical concentration in air	Site-Specific	mg/m^3	$EC\ (mg/m^3) = CAIR \times ET \times EF \times ED / AT$
			CSOIL	Chemical concentration in soil	Site-Specific	mg/kg	
			ET	Exposure time	8	hr/day	
			EF	Exposure frequency	60	days/year	EC = Exposure Concentration
			ED	Exposure duration	1	years	
			AT-NC	Averaging time–noncancer effects Averaging	8760	hours	$CAIR(mg/m^3) = CSOIL / VFS + PEF$
			AT-C	time-cancer effects	613200	hours	
			PEF	Particulates emissions factor	Site-Specific	m^3/kg	$PEF\ (m^3/kg) = Q/CWIND \times 3{,}600\ s/h / (0.036 \times)1\text{-}V) \times (UM/UT) \times F(X)$
			Q/CWIND	Inverse of mean concentration in air at center of affected soil area (30-acre default)	40.76	g/m^2-s per kg/m^3	
			V	Fraction of vegetative cover	0.5	unitless	$VFZ((m3/kg) = Q/CVOL \times (3.14 \times DA \times T)^{1/2} \times 10^{-4} m^2/cm^2$
			UM	Mean annual windspeed	4.8	m/s	
			UT	Equivalent threshold value of windspeed at 7m	11.32	m/s	
			F(X)	Function dependent on UM/UT	0.22	unitless	$DA(cm2/s) = \theta A^{10/3} \times DI \times H' + \theta W^{10/3} \times DW) / n2 \times (PB \times KD + \theta W + \theta A \times H')$
			VFS	Volatilization factor, soil to ambient air	Chem.Specific	m^3/kg	
			Q/CVOL	Inverse of mean concentration in air at center of affected soil area (30-acre default)	40.76	g/m^2-s per kg/m^3	
			T	Exposure interval	9.5×10^8	s	
			PB	Dry soil bulk density	1.67	g/cm^3	
			DA	Apparent diffusivity	Chem.Specific	cm^2/s	
			θA	Air-filled soil porosity (LAIR/LSOIL)	0.21	cm^3-air/cm^3-soil	
			DI	Chemical diffusivity in air	Chem.Specific	cm^2/s	
			H'	Henry's Law constant	Chem.Specific	unitless	
			θW	Water-filled soil porosity (LWATER/LSOIL)	0.16	cm^3-H2O/cm^3-soil	
			DW	Chemical diffusivity in water	Chem.Specific	cm^2/s	
			N	Total soil porosity	0.37	cm^3-pore space/cm^3-soil	
			KD	Soil organic carbon partition coefficient, for organics, KD = KOC x FOC	Chem.Specific	cm^3-water/g-soil	
			KOC	Soil organic carbon-water partition coefficient	Chem.Specific	cm^3-water/g-carbon	
			FOC	Fraction organic carbon in soil	0.008	g-carbon/g-soil	

References:
TCEQ, 2007a. Texas Risk Reduction Program (TRRP) Rule, 30 Texas Administrative Code (TAC) 350. Effective August 17, 2000.
USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response. December.
USEPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F) Supplemental Guidance for Inhalation Risk Assessment. OSWR 9285.7-82. Washington, DC. January.

Table 2F: Values Used in Risk Assessment

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route/ Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Equation
Ingestion/ Construction Worker	Adult	On-site groundwater – UTU trench scenario	CGW	Chemical concentration in groundwater	Site-Specific	mg/L	Intake (mg/kg/day) = CGW x IRW x ET x EF x ED / (BW x AT)
			IRW	Ingestion rate of water	0.05	L/hr	
			ET	Exposure time	8	hr/day	
			EF	Exposure frequency	60	days/year	
			ED	Exposure duration	1	years	
			BW	Body weight	70	kg	
			AT-NC	Averaging time–noncancer effects Averaging time-	365	days	
			AT-C	cancer effects	25550	days	
Dermal/ Construction Worker	Adult	On-site groundwater – UTU trench scenario > 10 feet bgs	CGW	Chemical concentration in groundwater	Site-Specific	mg/L	DAD(mg/kg-day) = DAevent x EF x ED x EV x SA / (BW x AT) *DAevent is f (KP, TAU-EVENT, T-EVENT, B, …)
			FA	Fraction absorbed water	Chem.Specific	unitless	
			KP	Dermal permeability coefficient of compound in water	Chem.Specific	cm/hr	
			TAU-EVENT	Lag time per event	Chem.Specific	hours/event	
			T-EVENT	Event duration	8	hours/event	
			B	Dimensionless ratio of KP through stratum corneum	Chem.Specific	unitless	
			EF	Exposure frequency	60	days/year	
			ED	Exposure duration	1	years	
			EV	Event frequency	1	events/day	
			SAW	Skin surface area available for contact with water	3300	cm^2	
			BW	Body weight	70	kg	
			AT-NC	Averaging time–noncancer effects	365	days	
			AT-C	Averaging time-cancer effects	25550	days	

References:
USEPA, 1989. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response. Washington, DC. December.
USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response. December.
USEPA, 2004. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E) Supplemental Guidance for Dermal Risk Assessment. Office of Emergency and Remedial Response. Washington, DC.
*See Appendix H-2 of the Baseline Human Health Risk Assessment for the derivation of DAevent

Table 2G: Values Used in Risk Assessment

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Outdoor Air, Vapors

Exposure Route/ Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Equation
Inhalation/ Construction Worker	Adult	On-site groundwater – UTU trench scenario > 10 feet bgs	CTRENCH	Chemical concentration in air in trench	Site-Specific	mg/m^3	$EC(mg/m^3) = CTRENCH \times ET \times EF \times ED / AT$
			CGW	Chemical concentration in groundwater	Site-Specific	mg/L	
			ET	Exposure time	8	hr/day	
			EF	Exposure frequency	60	days/year	EC = Exposure Concentration
			ED	Exposure duration	1	years	
			AT-NC	Averaging time–noncancer effects	8760	hours	$CTRENCH(mg/m^3) = CGW \times VFTRENCH$
			AT-C	Averaging time-cancer effects	613200	hours	
			VFTRENCH	Volatilization factor in a trench	Chem.Specific	L/m^3	
			KI	Overall mass transfer of coefficient of contaminant	Chem.Specific	cm/s	$VFTRENCH = KI \times A \times F \times 10^{-3} \times 10^4 \times 3600 / (ACH \times V)$
			A	Area of trench	$2.23x10^0$	m^2	
			F	Fraction of floor through which the contaminant can enter	1	unitless	$KIL = (MWO2 / MWI)^{0.5} \times T / 298 \times KL \times O2$
			ACH	Air changes per hour	360	h-1	
			V	Volume of trench	$6.8x10^0$	m^3	$KIG = (MWH2O / MWI)^{0.335} \times (T / 298)^{1.005} \times KG \times H2O$
			KIL	Liquid-phase mass transfer coefficient	Chem.Specific	cm/s	
			R	Ideal gas constant	0.000082	$atm\text{-}m^3/mole\text{-}K$	
			T	Average system absolute temperature	298	K	
			H'	Henry's Law constant	Chem.Specific	$atm\text{-}m^3/mole$	
			KIG	Gas-phase mass transfer coefficient	Chem.Specific	cm/s	
			MWO2	Molecular weight of oxygen	32	g/mol	
			MWI	Molecular weight of contaminant	Chem.Specific	g/mol	
			KLO2	Liquid-phase mas transfer coefficient of oxygen at 25°C	0.002	cm/s	
			MWH2O	Molecular weight of water	18	g/mol	
			KGH20	Gas-phase mass transfer coefficient of water vapor at 25°C	0.833	cm/s	

References:
USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response. December.
USEPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F) Supplemental Guidance for Inhalation Risk Assessment. OSWR 9285.7-82. Washington, DC. January.
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http://www.deq.virginia.gov/Programs/LandProtectionRevitalization/RemediationPrograms/VoluntaryRemediationProgram/VRPRiskAssessmentGuidance/Guidance.aspx

Table 2H: Values Used in Risk Assessment

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route/ Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Equation
Ingestion/ Construction Worker	Adult	Off-site groundwater – UTU trench scenario > 10 feet bgs	CGW IRW ET EF ED BW AT-NC AT-C	Chemical concentration in groundwater Ingestion rate of water Exposure time Exposure frequency Exposure duration Body weight Averaging time–noncancer effects Averaging time-cancer effects	Site-Specific 0.05 8 60 1 70 365 25550	mg/L L/hr hr/day days/year years kg days days	Intake (mg/kg/day) = CGW x IRW x ET x EF x ED / (BW x AT)
Dermal/ Construction Worker	Adult	Off-site groundwater – UTU trench scenario > 10 feet bgs	CGW FA KP TAU-EVENT T-EVENT B EF ED EV SAW BW AT-NC AT-C	Chemical concentration in groundwater Fraction absorbed water Dermal permeability coefficient of compound in water Lag time per event Event duration Dimensionless ratio of KP through stratum corneum Exposure frequency Exposure duration Event frequency Skin surface area available for contact with water Body weight Averaging time–noncancer effects Averaging time-cancer effects	Site-Specific Chem.Specific Chem.Specific Chem.Specific 8 Chem.Specific 60 1 1 3300 70 365 25550	mg/L unitless cm/hr hours/event hours/event unitless days/year years events/day cm^2 kg days days	DAD(mg/kg-day) = DAevent x EF x ED x EV x SA / (BW x AT) *DAevent is f (KP, TAU-EVENT, T-EVENT, B, …)

References:
USEPA, 1989. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response. Washington, DC. December.
USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response. December.
USEPA, 2004. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E) Supplemental Guidance for Dermal Risk Assessment. Office of Emergency and Remedial Response. Washington, DC.
*See Appendix H-2 of the Baseline Human Health Risk Assessment for the derivation of DAevent

Table 2I: Values Used in Risk Assessment

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Outdoor Air, Vapors

Exposure Route/ Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Equation
Inhalation/ Construction Worker	Adult	Off-site groundwater – UTU trench scenario > 10 feet bgs	CTRENCH	Chemical concentration in air in trench	Site-Specific	mg/m^3	$EC(mg/m^3)$ = CTRENCH x ET x EF x ED / AT
			CGW	Chemical concentration in groundwater	Site-Specific	mg/L	
			ET	Exposure time	8	hr/day	
			EF	Exposure frequency	60	days/year	
			ED	Exposure duration	1	years	EC = Exposure Concentration
			AT-NC	Averaging time–noncancer effects	8760	hours	
			AT-C	Averaging time-cancer effects	613200	hours	
			VFTRENCH	Volatilization factor in a trench	Chemical Specific	L/m^3	$CTRENCH(mg/m^3)$ = CGW x VFTRENCH
			KI	Overall mass transfer of coefficient of contaminant	Chemical Specific	cm/s	
			A	Area of trench	$2.23x10^0$	m^2	
			F	Fraction of floor through which the contaminant can enter	1	unitless	VFTRENCH = KI x A x F x 10^{-3} x 10^4 x 3600 / (ACH x V)
			ACH	Air changes per hour	360	h-1	
			V	Volume of trench	$6.8x10^0$	m^3	
			KIL	Liquid-phase mass transfer coefficient	Chemical Specific	cm/s	
			R	Ideal gas constant	0.000082	$atm-m^3/mole-K$	KIL = $(MWO2 / MWI)^{0.5}$ x T / 298 x KL x O2
			T	Average system absolute temperature	298	K	
			H’	Henry’s Law constant	Chemical Specific	$atm-m^3/mole$	
			KIG	Gas-phase mass transfer coefficient	Chemical Specific	cm/s	
			MWO2	Molecular weight of oxygen	32	g/mol	KIG = $(MWH2O / MWI)^{0.335}$ x $(T / 298)^{1.005}$ x KG x H2O
			MWI	Molecular weight of contaminant	Chemical Specific	g/mol	
			KLO2	Liquid-phase mas transfer coefficient of oxygen at 25°C	0.002	cm/s	
			MWH2O	Molecular weight of water	18	g/mol	
			KGH20	Gas-phase mass transfer coefficient of water vapor at 25°C	0.833	cm/s	

References:
USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response. December.
USEPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F) Supplemental Guidance for Inhalation Risk Assessment. OSWR 9285.7-82. Washington, DC. January.
VDEQ, 2012. Voluntary Remediation Program Risk Assessment Guidance. Available online at:
http://www.deq.virginia.gov/Programs/LandProtectionRevitalization/RemediationPrograms/VoluntaryRemediationProgram/VRPRiskAssessmentGuidance/Guidance.aspx

Table 3A Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Chemical of Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal ABS_{GI}	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s)
alpha BHC	6.30E+00	$(mg/kg\text{-}day)^{-1}$	9.70E-01	6.30E+00	$(mg/kg\text{-}day)^{-1}$	B2	I	4/27/2020
Arsenic	1.50E+00	$(mg/kg\text{-}day)^{-1}$	9.50E-01	1.50E+00	$(mg/kg\text{-}day)^{-1}$	A	I	4/27/2020
Benzene	5.50E-02	$(mg/kg\text{-}day)^{-1}$	9.70E-01	5.50E-02	$(mg/kg\text{-}day)^{-1}$	A	I	4/27/2020
Dieldrin	1.60E+01	$(mg/kg\text{-}day)^{-1}$	5.00E-01	1.60E-01	$(mg/kg\text{-}day)^{-1}$	B2	I	4/27/2020
Ethylbenzene	1.10E-02	$(mg/kg\text{-}day)^{-1}$	9.70E-01	1.10E-02	$(mg/kg\text{-}day)^{-1}$	D	CAL	4/27/2020
Heptachlor Epoxide	9.10E+00	$(mg/kg\text{-}day)^{-1}$	7.20E-01	9.10E+00	$(mg/kg\text{-}day)^{-1}$	B2	I	4/27/2020

Pathway: Inhalation

Chemical of Concern	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/ Cancer Guideline description	Unit Risk: Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s)
alpha BHC	1.80E-03	$(\mu g/m^3)^{-1}$	6.30E+00	$(mg/kg\text{-}day)^{-1}$	B2	I	4/27/2020
Arsenic	4.30E-03	$(\mu g/m^3)^{-1}$	1.52E+01	$(mg/kg\text{-}day)^{-1}$	A	I	4/27/2020
Benzene	7.80E-06	$(\mu g/m^3)^{-1}$	2.73E-02	$(mg/kg\text{-}day)^{-1}$	A	I	4/27/2020
Dieldrin	4.60E-03	$(\mu g/m^3)^{-1}$	1.61E+01	$(mg/kg\text{-}day)^{-1}$	B2	I	4/27/2020
Heptachlor Epoxide	2.60E-03	$(\mu g/m^3)^{-1}$	9.10E+00	$(mg/kg\text{-}day)^{-1}$	B2	I	4/27/2020

Key:
I=IRIS
CAL= CAL EPA

Table 3B Non-Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Chemical of Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal ABS_{GI}	Absorbed RfD for Dermal		Primary Target Organ	Combined Uncertainty/ Modifying Factors	RfD: Target Organs	
		Value	Units		Value	Units			Source (s)	Date(s)
Arsenic	Chronic	3.00E-04	mg/kg-day	9.50E-01	3.00E-04	mg/kg-day	Vascular system/Skin	3	I	4/20/2020
Benzene	Chronic	4.00E-03	mg/kg-day	9.70E-01	4.00E-03	mg/kg-day	Blood	300	I	4/20/2020
Methylphenol3&4	Chronic	5.00E-03	mg/kg-day	5.00E-01	5.00E-03	mg/kg-day	Nervous and Respiratory system, body weight	1000	H	4/21/2020

Pathway: Inhalation

Chemical of Concern	Chronic/Subchronic	Inhalation RfC		Extrapolated RfD		Primary Target Organ	Combined Uncertainty/ Modifying Factors	RfC: Target Organs	
		Value	Units	Value	Units			Source(s)	Date(s)
Arsenic	Chronic	1.50E-05	mg/m^3	4.29E-06	mg/kg-day	Developmental, cardiovascular, nervous system	30	CAL	4/20/2020
Benzene	Chronic	3.00E-02	mg/m^3	8.57E-03	mg/kg-day	Blood	300	I	4/20/2020
Methylphenol 3&4	Chronic	6.01E-01	mg/m^3	1.71E-01	mg/kg-day	Nervous system	300	CAL	4/21/2020

Key:
I=IRIS
CAL=CAL EPA
H=HEAST

Table 4A: Risk Characterization Summary – Carcinogens

Scenario Timeframe: Current, Future
Receptor Population: Outdoor Worker, South Pit Exposure Area
Receptor Age: Adult
Evaluation Type: Reasonable Maximum Exposure

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes
South Pit Exposure Area - UTU	Groundwater	Vapors	Benzene	N/A	1.8E-06	N/A	1.8E-06
						South Pit Exposure Area – UTU Total =	1.8E-06
South Pit Exposure Area - STU	Groundwater	Tap Water	Arsenic	9.3E-05	N/A	N/A	9.3E-05
						South Pit Exposure Area – STU Total =	9.3E-05
Surface Soil	Surface Soil	South Area	Arsenic	1.4E-06	3.9E-09	5.5E-07	1.9E-06
			Heptachlor epoxide	5.2E-07	1.5E-10	6.9E-07	1.2E-06
						Surface Soil Total =	3.2E-06
Waste	Waste	Waste	Benzene	N/A	9.8E-06	N/A	9.8E-06
						Waste Total =	9.8E-06
						Total Risk =	1.1E-04

Key
N/A: Route of exposure is not applicable to this medium
Outdoor Worker: assumed to be exposed to surface soil

Table 4B: Risk Characterization Summary – Carcinogens

Scenario Timeframe: Current, Future
Receptor Population: Construction Worker, South Pit Exposure Area
Receptor Age: Adult
Evaluation Type: Reasonable Maximum Exposure

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes
South Pit Exposure Area - UTU	Groundwater in Trench	Groundwater in Trench	Arsenic	4.8E-05	N/A	3.2E-06	5.1E-05
			alpha-BHC	6.3E-07[7]	4.1E-08	2.1E-06	2.8E-06
			Dieldrin	1.1E-06	8.1E-08	2.5E-06	3.6E-06
			Benzene	4.3E-06	1.5E-06	4.4E-06	1.0E-05
			3&4-Methylphenol	N/A	N/A	N/A	N/A
						South Pit Exposure Area – UTU Total =	6.8E-05
						Total Risk =	6.8E-05

Key
N/A: Route of exposure is not applicable to this medium
Construction Worker: assumed to be working at a depth of 10-feet below ground surface (bgs)

Table 4C: Risk Characterization Summary – Carcinogens

Scenario Timeframe: Current, Future
Receptor Population: Outdoor Worker, Off-Site Exposure Area
Receptor Age: Adult
Evaluation Type: Reasonable Maximum Exposure

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes
Off-Site Exposure Area - STU	Groundwater	Tap Water	Arsenic	5.5E-04	N/A	N/A	5.5E-04
			Heptachlor epoxide	6.0E-06	N/A	N/A	6.6E-06
			Benzene	9.6E-06	N/A	N/A	9.6E-06
			Ethylbenzene	2.2E-06	N/A	N/A	2.2E-06
						Off-Site Exposure Area – STU Total =	5.7E-04
						Total Risk =	5.7E-04

Key
N/A: Route of exposure is not applicable to this medium
Outdoor Worker: assumed to be exposed to surface soil

Table 4D: Risk Characterization Summary – Carcinogens

Scenario Timeframe: Current, Future
Receptor Population: Construction Worker, Off-Site Exposure Area
Receptor Age: Adult
Evaluation Type: Reasonable Maximum Exposure

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes
Off-Site Exposure Area - UTU	Groundwater in Trench	Groundwater in Trench	Benzene	2.6E-06	8.9E-07	2.6E-06	6.1E-06
						Off-Site Exposure Area – UTU Total =	6.1E-06
						Total Risk =	6.1E-06

Key
N/A: Route of exposure is not applicable to this medium
Construction Worker: assumed to be working at a depth of 10-feet below ground surface (bgs)

Table 4E: Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current, Future
Receptor Population: Construction Worker, South Pit Exposure Area
Receptor Age: Adult
Evaluation Type: Reasonable Maximum Exposure

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes
South Pit Exposure Area - UTU	Groundwater in Trench	Groundwater in Trench	Arsenic	Vascular system/Skin	7.5E+00	N/A	5.0E-01	8.0E+00
			alpha-BHC	Liver	8.8E-04	N/A	2.9E-03	3.8E-03
			Dieldrin	Liver	9.2E-02	N/A	2.2E-01	3.1E-01
			Benzene	Blood	1.4E+00	4.4E-01	1.4E+00	3.2E+00
			3&4-Methylphenol	CNS/Respiratory/Whole body	1.1E+01	2.5E-03	5.9E+00	1.7E+01
				Chemical Total =	2.0xE+01	4.4E-01[1]	8.0E+00	2.8E+01
				South Pit Exposure Area – UTU Total =				2.8E+01
				Total Risk =				2.8E+01

Key
N/A: Route of exposure is not applicable to this medium
Construction Worker: assumed to be working at a depth of 10-feet below ground surface (bgs)

Table 4F: Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current, Future
Receptor Population: Outdoor Worker, Off-Site Exposure Area
Receptor Age: Adult
Evaluation Type: Reasonable Maximum Exposure

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes
Off-Site Exposure Area - STU	Groundwater	Tap Water	Arsenic	Vascular system/Skin	3.4E+00	N/A	N/A	3.4E+00
			Heptachlor epoxide	Liver	1.4E-01	N/A	N/A	1.4E-01
			Benzene	Blood	1.2E-01	N/A	N/A	1.2E-01
			Ethylbenzene	Liver/Kidney	5.7E-03	N/A	N/A	5.7E-03
				Chemical Total =	3.4E+00	0.0E+00	0.0E+00	3.7E+00
				Off-Site Exposure Area – STU Total =				3.7E+00
				Total Risk =				3.7E+00

Key
N/A: Route of exposure is not applicable to this medium
Outdoor Worker: assumed to be exposed to surface soil

Table 4G: Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current, Future
Receptor Population: Construction Worker, Off-Site Exposure Area
Receptor Age: Adult
Evaluation Type: Reasonable Maximum Exposure

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes
Off-Site Exposure Area - UTU	Groundwater in Trench	Groundwater in Trench	Benzene	Blood	8.2E-01	2.7E-01	8.4E-01	1.9E+00
				Chemical Total =	8.2E-01	2.7E-01	8.4E-01	1.9E+00
							Off-Site Exposure Area - UTU risk total=	1.9E+00
							Total Risk=	1.9E+00

Key
Construction Worker: assumed to be working at a depth of 10-feet below ground surface (bgs)

Table 5 Summary of Location-Specific ARARs

ARAR	Regulatory Citation	A / R&A	Description
Cultural Resources			
Historic/Cultural Resources	Executive Order 11593; 16 USC 470 40 CFR 6.301	No	Establishes requirements for the identification and preservation of historic and cultural resources. No historic or cultural resources were identified by the State Historic Preservation Officer.
Floodplain and Wetlands Protection			
Statement of Procedures on Floodplain Management and Wetlands Protection	Executive Order 11990; 40 CFR 6.302 / Appendix A	A	Activities should avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid new construction in wetlands if a practicable alternative exists. The East Ditch appears on the National Wetlands Inventory and is classified as riverine, unknown perennial, unconsolidated bottom (R5UBH) (USFWS, 2017).
Section 404(b)(1) Guidelines for the Specification of Disposal Sites for Dredged or Fill Material	40 CFR 230	A	Designates procedures for the protection of wetlands including the evaluation of sites and the issuance of General Permits. The East Ditch appears on the National Wetlands Inventory and is classified as riverine, unknown perennial, unconsolidated bottom (R5UBH) (USFWS, 2017).
Floodplain Management	Executive Order 11988; 40 CFR 6.302 / Appendix A	A	Actions should avoid, to the extent possible, adverse effects associated with direct and indirect development of a floodplain. If newly constructed structures or facilities are to be located in a floodplain, accepted flood proofing and other flood protection measures shall be undertaken. To achieve flood protection, EPA shall, wherever practicable, elevate structures above the base flood level rather than filling land. The 2015 preliminary FIRM Panel 4835C0285G shows an area of the East Ditch extending approximately 250 feet south of Up River Road in Zone AE (1% annual chance of flood). The segment from approximately 250 feet south of Up River Road to approximately 1050 feet south of Up River Road is Zone X (0.2% annual chance of flood). The remainder of the East Ditch and the portion of the Site south of Lot 4 is in Zone X (FEMA, 2015).
Location Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	40 CFR 264.18	A	A facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood. Standard would serve as an ARAR for treatment units. The 2015 preliminary FIRM Panel 4835C0285G shows an area of the East Ditch extending approximately 250 feet south of Up River Road in Zone AE (1% annual chance of flood). The segment from approximately 250 feet south of Up River Road to approximately 1050 feet south of Up River Road is Zone X (0.2% annual chance of flood). The remainder of the East Ditch and the portion of the Site south of Lot 4 is in Zone X (FEMA, 2015).
Protected Species			
Endangered and Threatened Wildlife and Plants	50 CFR 17 40 CFR 6.302	No	Identifies those species of wildlife and plants determined to be endangered or threatened with extinction and also carry over the species and subspecies of wildlife designated as endangered under the Endangered Species Conservation Act of 1969. Statute requires that proposed actions minimize effects on endangered species and requires coordination with federal and state agencies to provide adequate protection of fish and wildlife resources. No endangered or threatened species are known to utilize the Site for foraging or nesting.
Designated Critical	50 CFR 226.101	No	Identifies habitats designated as critical for endangered and threatened species. No portions of the Site are listed

ARAR	Regulatory Citation	A / R&A	Description
Habitat	to 226 213		as critical habitats.
Threatened and Endangered Nongame Species	31 TAC 65.175	A	Describes provisions for protection of threatened and endangered species and provides list of state threatened species. Three protected bird species and one snake protected species were identified from the Nueces county listing and potentially be present based on-Site characteristics. The SLERA determined these species are not at risk from COPCs.
Resource Protection	31 TAC 69 Subchapter A	No	Describes provisions for protection of threatened and endangered plants and provides list of threatened and endangered plants. No threatened or endangered plants exist onsite.
Surface Water			
Texas Surface Water Quality Standards (Site-Specific Uses and Criteria)	30 TAC 307.7 / Appendix A	A	Sets surface water quality standards for Segment 2484 (Corpus Christi Inner Harbor). Serves as an ARAR to the extent that water is discharged from the Site during the remedial action and after completion of the remedial action.

ARAR – Applicable or relevant and appropriate requirements
CFR – Code of Federal Regulations
TAC – Texas Administrative Code

A – Applicable
R&A – Relevant and Appropriate

State regulations are not included in this table if they are referencing federal regulations.

Table 6 Summary of Chemical-Specific ARARs

ARAR	Regulatory Citation	A / R&A	Description
Air			
National Primary and Secondary Ambient Air Quality Standards	40 CFR 50.4, 50.6, 50.8, 50.9, 50.11, 50.12	A	National Ambient Air Quality Standards (NAAQS) define levels of air quality to protect the public health or the public welfare from any known or anticipated adverse effects of a federally regulated pollutant. NAAQS are promulgated for sulfur dioxide, particulate matter, nitrogen dioxide, carbon monoxide, ozone, and lead.
Nuisance	30 TAC 101.4	A	Prohibits discharge from any source air contaminants in such concentration and of such duration that may be injurious to or to adversely affect human health or welfare, animal life, vegetation, or property, or as to interfere with the normal use and enjoyment of animal life, vegetation, or property.
Permit by Rule for Remediation	30 TAC 106.533	A	Applicable to equipment used to extract, handle, process, reclaim, or destroy contaminants for the purpose of remediation. A permit is not required but project must comply with permit conditions.
Drinking Water			
Safe Drinking Water Act	40 CFR 141 – 149	R&A	Sets primary drinking water regulations and implementation, national secondary drinking water regulations, underground injection control requirements, hazardous waste injection restrictions, and restrictions for sole source aquifers.
Primary Drinking Water Standards (Maximum Contaminant Levels [MCL] and MCL Goals)	40 CFR 141	R&A	Federal standards not applicable in absence of current public water drinking supply system (40 CFR 141.3). Standards are not relevant and appropriate to the UTU groundwater which is Class 3 based on total dissolved solids concentrations and is not consider usable as a potential drinking water supply. Standards are relevant and appropriate to the STU groundwater which is Class 2, a potential drinking water supply.
Secondary Drinking Water Regulations (Secondary MCLs)	40 CFR 143	No	Regulation is not federally enforceable but intended as guideline for public water systems (40 CFR 143.1). Guidelines are not applicable or relevant and appropriate because the groundwater at the Site is not a public drinking water supply.
Surface Water			
Certification of Water Quality Compliance	33 CFR 320.3	A	Section 401 of the Clean Water Act (33 U.S.C. 1341) requires any applicant for a federal license or permit to conduct any activity that may result in a discharge of a pollutant into waters of the United States to obtain a certification from the state in which the discharge originates that the discharge will comply with the applicable effluent limitations and water quality standards.
Federal Water Quality Criteria	40 CFR 131	A	Sets standards for surface water to protect aquatic organisms and human health.
Texas Surface Water Quality Standards	30 TAC 307	A	Sets state standards for surface water to protect aquatic organisms and human health.
Waste			
Identification and Listing of Hazardous Waste	40 CFR 261.1 to 261.38	A	Defines a hazardous waste as exhibiting the characteristics of hazardous wastes, is a mixture of a solid waste and hazardous waste or is a listed hazardous waste.
Land Disposal Restrictions	40 CFR 268	A	The temporary or permanent placement of restricted hazardous wastes may trigger RCRA land disposal restrictions treatment standards. Wastes that are hazardous only because they exhibit a hazardous characteristic, and which are otherwise prohibited under this part, are not prohibited if they meet the requirements of 40 CFR 268.1(c) (4).

ARAR	Regulatory Citation	A / R&A	Description
Waste Classification	30 TAC 335 Subchapter R	A	Persons who generate industrial solid waste shall comply with the provisions of this subchapter. Wastes that are regulated under Chapter 334, Subchapter K, of this title (relating to Storage, Treatment and Reuse Procedures for Petroleum-Substance Contaminated Soil) are not subject to the provisions of this subchapter. Persons who generate wastes shall classify their own waste, provide notification of waste generation activities, and submit required documentation.
Wastewater			
National Pollutant Discharge Elimination System	40 CFR 122 and 125	A	Regulates discharge of treated effluent and storm water runoff to waters of the United States. Potentially applicable standards include technology-based pollutant controls, or effluent standards governing surface water discharges. Would serve as an ARAR to the extent that water is discharged from the Site during and after the remedial action.
Texas Pollutant Discharge Elimination System	30 TAC 332	A	Regulates discharge of treated effluent and storm water runoff to waters of the United States. Potentially applicable standards include technology-based pollutant controls, or effluent standards governing surface water discharges. Would serve as an ARAR to the extent that water is discharged from the Site during and after the remedial action.
Worker Protection			
OSHA: Toxic and Hazardous Substances	29 CFR 1910.120	A	Provides requirements for safety and health program, site characterization, site control, medical surveillance, engineering controls and personal protective equipment, decontamination and other items related to hazardous waste operations and emergency response.
OSHA: Toxic and Hazardous Substances	29 CFR 1910.1000	A	Limits employee exposure to concentrations of air contaminants and 33 toxic hazardous substances.
OSHA: Toxic and Hazardous Substances	29 CFR 1926 Subpart Z	A	Sets exposure standards for 26 toxic and hazardous substances.

ARAR – Applicable or relevant and appropriate requirements
CFR – Code of Federal Regulations
OSHA - Occupational Safety and Health Standards
TAC – Texas Administrative Code
A – Applicable
R&A – Relevant and Appropriate

State regulations are not included in this table if they are referencing federal regulations.

Table 7 Summary of Action-Specific ARARs

ARAR	Regulatory Citation	A / R&A	Description
General Remediation			
National Emission Standards for Hazardous Air Pollutants for Source Categories – Site Remediation	40 CFR 63 Subpart GGGGG	R&A	Establishes emission limitations and work practice standards for hazardous air pollutants emitted from Site remediation activities. Establishes requirements to demonstrate compliance. Remediation is not subject to this subpart if performed under CERCLA as a remedial action or non-time critical removal action, but considered relevant and appropriate for worker safety.
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities: Applicability	40 CFR 264.1(j)	A	Describes general facility requirements, preparedness and contingency requirements for remediation waste management sites that can be used in lieu of 40 CFR 261 Subparts B, C, and D and 40 CFR 265.101.
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities: Subpart F: Releases from Solid Waste Management Units	40 CFR 264.92 to 264.95	A	Provides requirements for monitoring and responding to releases from Solid Waste Management Units.
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities: Subpart F: Releases from Solid Waste Management Units	40 CFR 264.97	A	Provides general groundwater monitoring requirements for releases from Solid Waste Management Units.
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities: Subpart S: Special Provisions for Cleanup	40 CFR 265.533	A	Describes procedures for temporary units.
Worker Health and Safety for Remedial Action	40 CFR 300.150	A	Response actions under the NCP would comply with the provisions for response action worker safety and health in 29 CFR 1910.120.
Transportation of Natural and Other Gas by Pipeline: Subpart N: Qualification of Operator Personnel: Transportation of Hazardous Liquids by Pipeline: Subpart G: Qualification of Operator Personnel	49 CFR 192 Subpart N and 49 CFR 195 Subpart G	A	Equipment operators working in the vicinity of a pipeline need to be participants in an Operator Qualification Program which evaluates their ability to perform the assigned task and recognize and react to abnormal operation conditions.
Nuisance	30 TAC 101.4	A	Prohibits discharge from any source air contaminants in such concentration and of such duration that may be injurious to or adversely affect human health or welfare, animal life, vegetation, or property, or as to interfere with the normal use and enjoyment of animal life, vegetation or property.
Facilities (Emissions and Distance	30 TAC 106.262	A	Specifies distance limitations for emission points from off-plant receptors.

Limitations)			
Permits by Rule (Remediation)	30 TAC 106.533	A	Provides conditions permitting by rule for equipment used to extract, handle, process, condition, reclaim, or destroy contaminants for the purpose of remediation. A permit is not required but project must comply with permit conditions.
Texas Surface Water Quality Standards (General Criteria)	30 TAC 306.4	A	Lists general criteria applicable to surface waters of the State for aesthetics, toxicity, nutrients, salinity, aquatic life uses and habitat. Would serve as an ARAR to the extent that surface water is discharged from the Site during or after remedial action.
Texas Surface Water Quality Standards (Toxic Materials)	30 TAC 307.6	A	Designates that waters of the State shall not be acutely toxic, chronically toxic to aquatic life, or be toxic to humans. Would serve as an ARAR to the extent that surface water is discharged from the Site during or after remedial action.
Spill Prevention and Control	30 TAC 327.4	A	Defines reportable quantities in the event of a spill or release to environment.
Caps			
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities: Subpart B Construction Quality Assurance	40 CFR 264.19	A	Establishes requirements for quality assurance program for cover systems
Cleanup of Hazardous and Toxic Waste	USACE Nationwide Permit 38	R&A	Specifies activities required to contain, stabilize, or remove hazardous or toxic waste materials that are performed, ordered, or sponsored by a government agency. Activities undertaken entirely on a CERCLA site approved or required by EPA are not required to obtain permits under the Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act.
Groundwater Management			
Technical Requirements-Standards for Capping and Plugging of Wells and Plugging Wells that Penetrate Undesirable Water or Constituent Zones	TAC 76.1004	A	Describes standards for capping and plugging of wells and plugging wells that penetrate undesirable water or constituent zones.
Landfills			
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities: Subpart M: Land Treatment	40 CFR 264.270 to 264.280	A	States requirements for land treatment of hazardous waste.
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities: Subpart N: Landfills	40 CFR 264.300 to 264.314	A	Requirements for liner system and exemptions for liner requirements; for surveying location, and monitoring and inspection of hazardous waste landfills. Only applies to alternatives that trigger LDRs (or placement). Prohibits the placement of bulk or non-containerized liquid hazardous waste or hazardous waste containing free liquids in a landfill.
Deed Recordation of Waste Disposal	30 TAC 335.5	A	Requires deed recordation of portion or portions of the tract of land on which disposal of industrial solid waste or municipal hazardous waste occurs.

Offsite Disposal			
Criteria for Identifying the Characteristics of Hazardous Waste and for Listing Hazardous Waste	40 CFR 261.10 to 261.11	A	Provides the criteria for identifying a characteristic or listed waste.
Characteristics of Hazardous Waste	40 CFR 261.20 to 261.24	A	Solid waste is a hazardous waste if it exhibits any of the characteristics of ignitability, corrosivity, reactivity, and toxicity.
Waste Classification	30 TAC 335.505 to 335.508	A	Provides a procedure for implementation of Texas waste notification system and establishes standards for classification of industrial solid waste managed in Texas, including Class 1, Class 2 and Class 3 wastes.
Procedures for Planning and Implementing Off-Site Response Actions	40 CFR 300.440	A	Hazardous wastes generated from CERCLA cleanups must go to RCRA-permitted treatment, storage and disposal facilities that are in compliance with RCRA and State rules and that do not have releases to the environment.
Standards Applicable to Generators of Hazardous Waste: The Manifest	40 CFR 262 Subpart B	A	Provides requirements for the use of the manifest system.
Standards Applicable to Generators of Hazardous Waste: Pre-Transport Requirements	40 CFR 262 Subpart C	A	Provides requirements for pre-transport packaging, labeling, marking, placarding, and accumulation time limits.
Department of Transportation: Hazardous Materials Regulations	49 CFR 171 - 177	A	Packaging and pre-transport regulations that apply to persons that cause hazardous materials to be transported.
Thermal Treatment			
National Emissions Standards for Hazardous Air Pollutants	40 CFR 61	A	Lists requirements for emission of hazardous air pollutants during incineration (stationary sources).
NESHAPS for Hazardous Waste Combustors	40 CFR 63 Subpart EEE	A	Provides standards for emissions for PCDDs/PCDFs, mercury, lead, cadmium, arsenic, beryllium, chromium, carbon monoxide, hydrocarbons, hydrochloric acid, chlorine gas, particulate matter and requirements for destruction and removal efficiency for incinerators.
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities: Subpart O: Incinerators	40 CFR 264.340 to 264.343	A	References 40 CFR 63 Subpart EEE and provides requirements for waste analysis and performance standards for treatment.
Land Disposal Restrictions	40 CFR 268, 40 CFR 268.4 / Subpart D (Treatment Standards)	A	Offsite shipments of hazardous wastes are restricted from land disposal without meeting treatment standards. Offsite shipments must contain a notice that wastes are restricted from land disposal without treatment. Treatment and subsequent placement onsite are restricted from land disposal without meeting treatment standards.
Vent Gas Control	30 TAC 115.121(a)(1) / 30 TAC 115.122(a)	A	Establishes the requirements for vent gas control and control requirements.

Water Discharge			
National Pollutant Discharge Elimination System Conditions Applicable to All Permits	40 CFR 122.41	A	Provides conditions that must be incorporated into NPDES permits. Applicable to discharge of water from the Site.
National Pollutant Discharge Elimination System Establishing Limitations, Standards and Permit Conditions	40 CFR 122.44	A	Provides conditions that must be incorporated into NPDES permits. Applicable to discharge of water from the Site.
Effluent Guidelines and Standards – Landfills Point Source Category	40 CFR 445	A	Provides for discharge of wastewater from landfills subject to provisions of 40 CFR 264 Subpart N and 40 CFR 265 Subpart N.
Texas Hazardous Metals Discharge Limits	30 TAC 319.22	A	Sets numerical limitations on discharge of hazardous metals to inland or tidal waters. Applicable as ARAR for any surface water discharge.
General Permit to Discharge Wastes	TXR050000	A	Describes effluent limitations for industrial facilities that discharge storm water associated with industrial activity.
TXDOT Municipal Separate Storm Sewer System	TXS002101	A	Dischargers of construction storm water into TXDOT's municipal separate storm sewer system shall submit a signed Notice of Intent to the district office.

ARAR – Applicable or relevant and appropriate requirements
CFR – Code of Federal Regulations
NPDES – National Pollutant Discharge Elimination System

TAC – Texas Administrative Code
A – Applicable
R&A – Relevant and Appropriate

USACE – US Army Corps of Engineers
State regulations are not included in this table if they are referencing federal regulations.

Table 8 Alternative 4D
Solidification Targeted Area South Pit (25%), South Pit Cover, Buildings Remain

Site: Brine Service Company Superfund Site
Location: Corpus Christi, Texas
Phase: Feasibility Study (-30% to +50%)
Base Year: 2018
Date: January 21, 2019

Description: Alternative 4C consists of the following elements:
1. Preparation of Work Plans
2. Excavate top 2 to 2.5 feet of South Pit soil to accommodate soil cover
3. Install LNAPL source control
4. Remove infrastructure on Robert's Equipment and Adult Video but retaining buildings
5. Solidify reworked soil waste/sludge in targeted area of South Pit (25%)
6. Install soil cover over South Pit
7. Replace parking and connect to City sewer
8. Remove lead weights and North Pit top soil (acute toxicity) and replace with clean fill
9. Post Achievement Work Plans and Institutional Controls
10. LNAPL recovery prior to transition to NSZD
11. Groundwater Monitored Natural Attenuation / Cap Inspection

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
Phase 1: Work Plans (Element 1)				
Plan Preparation and Submittals	1	LS	$ 254,000	$ 254,000
Quarterly Status Reports	1	LS	$ 47,100	$ 47,100
SUBTOTAL				**$ 301,100**
Phase 2: Remedy Implementation (Elements 2 to 8)				
Mobilization/Demobilization	1	LS	$ 339,000	$ 339,000
Project Management	1	LS	$ 666,000	$ 666,000
Health and Safety	1	LS	$ 162,000	$ 162,000
Air Monitoring/Dust Control	1	LS	$ 313,000	$ 313,000
Water Management	1	LS	$ 97,000	$ 97,000
Excavate and Dispose of Cover Soil - Including Parking Lot	1	LS	$ 2,650,000	$ 2,650,000
Cover South Pit	1	LS	$ 777,000	$ 777,000
Replace Parking Lots	1	LS	$ 209,000	$ 209,000
Remove and Replace Equipment	1	LS	$ 88,000	$ 88,000
Solidification/Stabilization Targeted Area South Pit (25%)	1	LS	$ 1,419,000	$ 1,419,000
Excavate, dispose & backfill North Pit metals area	1	LS	$ 504,000	$ 504,000
Design	1	LS	$ 245,000	$ 245,000
Pilot Study	1	LS	$ 85,000	$ 85,000
Isolation Trench	1	LS	$ 49,000	$ 49,000
Sanitary Sewer Tie-in	1	LS	$ 179,000	$ 179,000
SUBTOTAL				**$ 7,790,000**
Phase 3: Post-Achievement Operation and Maintenance (Element 9)				
Develop and Implement Groundwater Monitoring Program	1	LS	$ 142,000	$ 142,000
Develop and Implement LNAPL Recovery Program	1	LS	$ 96,000	$ 96,000
Post-Achievement Work Plans	1	LS	$ 113,000	$ 113,000
Institutional Controls Plans and Measures	1	LS	$ 15,000	$ 15,000
Landowner Approval to Implement Institutional Controls	10%	LS	$ 1,170,000	$ 117,000
SUBTOTAL				**$ 483,000**
SUBTOTAL				**$ 8,575,000**
Contingency	10%			**$ 857,500**
Project Management	3%			$ 258,000
Pre-Design Investigation, Remedial Design, Engineering Support, Remedial Act	10%			$ 858,000
Third Party QA/QC	2%			$ 172,000
SUBTOTAL				**$ 1,288,000**
TOTAL CAPITAL COST				**$ 9,940,000**

O&M COSTS:

DESCRIPTION		QTY	UNIT	UNIT COST	TOTAL
Phase 4: Post-Achievement Operation and Maintenance (Elements 10 to 12)					
General Site Maintenance (Year 1)		2	EA	$ 500	$ 1,000
Mowing (Year 1)		2	EA	$ 2,000	$ 4,000
South Pit and East Ditch Cap Inspections (Year 1)	Assume concurrent with groundwater monitoring				$ -
South Pit and East Ditch Cap Maintenance (Year 1)		1	LS	$ 10,000	$ 10,000
LNAPL Recovery	Monthly	12	EA	$ 15,000	$ 180,000
Groundwater Monitoring (Year 1)	Quarterly	4	EA	$ 44,000	$ 176,000
Groundwater Reporting (Year 1)		1	EA	$ 52,000	$ 52,000
Institutional Control Review (Year 1)		1	EA	$ 6,000	$ 6,000
SUBTOTAL					**$ 429,000**
General Site Maintenance (Year 2-5)		8	EA	$ 500	$ 4,000
Mowing (Year 2-5)		8	EA	$ 2,000	$ 16,000

DESCRIPTION		QTY	UNIT	UNIT COST	TOTAL
South Pit and East Ditch Cap Inspections (Year 2-5)	Assume concurrent with groundwater monitoring				$ -
South Pit and East Ditch Cap Maintenance (Year 2-5)		1	LS	$ 10,000	$ 10,000
LNAPL Recovery	Quarterly	16	EA	$ 15,000	$ 240,000
Groundwater Monitoring (Year 2-5)	Semiannually	8	EA	$ 37,000	$ 296,000
Groundwater Reporting (Year 2-5)		4	EA	$ 52,000	$ 208,000
Institutional Control Review (Year 2-5)		4	EA	$ 6,000	$ 24,000
SUBTOTAL					**$ 798,000**
General Site Maintenance (Year 6-10)		10	EA	$ 500	$ 5,000
Mowing (Year 6-10)		10	EA	$ 2,000	$ 20,000
South Pit and East Ditch Cap Inspections (Year 6-10)	Assume concurrent with groundwater monitoring				$ -
South Pit and East Ditch Cap Maintenance (Year 6-10)		1	LS	$ 10,000	$ 10,000
Groundwater Monitoring (Year 6-10)	Annually	5	EA	$ 37,000	$ 185,000
Groundwater Reporting (Year 6-10)		5	EA	$ 26,000	$ 130,000
Institutional Control Review (Year 6-10)		5	EA	$ 6,000	$ 30,000
SUBTOTAL					**$ 380,000**
General Site Maintenance (Year 11-30)		40	EA	$ 500	$ 20,000
Mowing (Year 11-30)		40	EA	$ 2,000	$ 80,000
South Pit and East Ditch Cap Inspections (Year 11-30)	Annually	20	LS	$ 7,640	$ 152,800
South Pit and East Ditch Cap Maintenance (Year 11-30)		4	LS	$ 10,000	$ 40,000
Groundwater Monitoring (Year 11-30)	Once per 5 years	4	EA	$ 37,000	$ 148,000
Groundwater Reporting (Year 11-30)		4	EA	$ 26,000	$ 104,000
Institutional Control Review (Year 11-30)		20	EA	$ 6,000	$ 120,000
SUBTOTAL					**$ 664,800**
SUBTOTAL (Year 1)					**$ 429,000**
SUBTOTAL (Year 2-5)					**$ 798,000**
SUBTOTAL (Year 6-10)					**$ 380,000**
SUBTOTAL (Year 11-30)					**$ 664,800**
Contingency		10%			
SUBTOTAL with CONTINGENCY (Year 1)					**$ 471,900**
SUBTOTAL with CONTINGENCY (Year 2-5)					**$ 877,800**
SUBTOTAL with CONTINGENCY (Year 6-10)					**$ 418,000**
SUBTOTAL with CONTINGENCY (Year 11-30)					**$ 731,280**
Project Management		5%			
Technical Support		5%			
SUBTOTAL (Year 1)					**$ 47,190**
SUBTOTAL (Year 2-5)					**$ 87,780**
SUBTOTAL (Year 6-10)					**$ 41,800**
SUBTOTAL (Year 11-30)					**$ 73,128**
TOTAL ANNUAL O&M COST (Year 1)					**$ 519,090**
TOTAL ANNUAL O&M COST (Year 2-5)					**$ 965,580**
TOTAL ANNUAL O&M COST (Year 6-10)					**$ 459,800**
TOTAL ANNUAL O&M COST (Year 11-30)					**$ 804,408**

PRESENT VALUE ANALYSIS:

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (7%)	PRESENT VALUE	
Capital Cost	0	$ 9,940,000	$ 9,940,000.00	1	$ 9,940,000	
Annual O&M Cost	1	$ 519,090	$ 519,090.00	0.93458	$ 485,131	
Annual O&M Cost	2 - 5	$ 965,580	$ 241,395.00	3.16562	$ 764,164	
Annual O&M Cost	6 - 10	$ 459,800	$ 91,960.00	2.92338	$ 268,834	
Annual O&M Cost	11 - 30	$ 804,408	$ 40,220.40	5.38546	$ 216,605	$1,735,000
		$ 12,688,878			**$ 11,680,000**	

TOTAL PRESENT VALUE OF ALTERNATIVE	**$ 11,680,000**
Feasibility Study Range (-30%)	*$ 8,176,000*
Feasibility Study Range (+50%)	*$ 17,520,000*

Note:
Operation and Maintenance costs were estimated based on experience with similar projects.

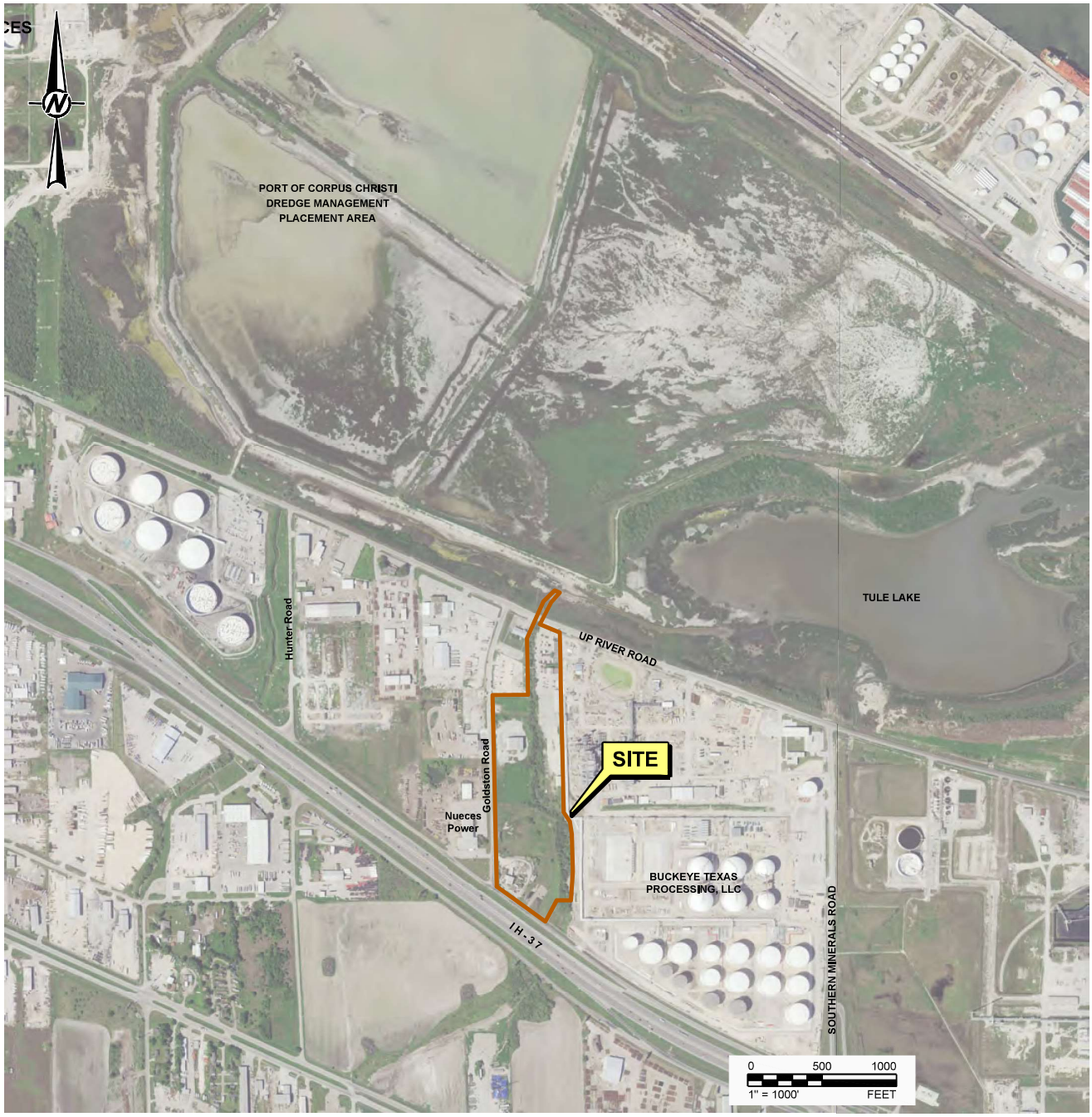
Table 9: Cost Effectiveness Matrix

RELEVANT CONSIDERATIONS FOR COST EFFECTIVENESS DETERMINATION:					
Alternative	Cost Effective?	Present Worth Cost	Long Term Effectiveness and Permanence	Reduction of TMV through Treatment	Short Term Effectiveness
1) Alternative 1 No Action	No	$0	No reduction in long term risk.	No reduction in TMV.	Continued risk to human health and the environment.
2) Alternative 2 – LNAPL Source Control, MNA, and Groundwater Monitoring	Yes	$2,930,000	Will not meet all RAOs.	No reduction in TMV through treatment.	Minimal short-term community risk
3) Alternative 3 – South Pit Subsurface Barrier Wall and Cap					
• Alternative 3A – "Wing" Wall barrier wall	Yes	$3,532,830	Least long-term effectiveness due to highest residual risk from waste materials in contact with groundwater; best reliability due to simplicity of technology	Containment alternative. No reduction in TMV through treatment.	Best short-term effectiveness with least risk to community based on lowest potential for VOC emissions and damage to pipeline.
• Alternative 3B – "360" Wall barrier wall	Yes	$69,597	Better long-term effectiveness than Alternative 3A and 4C since groundwater contact with waste material minimized; less reliability than Alternative 3A	Containment alternative. No reduction in TMV through treatment.	Short-term effectiveness is less than Alternative 3A with some potential risk to community based on potential for VOC emissions and damage to pipeline.
4) Alternative 4 – South Pit Solidification and Cap					
• Alternative 4A – Solidification with a Multi-Component Cap	Yes	$16,620,000	Best long-term effectiveness due to lowest residual risk from waste materials; reliability less than Alternatives 3A and 3B due to inability to verify vertical extent of solidification	Reduces toxicity and mobility through treatment, increase in volume may occur through treatment.	Short-term effectiveness is less than Alternatives 3A, 3B, 4C, and 4D with potential risk to community based on potential for VOC emissions during solidification and damage to pipelines.
• Alternative 4B – Solidification with a Single-Component Cap	Yes	$15,410,000	Best long-term effectiveness due to lowest residual risk from waste materials; reliability less	Same as above.	Short-term effectiveness is less than Alternatives 3A, 3B, 4C, and 4D with potential risk to community based on potential for VOC

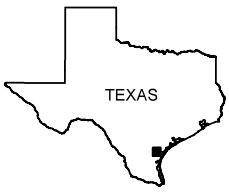
			than Alternatives 3A and 3B due to inability to verify vertical extent of solidification		emissions during solidification and damage to pipelines.
• Alternative 4C – Targeted Solidification with a Multi-Component Cap	Yes	$12,610,000	Better long-term effectiveness than Alternative 3A and 3B since active remediation of source areas; combination of containment and treatment increases long-term effectiveness	Same as above.	Best short-term effectiveness for treatment alternatives with minimal risk to community based on potential for VOC emissions adjacent to businesses during solidification. Lower risk of damage to pipelines than 4A and 4B.
• Alternative 4D – Targeted Solidification with a Single Component Cap	Yes	$11,680,000	Better long-term effectiveness than Alternative 3A and 3B since active remediation of source areas; combination of containment and treatment increases long-term effectiveness.	Same as above.	Best short-term effectiveness for treatment alternatives with minimal risk to community based on potential for VOC emissions adjacent to businesses. Single component cap is protective and more cost effective than multi-component cap. Lower risk of damage to pipelines than 4C.
Alternative 5 – South Pit Excavation and Off-Site Disposal	No	$38,200,000	Best long-term effectiveness and permanence since excavation and disposal off-site reduces mobility and volume of wastes.	Reduces toxicity and mobility through treatment of hazardous waste component before off-site disposal	Highest increase in short-term risks to the community, businesses, and to remedial action workers.

Notes:
Alternative 1 No Action does not reduce risks to either human health or the environment and therefore is not considered cost effective.
TMV = Toxicity, Mobility and Volume

APPENDIX B FIGURES



REFERENCE(S)
IMAGERY TAKEN FROM WWW.TNRIS.GOV, 2015 AERIAL IMAGERY, 0.5M RESOLUTION.



PHOTOGRAPH LOCATIONS

CLIENT
BRINE SERVICE COMPANY

PROJECT
SUPERFUND SITE
CORPUS CHRISTI, TEXAS

TITLE
SITE LOCATION MAP

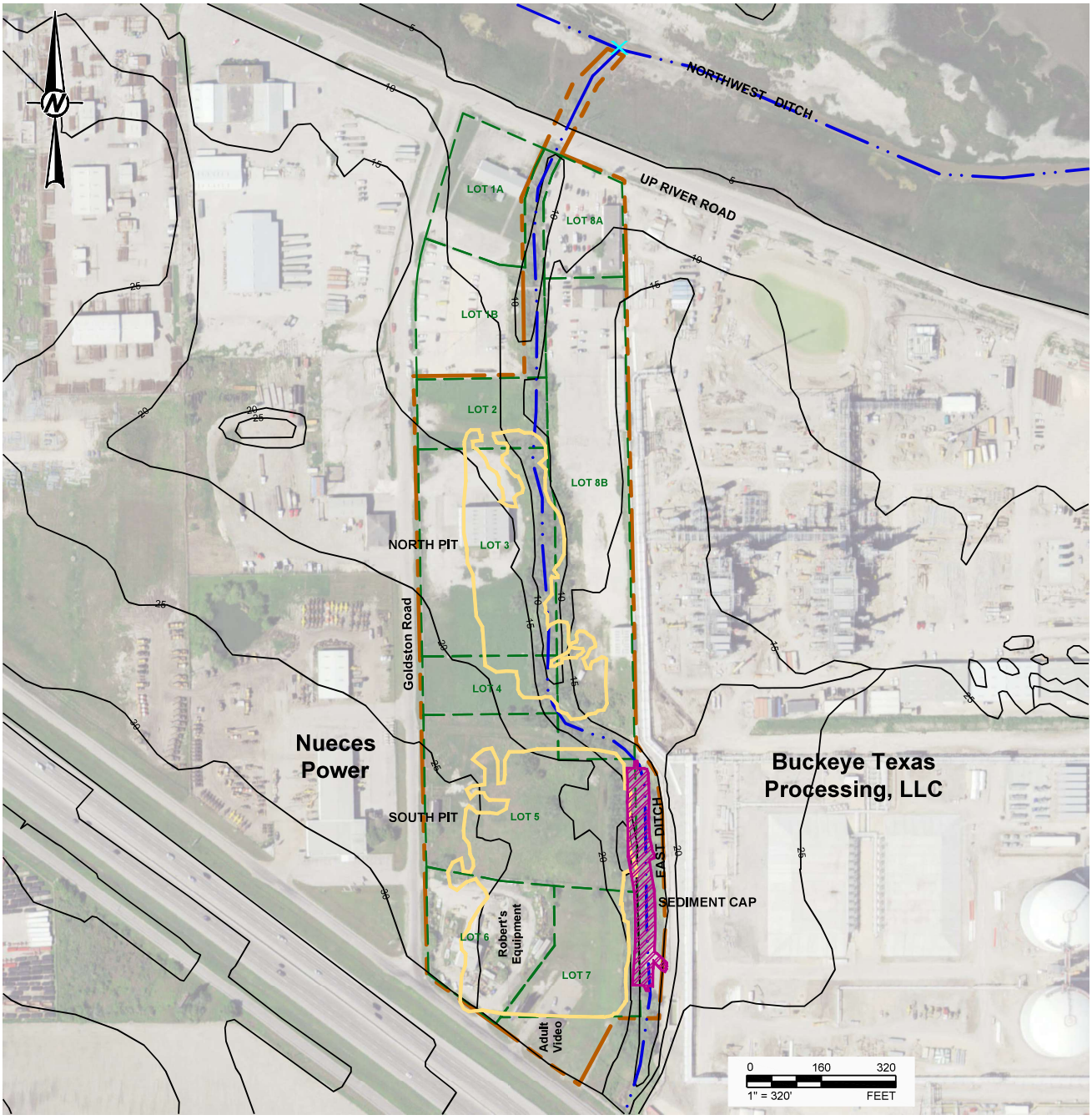
CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-18
DESIGNED	AJD
PREPARED	AJD
REVIEWED	BB
APPROVED	BB

PROJECT NO.	REV.	FIGURE
30404056	0	1

Last Edited By: adiamond Date: 2019-03-18 Time:9:00:21 AM | Printed By: adiamond Date: 2019-03-18 Time:9:03:07 AM
Path: C:\Autodesk\Temp-DwgToPublish_15664\ | File Name: FIG 1 - Site Location Map.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A



LEGEND

- 15 — TOPOGRAPHIC CONTOUR INTERVAL
- EAST DITCH
- SITE BOUNDARY
- LOT BOUNDARY
- EXTENT OF HISTORICAL PITS
- DOWNSTREAM AOC LIMIT OF INVESTIGATION

REFERENCE(S)

IMAGERY TAKEN FROM WWW.TNRIS.GOV, 2015 AERIAL IMAGERY, 0.5M RESOLUTION. TOPOGRAPHIC ELEVATION CONTOURS FROM THE USGS 7.5 MIN. SERIES TOPOGRAPHIC QUADRANGLE MAPS OF ANNAVILLE AND CORPUS CHRISTI, TX, 1975.

CLIENT
BRINE SERVICE COMPANY

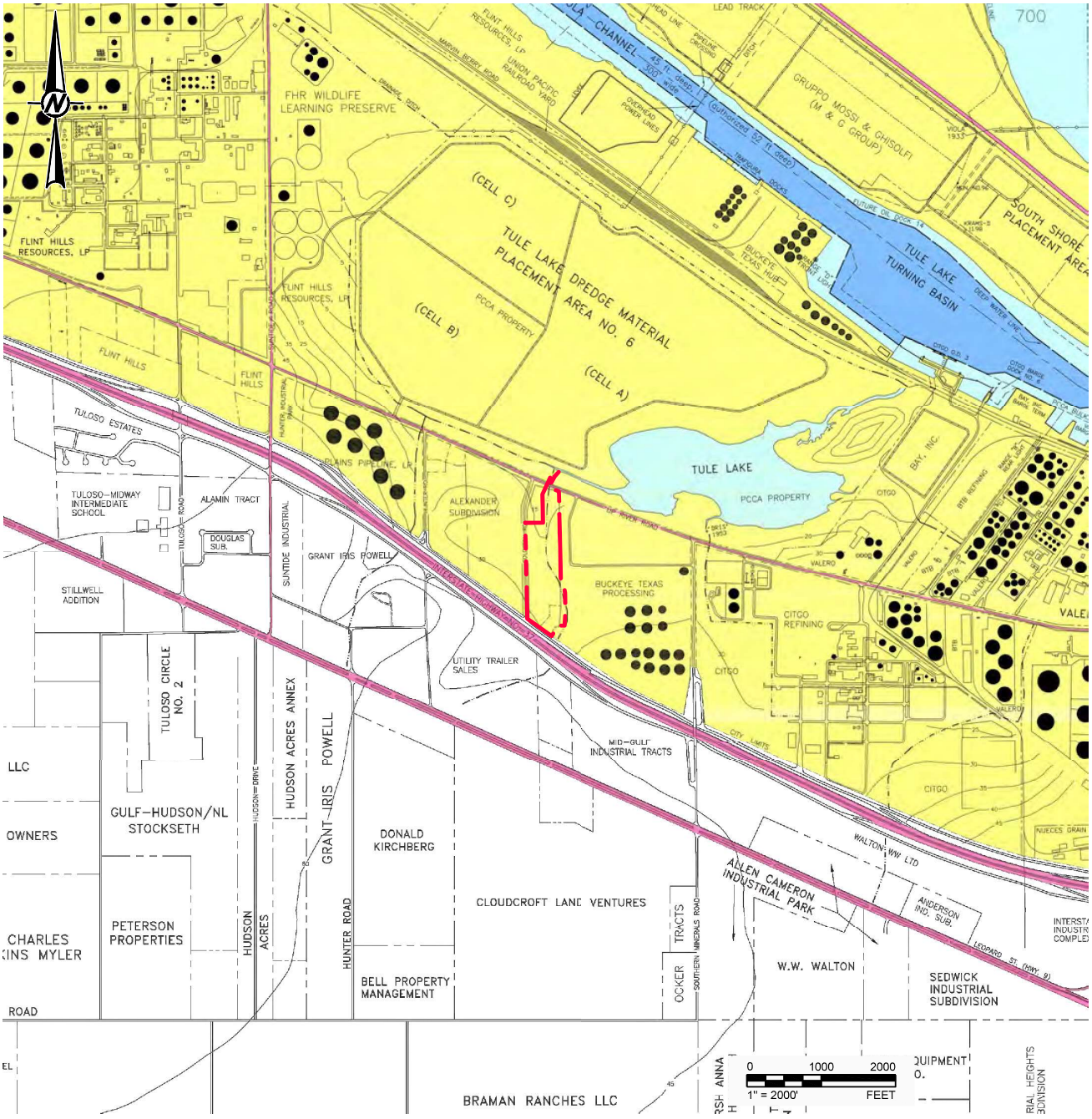
PROJECT
SUPERFUND SITE
CORPUS CHRISTI, TEXAS

TITLE
SITE MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2019-04-09
DESIGNED	AJD
PREPARED	AJD
REVIEWED	BB
APPROVED	BB

PROJECT NO. 30404056 | REV. 0 | FIGURE 2



LEGEND

SITE BOUNDARY

PORT OF CORPUS CHRISTI INNER HARBOR PORT RELATED DISTRICT

REFERENCE(S)

BASEMAP TAKEN FROM PORT CORPUS CHRISTI INNER HARBOR PORT RELATED DISTRICT MAP, 2015.

CLIENT
BRINE SERVICE COMPANY

PROJECT
SUPERFUND SITE
CORPUS CHRISTI, TEXAS

TITLE
INDUSTRIAL LAND USE

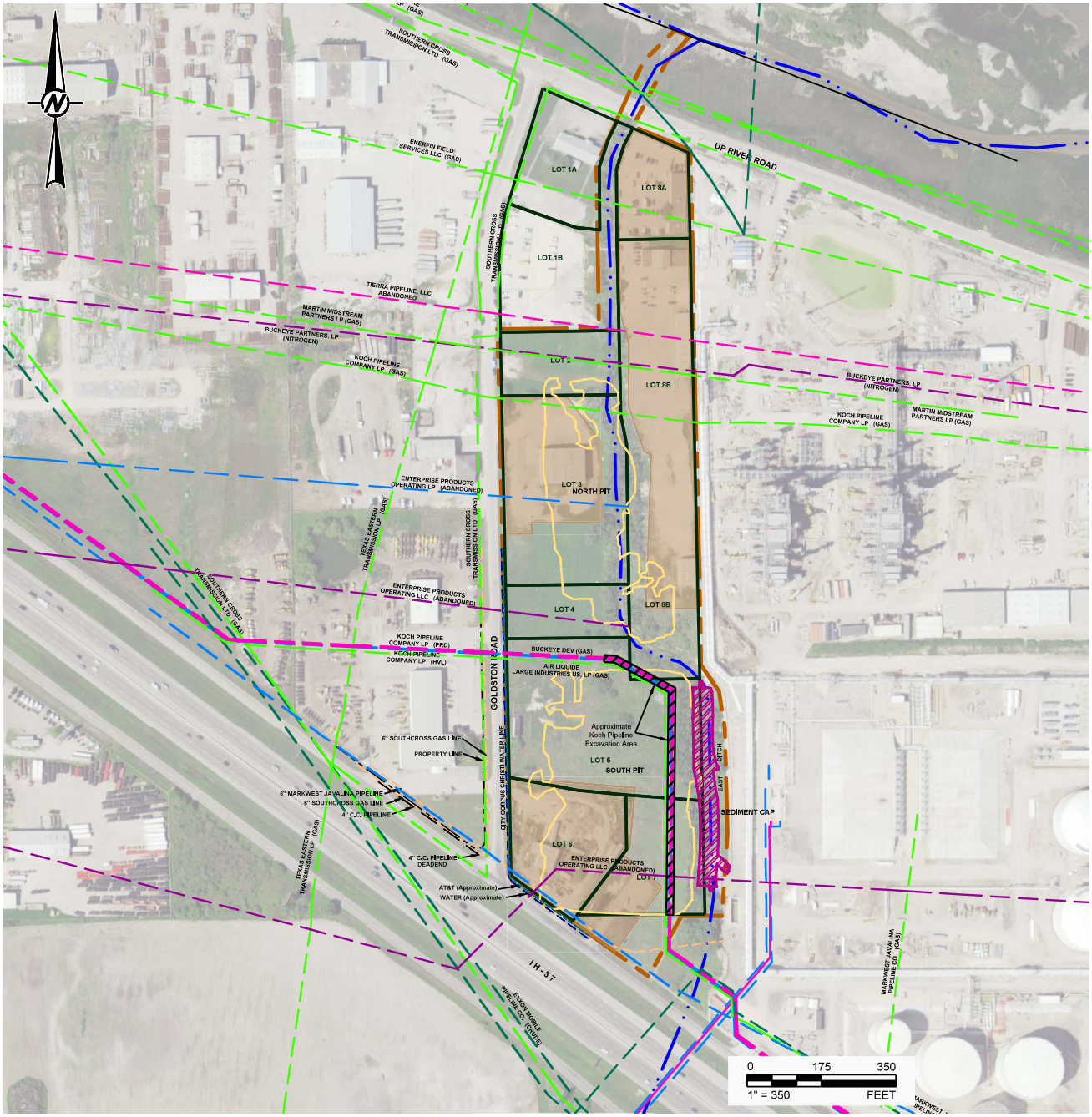
CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-18
DESIGNED	AJD
PREPARED	AJD
REVIEWED	BB
APPROVED	BB

PROJECT NO. 30404056 | REV. 0 | FIGURE 3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

Last Edited By: adiamond Date: 2019-03-18 Time:11:07:21 AM | Printed By: adiamond Date: 2019-03-18 Time:11:07:40 AM
Path: \\texas\ana\data\Projects - Houston\4056 - Brine\2019-03 March \ File Name: FIG 3 - Industrial Land Use.dwg



LEGEND

- SITE BOUNDARY
- EXTENT OF HISTORICAL PITS
- NON-HABITAT AREA
- EAST DITCH

NOTE(S)

1. PIPELINES (INDICATED BY DASHED LINES) RELOCATED BASED ON FIELD OBSERVATIONS.

REFERENCE(S)

IMAGERY TAKEN FROM WWW.TNRIS.GOV, 2015 AERIAL IMAGERY, 0.5M RESOLUTION.
WELL DATA BY RAILROAD COMMISSION OF TEXAS PUBLIC GIS VIEWER, JULY 2017.
PIPELINE DATA BY REXTAG STRATEGIES GIS DATA LAYERS, 2017 SPRING QTR. UP DATE.

CLIENT
BRINE SERVICE COMPANY

PROJECT
SUPERFUND SITE
CORPUS CHRISTI, TEXAS

TITLE
PIPELINE LOCATION MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-18
DESIGNED	AJD
PREPARED	AJD
REVIEWED	BB
APPROVED	BB

PROJECT NO. 30404056 | REV. 0 | FIGURE 4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A

1 in
0

Last Edited By: rsalazar Date: 2020-05-28 Time: 8:06:22 PM | Printed By: RSalazar Date: 2020-07-27 Time: 9:21:38 AM
Path: \\texarkana\data\Projects\Houston\4056 - Brine\2019-03 March\ | File Name: FIG 4 - Pipeline Location Map.dwg

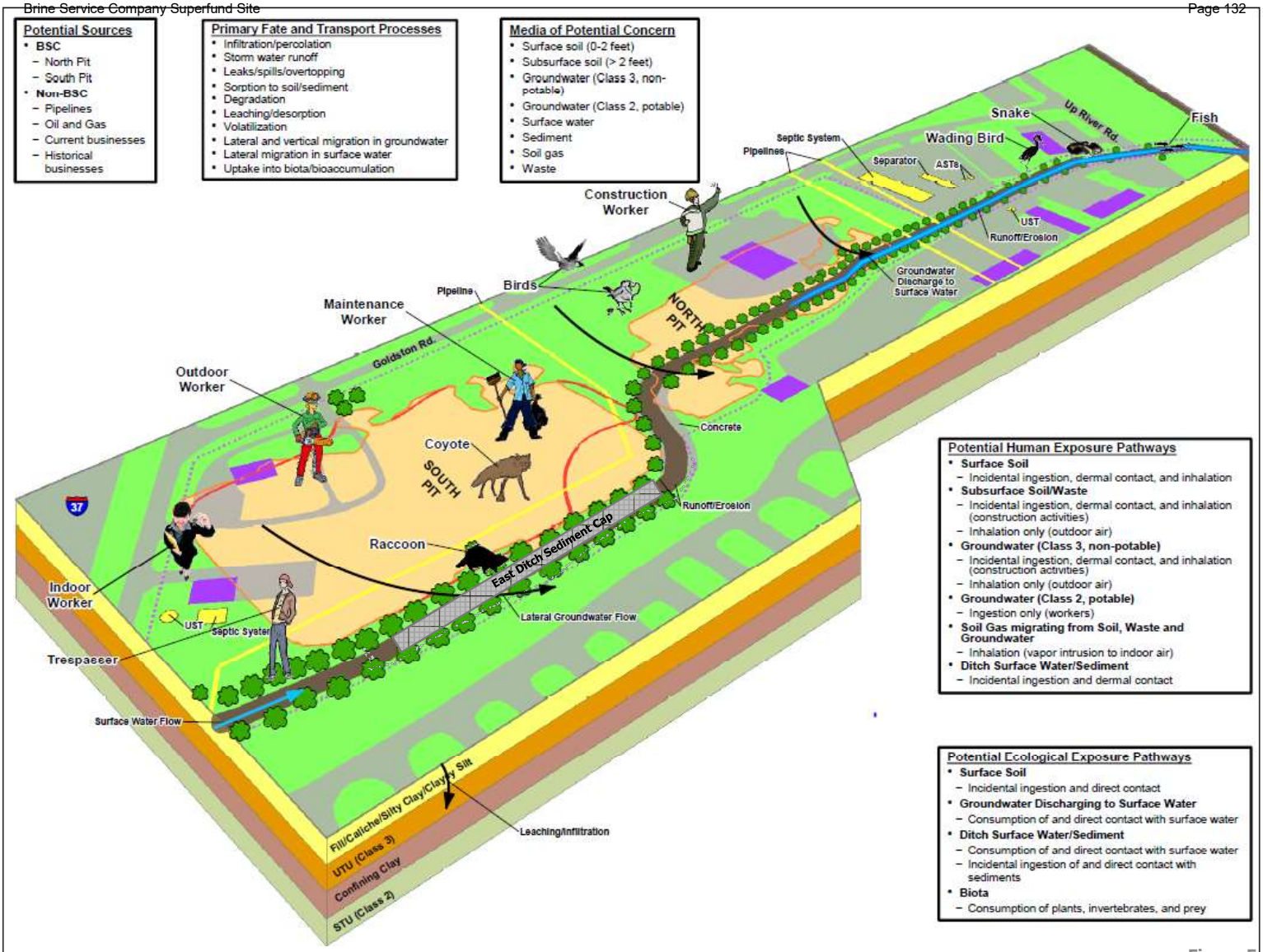
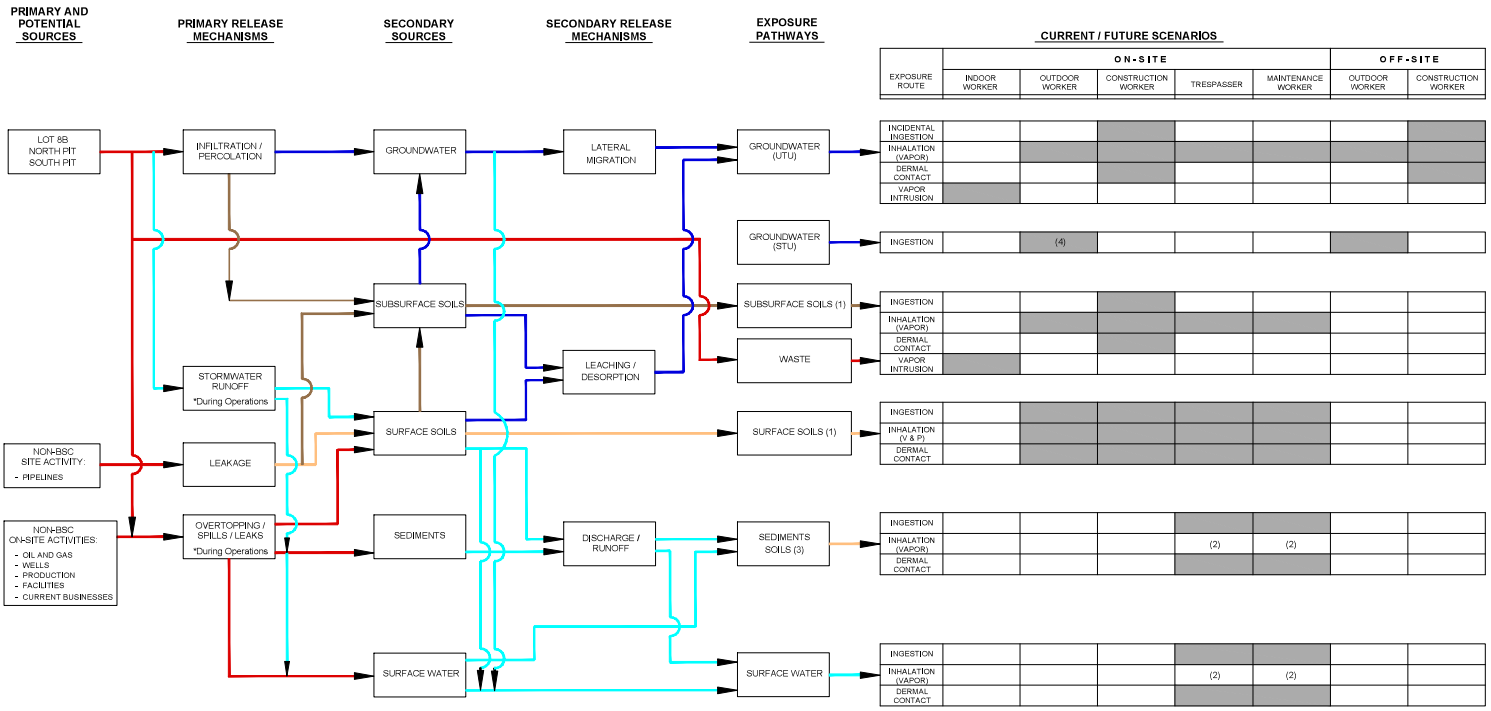

Potential Sources
• BSC
– North Pit
– South Pit
• Non-BSC
– Pipelines
– Oil and Gas
– Current businesses
– Historical businesses
Primary Fate and Transport Processes
• Infiltration/percolation
• Storm water runoff
• Leaks/spills/overtopping
• Sorption to soil/sediment
• Degradation
• Leaching/desorption
• Volatilization
• Lateral and vertical migration in groundwater
• Lateral migration in surface water
• Uptake into biota/bioaccumulation
Media of Potential Concern
• Surface soil (0-2 feet)
• Subsurface soil (> 2 feet)
• Groundwater (Class 3, non-potable)
• Groundwater (Class 2, potable)
• Surface water
• Sediment
• Soil gas
• Waste
Snake
Up River Rd.
Fish
Wading Bird
Septic System
Pipelines
Separator
ASTs
Construction Worker
UST
Runoff/Erosion
Groundwater Discharge to Surface Water
Pipeline
Birds
NORTH PIT
Maintenance Worker
Goldston Rd.
Outdoor Worker
Concrete
Coyote
SOUTH PIT
Runoff/Erosion
Raccoon
East Ditch Sediment Cap
Indoor Worker
Lateral Groundwater Flow
UST
Septic System
Treespaeeer
Surface Water Flow
Fill/Caliche/Silty Clay/Clayey Silt
UTU (Class 3)
Confining Clay
STU (Class 2)
Leaching/Infiltration
Potential Human Exposure Pathways
• Surface Soil
– Incidental ingestion, dermal contact, and inhalation
• Subsurface Soil/Waste
– Incidental ingestion, dermal contact, and inhalation (construction activities)
– Inhalation only (outdoor air)
• Groundwater (Class 3, non-potable)
– Incidental ingestion, dermal contact, and inhalation (construction activities)
– Inhalation only (outdoor air)
• Groundwater (Class 2, potable)
– Ingestion only (workers)
• Soil Gas migrating from Soil, Waste and Groundwater
– Inhalation (vapor intrusion to indoor air)
• Ditch Surface Water/Sediment
– Incidental ingestion and dermal contact
Potential Ecological Exposure Pathways
• Surface Soil
– Incidental ingestion and direct contact
• Groundwater Discharging to Surface Water
– Consumption of and direct contact with surface water
• Ditch Surface Water/Sediment
– Consumption of and direct contact with surface water
– Incidental ingestion of and direct contact with sediments
• Biota
– Consumption of plants, invertebrates, and prey

Figure 5

Path: \\texarkana\data\Projects - Houston_2019\19124986 - Brine\2020-01 Jan\PRODUCTION\ | File Name: Human Health Conceptual Site Model.dwg



LEGEND

- COMPLETE EXPOSURE PATHWAY
- INCOMPLETE OR INSIGNIFICANT EXPOSURE PATHWAY
- SURFACE SOILS / SEDIMENT
- SUBSURFACE SOILS
- SURFACE WATER / STORMWATER
- GROUNDWATER
- WASTES

(V & P)	VAPOR AND PARTICULATES
UTU	UPPER TRANSMISSIVE UNIT
STU	SECOND TRANSMISSIVE UNIT
COPCs	CHEMICALS OF POTENTIAL CONCERN

NON-BSC SITE ACTIVITY: CURRENT OR HISTORICAL ON-SITE SOURCES WHICH ARE NOT RELATED TO THE BRINE SUPERFUND SITE WASTE HANDLING.

NOTE(S)

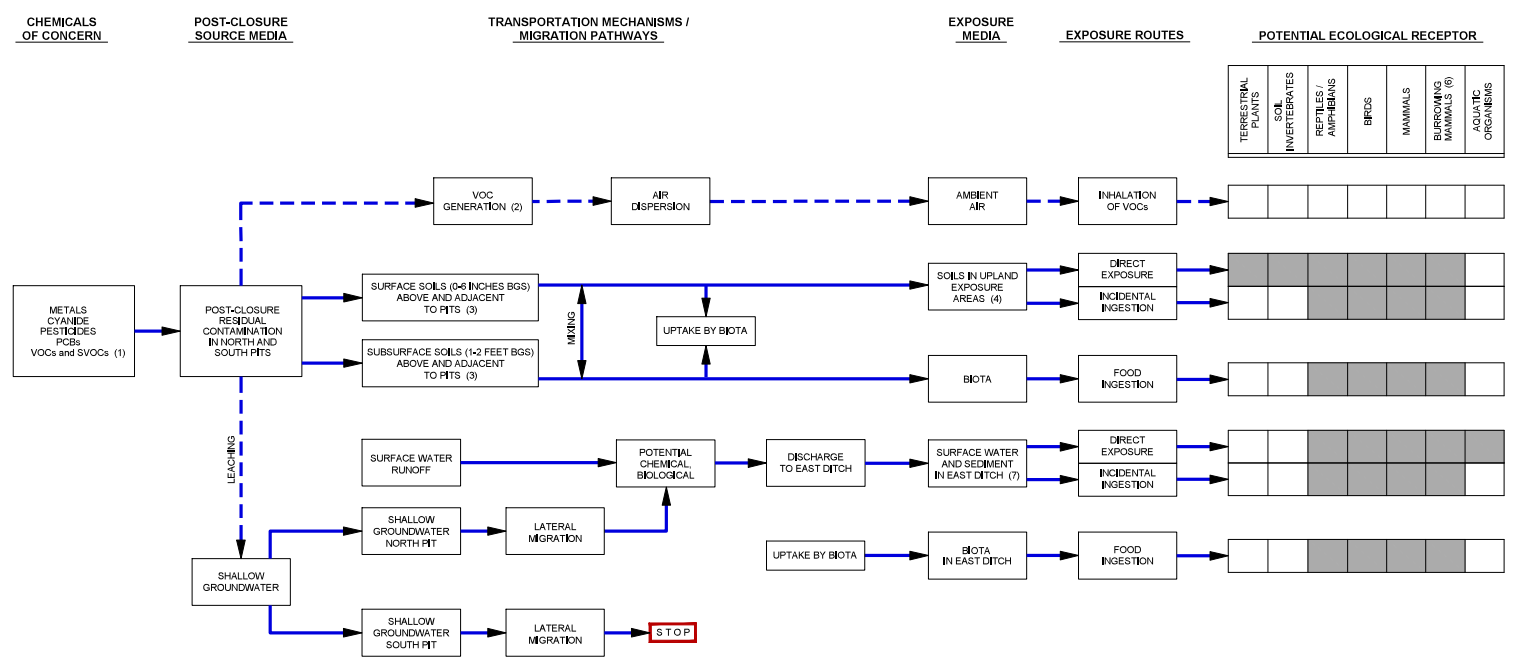
1. SURFACE SOIL IS DEFINED AS 0 TO 2 FEET AND SUBSURFACE SOIL IS > 2 FEET BELOW GROUND SURFACE.
2. A QUANTITATIVE EVALUATION OF THE INHALATION ROUTE IS EXCLUDED BECAUSE NO SUFFICIENTLY VOLATILE COPCs WERE SCREENED FOR FURTHER EVALUATION FOR THE SEDIMENT AND SURFACE WATER EXPOSURE PATHWAYS.
3. SOUTHERN PORTION OF EAST DITCH IS INTERMITTENT. THEREFORE, THIS PORTION OF THE EAST DITCH IS EVALUATED AS SEDIMENTS AND SOILS.
4. ASSUMED TAP WATER IS NOT ROUTINELY USED FOR BATHING (INDUSTRIAL RECEPTOR). THEREFORE, DERMAL CONTACT IS NOT EVALUATED.

GOLDER

BRINE SERVICE COMPANY SUPERFUND SITE
HUMAN HEALTH CONCEPTUAL SITE MODEL

FIGURE 6

Path: \\texarkana\data\Projects - Houston_2019\19124986 - Brine\2020-01 Jan\PRODUCTION\ | File Name: Ecological Conceptual Site Model.dwg



LEGEND

- EXPOSURE PATHWAY IS COMPLETE OR POTENTIALLY COMPLETE
- EXPOSURE PATHWAY IS MINOR, INSIGNIFICANT, OR NOT APPLICABLE
- POTENTIAL MIGRATION PATHWAY
- RELEASE / TRANSPORT IS MINOR, INSIGNIFICANT, OR UNLIKELY TO OCCUR
- STOP — RELEASE / TRANSPORT DOES NOT OCCUR

COC	CHEMICAL OF CONCERN
PCB	POLYCHLORINATED BIPHENYL
VOCs	VOLATILE ORGANIC COMPOUNDS
SVOCs	SEMIVOLATILE ORGANIC COMPOUNDS
BGS	BELOW GROUND SURFACE

NOTE(S)

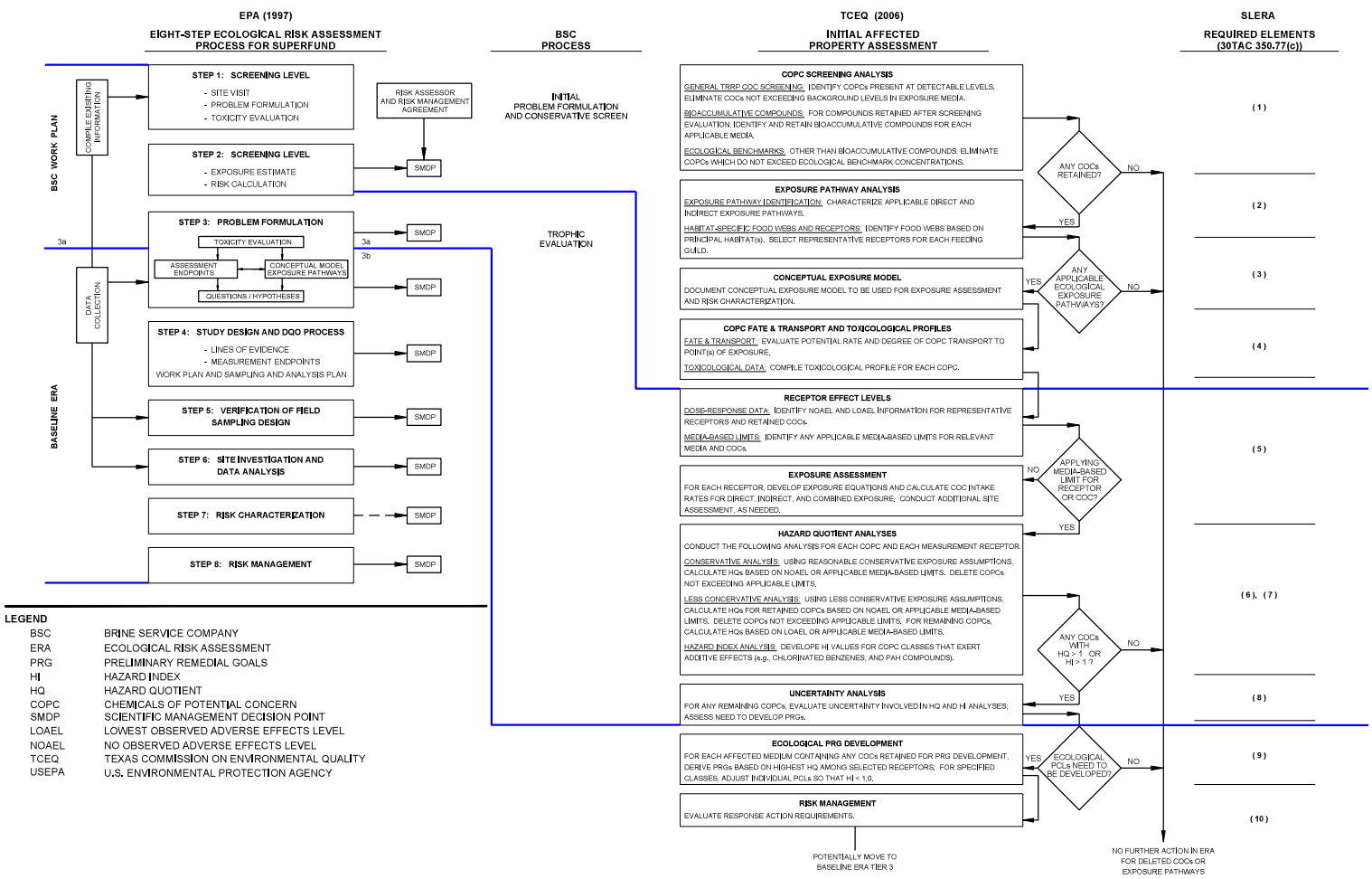
1. COMPLETE PHASE I ANALYTE LIST.
2. VOC GENERATION INTO AMBIENT AIR IS UNLIKELY BECAUSE OF THE AGE OF THE PITS AND THE COVER IN PLACE.
3. SURFACE SOIL IS DEFINED AS 0 TO 0.5 FEET BGS AND SUBSURFACE SOIL IS 1 TO 2 FEET BELOW GROUND SURFACE.
4. TERRESTRIAL AREAS INCLUDE THE NORTH AND SOUTH PITS AND THE AREAS ADJACENT TO THE PITS TO THE EAST AND WEST.
5. OTHER THAN A SHORT SEGMENT, GROUNDWATER IS BELOW THE LEVEL OF THE EAST DITCH ADJACENT TO THE SOUTHERN PORTION.
6. DATA FROM SOILS 1 TO 2 FEET BGS WILL BE USED TO EVALUATE RISK TO BURROWING ANIMALS ONLY.
7. EAST DITCH SOUTH IS INTERMITTENT. THIS AREA IS ALSO CONSIDERED TERRESTRIAL IN SLERA. EAST DITCH NORTH IS PERENNIAL.

GOLDER

BRINE SERVICE COMPANY SUPERFUND SITE
ECOLOGICAL CONCEPTUAL SITE MODEL

FIGURE 7

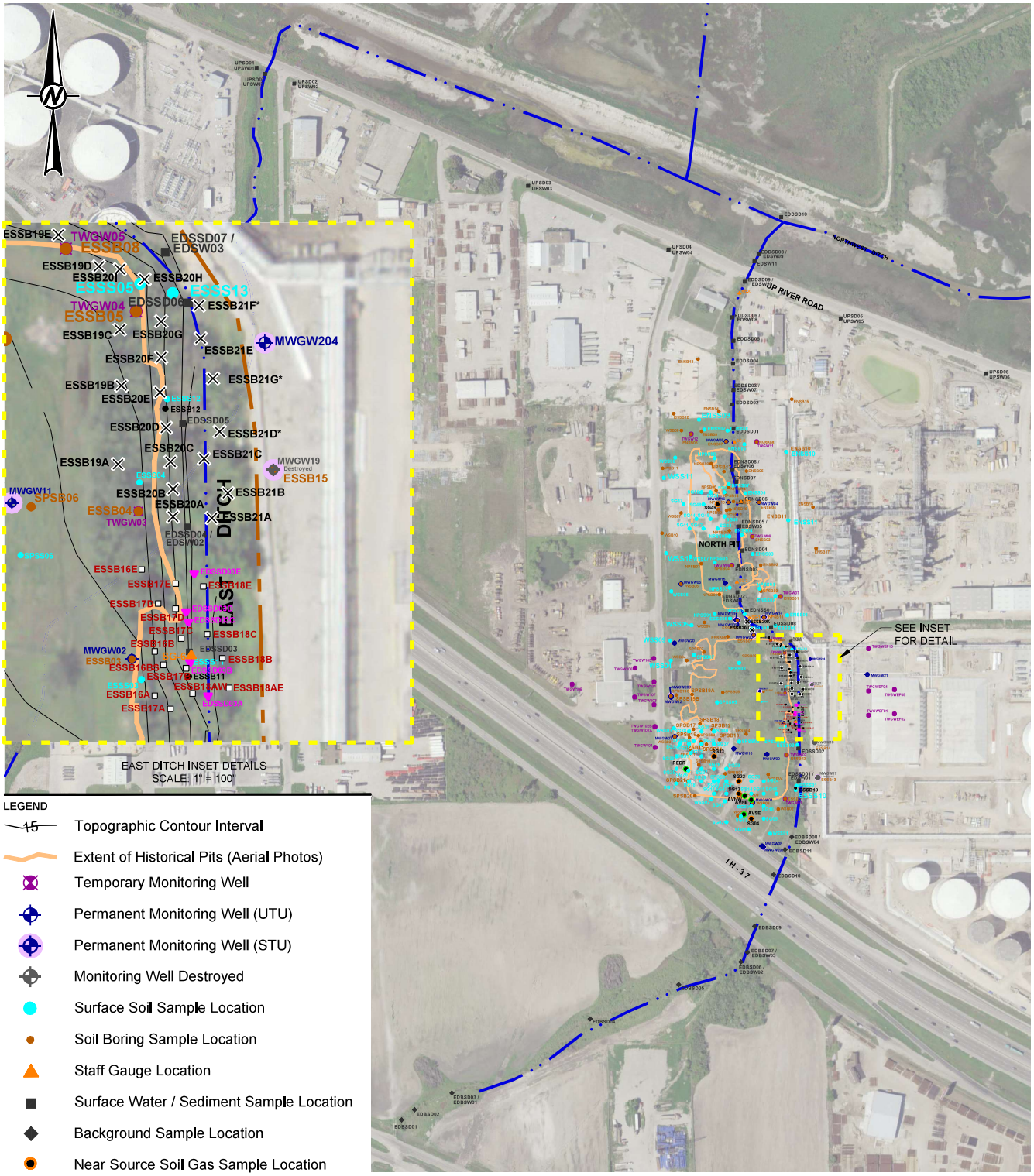
Path: \\texarkana\data\Projects - Houston_2019\19124986 - Brine\2020-01 Jan\PRODUCTION\ | File Name: Screening Level Ecological Risk Process.dwg



GOLDER

BRINE SERVICE COMPANY SUPERFUND SITE
SCREENING LEVEL ECOLOGICAL RISK PROCESS

FIGURE 8



LEGEND

- 15 — Topographic Contour Interval
- Extent of Historical Pits (Aerial Photos)
- Temporary Monitoring Well
- Permanent Monitoring Well (UTU)
- Permanent Monitoring Well (STU)
- Monitoring Well Destroyed
- Surface Soil Sample Location
- Soil Boring Sample Location
- Staff Gauge Location
- Surface Water / Sediment Sample Location
- Background Sample Location
- Near Source Soil Gas Sample Location
- Sub-Slab Soil Gas Sample Location
- Sediment Sample Location (East Ditch Area)
- Piezometer Sample Location (East Ditch Area)
- DPT Sample Location
- East Ditch

NOTE(S)
1. UTU - UPPER TRANSMISSIVE UNIT
2. STU - SECOND TRANSMISSIVE UNIT

REFERENCE(S)
TOPOGRAPHIC ELEVATION CONTOURS AND SAMPLE LOCATIONS WERE SURVEYED BY FRONTIER SURVEYING.

0 250 500
1" = 500' FEET

BRINE SERVICE COMPANY SUPERFUND SITE
SAMPLE LOCATION MAP

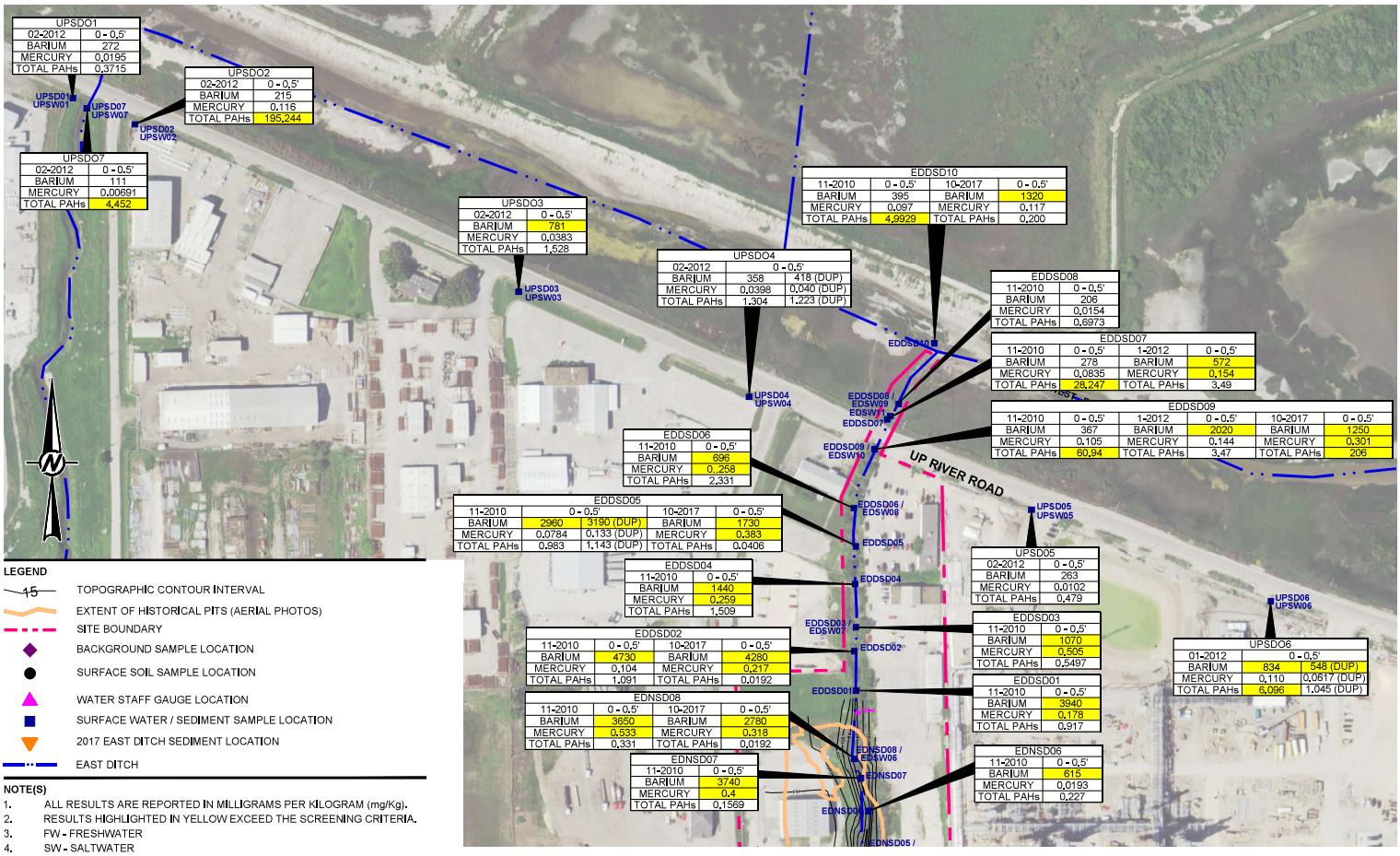
GOLDER

FIGURE 9

015236

Path: \\texalkana\data\Projects - Houston_2019\19124986 - Brine\2020\01 Jan\PRODUCTION | File Name: Sample Locations.dwg

Path: \\texarkana\data\Projects - Houston_2019\19124986 - Brine\2020-01 Jan\PRODUCTION\ | File Name: Barium, Mercury and Total PAH Concentrations.dwg



LEGEND

- 15 — TOPOGRAPHIC CONTOUR INTERVAL
- EXTENT OF HISTORICAL PITS (AERIAL PHOTOS)
- SITE BOUNDARY
- BACKGROUND SAMPLE LOCATION
- SURFACE SOIL SAMPLE LOCATION
- WATER STAFF GAUGE LOCATION
- SURFACE WATER / SEDIMENT SAMPLE LOCATION
- 2017 EAST DITCH SEDIMENT LOCATION
- EAST DITCH

NOTE(S)

1. ALL RESULTS ARE REPORTED IN MILLIGRAMS PER KILOGRAM (mg/Kg).
2. RESULTS HIGHLIGHTED IN YELLOW EXCEED THE SCREENING CRITERIA.
3. FW - FRESHWATER
4. SW - SALTWATER

SCREENING CRITERIA

BARIUM	465
MERCURY	0.15 (SW)
TOTAL PAHs	4.022 (SW)

REFERENCE(S)

TOPOGRAPHIC ELEVATION CONTOURS AND SAMPLE LOCATIONS WERE SURVEYED BY FRONTIER SURVEYING.

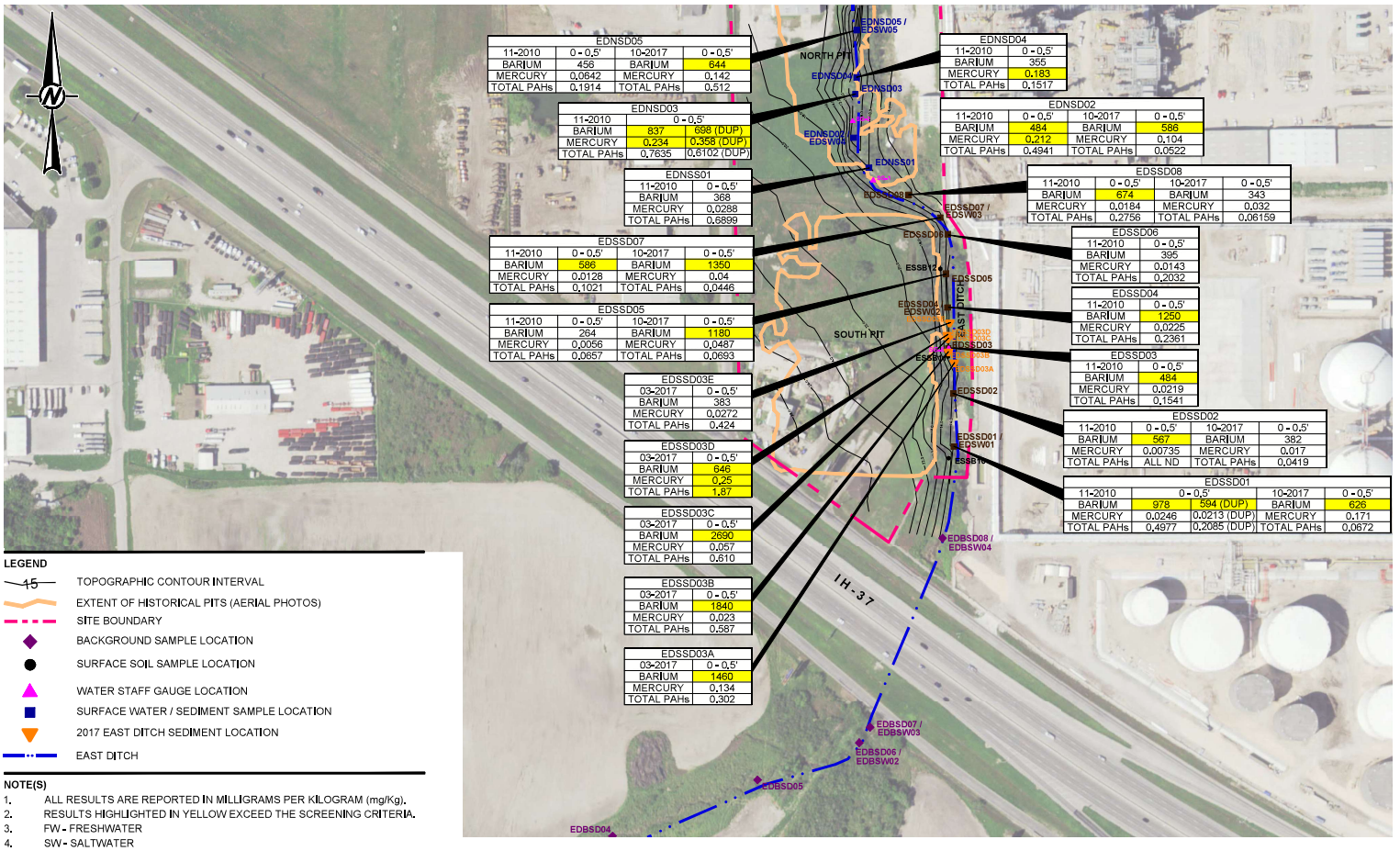
0 150 300
1" = 300' FEET

GOLDER

BRINE SERVICE COMPANY SUPERFUND SITE
BARIUM, MERCURY, AND TOTAL PAH CONCENTRATIONS IN EAST DITCH AND UP RIVER ROAD (NORTH)

FIGURE 10

Path: \\texarkana\data\Projects - Houston_2019\19124986 - Brine\2020-01 Jan\PRODUCTION\ | File Name: Barium, Mercury and Total PAH Concentrations.dwg



EDNSD05			
11-2010	0 - 0.5'	10-2017	0 - 0.5'
BARIUM	456	BARIUM	644
MERCURY	0.0642	MERCURY	0.142
TOTAL PAHs	0.1914	TOTAL PAHs	0.512

EDNSD03		
11-2010	0 - 0.5'	
BARIUM	837	698 (DUP)
MERCURY	0.234	0.358 (DUP)
TOTAL PAHs	0.7635	0.8102 (DUP)

EDNSS01	
11-2010	0 - 0.5'
BARIUM	368
MERCURY	0.0288
TOTAL PAHs	0.6899

EDSSD07			
11-2010	0 - 0.5'	10-2017	0 - 0.5'
BARIUM	586	BARIUM	1350
MERCURY	0.0128	MERCURY	0.04
TOTAL PAHs	0.1021	TOTAL PAHs	0.0446

EDSSD05			
11-2010	0 - 0.5'	10-2017	0 - 0.5'
BARIUM	264	BARIUM	1180
MERCURY	0.0056	MERCURY	0.0487
TOTAL PAHs	0.0657	TOTAL PAHs	0.0693

EDSSD03E		
03-2017	0 - 0.5'	
BARIUM	383	
MERCURY	0.0272	
TOTAL PAHs	0.424	

EDSSD03D	
03-2017	0 - 0.5'
BARIUM	646
MERCURY	0.25
TOTAL PAHs	1.87

EDSSD03C	
03-2017	0 - 0.5'
BARIUM	2690
MERCURY	0.057
TOTAL PAHs	0.610

EDSSD03B	
03-2017	0 - 0.5'
BARIUM	1840
MERCURY	0.023
TOTAL PAHs	0.567

EDSSD03A	
03-2017	0 - 0.5'
BARIUM	1460
MERCURY	0.134
TOTAL PAHs	0.302

EDNSD04	
11-2010	0 - 0.5'
BARIUM	355
MERCURY	0.183
TOTAL PAHs	0.1517

EDNSD02			
11-2010	0 - 0.5'	10-2017	0 - 0.5'
BARIUM	484	BARIUM	586
MERCURY	0.212	MERCURY	0.104
TOTAL PAHs	0.4941	TOTAL PAHs	0.0522

EDSSD08			
11-2010	0 - 0.5'	10-2017	0 - 0.5'
BARIUM	674	BARIUM	343
MERCURY	0.0184	MERCURY	0.032
TOTAL PAHs	0.2756	TOTAL PAHs	0.06159

EDSSD06	
11-2010	0 - 0.5'
BARIUM	395
MERCURY	0.0143
TOTAL PAHs	0.2032

EDSSD04	
11-2010	0 - 0.5'
BARIUM	1250
MERCURY	0.0225
TOTAL PAHs	0.2361

EDSSD03	
11-2010	0 - 0.5'
BARIUM	484
MERCURY	0.0219
TOTAL PAHs	0.1541

EDSSD02			
11-2010	0 - 0.5'	10-2017	0 - 0.5'
BARIUM	567	BARIUM	382
MERCURY	0.00735	MERCURY	0.017
TOTAL PAHs	ALL ND	TOTAL PAHs	0.0419

EDSSD01			
11-2010	0 - 0.5'	10-2017	0 - 0.5'
BARIUM	978	594 (DUP)	BARIUM 626
MERCURY	0.0246	0.0213 (DUP)	MERCURY 0.171
TOTAL PAHs	0.4977	0.2085 (DUP)	TOTAL PAHs 0.0672

LEGEND

- 15 — TOPOGRAPHIC CONTOUR INTERVAL
- EXTENT OF HISTORICAL PITS (AERIAL PHOTOS)
- SITE BOUNDARY
- BACKGROUND SAMPLE LOCATION
- SURFACE SOIL SAMPLE LOCATION
- WATER STAFF GAUGE LOCATION
- SURFACE WATER / SEDIMENT SAMPLE LOCATION
- 2017 EAST DITCH SEDIMENT LOCATION
- EAST DITCH

NOTE(S)

1. ALL RESULTS ARE REPORTED IN MILLIGRAMS PER KILOGRAM (mg/Kg).
2. RESULTS HIGHLIGHTED IN YELLOW EXCEED THE SCREENING CRITERIA.
3. FW - FRESHWATER
4. SW - SALTWATER

SCREENING CRITERIA

BARIUM	465	
MERCURY	0.18 (FW)	0.15 (SW)
TOTAL PAHs	1.61 (FW)	4.022 (SW)

REFERENCE(S)

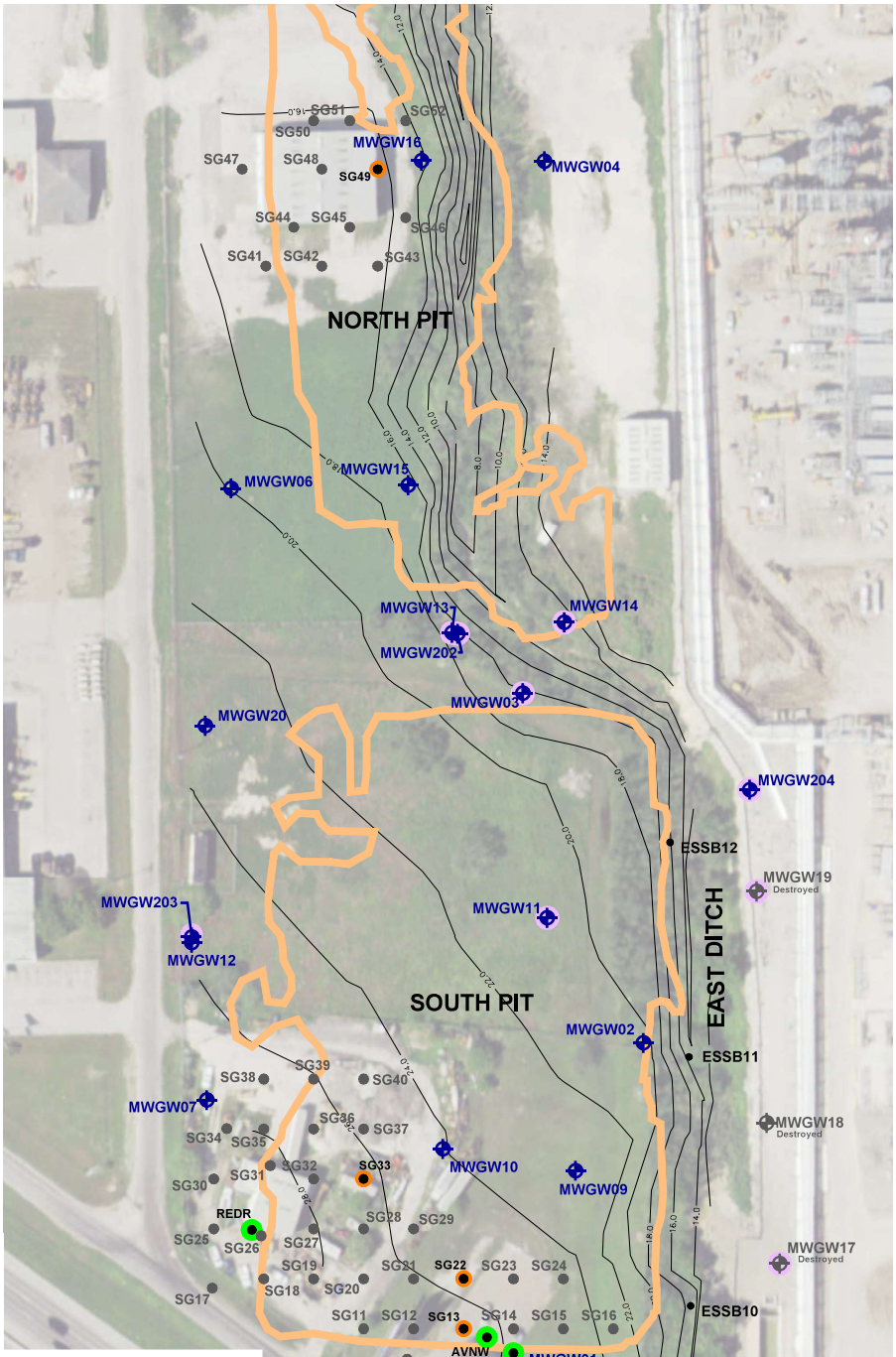
TOPOGRAPHIC ELEVATION CONTOURS AND SAMPLE LOCATIONS WERE SURVEYED BY FRONTIER SURVEYING.

0 150 300
1" = 300' FEET

GOLDER

BRINE SERVICE COMPANY SUPERFUND SITE
BARIUM, MERCURY, AND TOTAL PAH CONCENTRATIONS IN EAST DITCH AND UP RIVER ROAD (SOUTH)

FIGURE 11



LEGEND

- 15 — Topographic Contour Interval
- Extent of Historical Pits (Aerial Photos)
- Permanent Monitoring Well (UTU)
- Permanent Monitoring Well (STU)
- Monitoring Well Destroyed
- Passive Soil Gas Sample Location
- Near Source Soil Gas Sample Location
- Sub-Slab Soil Gas Sample Location

NOTE(S)
1. UTU - UPPER TRANSMISSIVE UNIT
2. STU - SECOND TRANSMISSIVE UNIT

REFERENCE(S)
TOPOGRAPHIC ELEVATION CONTOURS AND SAMPLE LOCATIONS WERE SURVEYED BY FRONTIER SURVEYING.

0 80 160
1" = 160' FEET

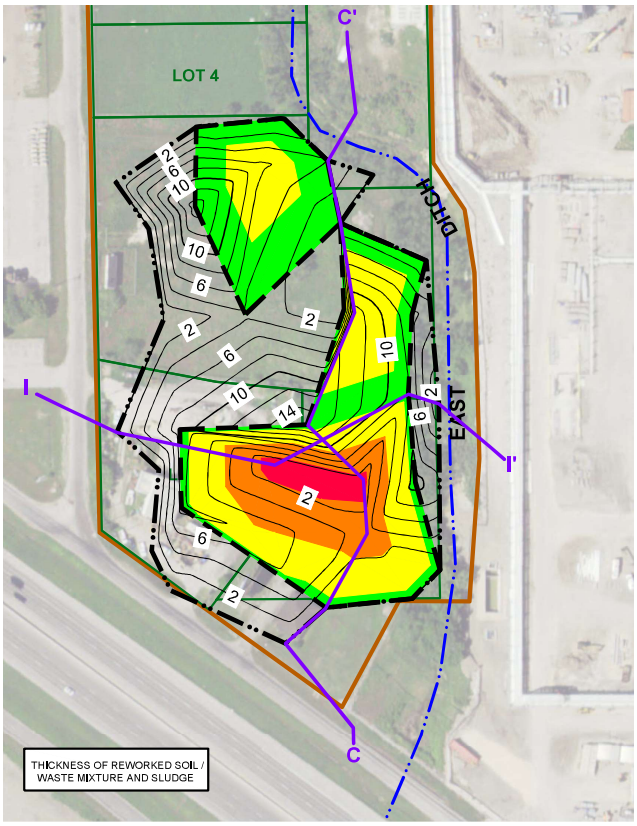
BRINE SERVICE COMPANY SUPERFUND SITE
SOIL GAS SAMPLE LOCATION MAP

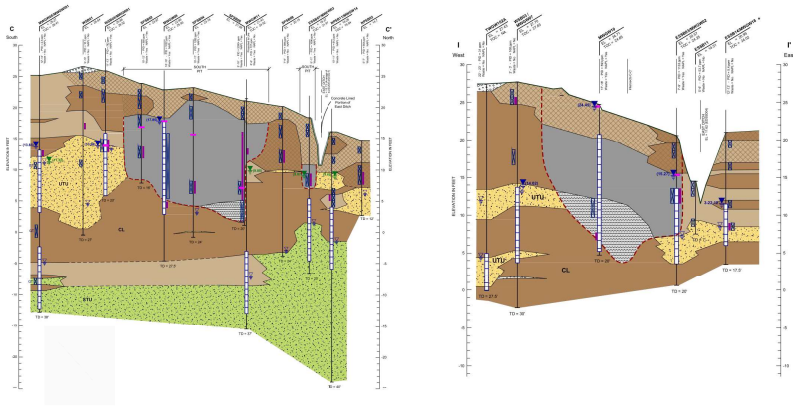
GOLDER

FIGURE 12

Path: \\texarkana\data\Projects - Houston_2019\19124986 - Brine\2020-01 Jan\PRODUCTION | File Name: Soil Gas Sample Location Map.dwg

Last Edited By: rsalazar Date: 2020-08-04 Time:1:43:16 PM | Printed By: RSalazar Date: 2020-08-04 Time:3:24:54 PM |
Path: \\texarkana\data\Projects - Houston_2019\19124986 - Brine\2019-8 Augt. | File Name: FIG 13 - Estimated Thickness of Reworked Soil_Waste & Sludge.dwg





Fill Material
Gravel Base Material
Clay / Silty Clay / Sandy Clay
Silt / Clayey Silt / Sandy Silt
Clayey Sand / Silty Sand / Sand
Reworked Soil / Waste Material
Sludge Material

LEGEND

- SITE BOUNDARY
- EXTENT OF REWORKED SOIL/WASTE
- EXTENT OF SLUDGE (CALCULATED)
- A — A' CROSS SECTION LOCATION
- 2 THICKNESS OF REWORKED SOIL/WASTE MIXTURE CONTOUR (CONTOUR INTERVAL = 2 ft)
- EAST DITCH

NOTE(S)

1. EXTENT AND THICKNESS OF SLUDGE WILL BE REFINED DURING RD.

SOURCE

BRINE FEASIBILITY STUDY, OCTOBER 2018

THICKNESS OF SLUDGE (IN FEET)		
	0	1
	1	5
	5	9
	9	12

CLIENT
BRINE SERVICE COMPANY

PROJECT
SUPERFUND SITE
CORPUS CHRISTY, TEXAS

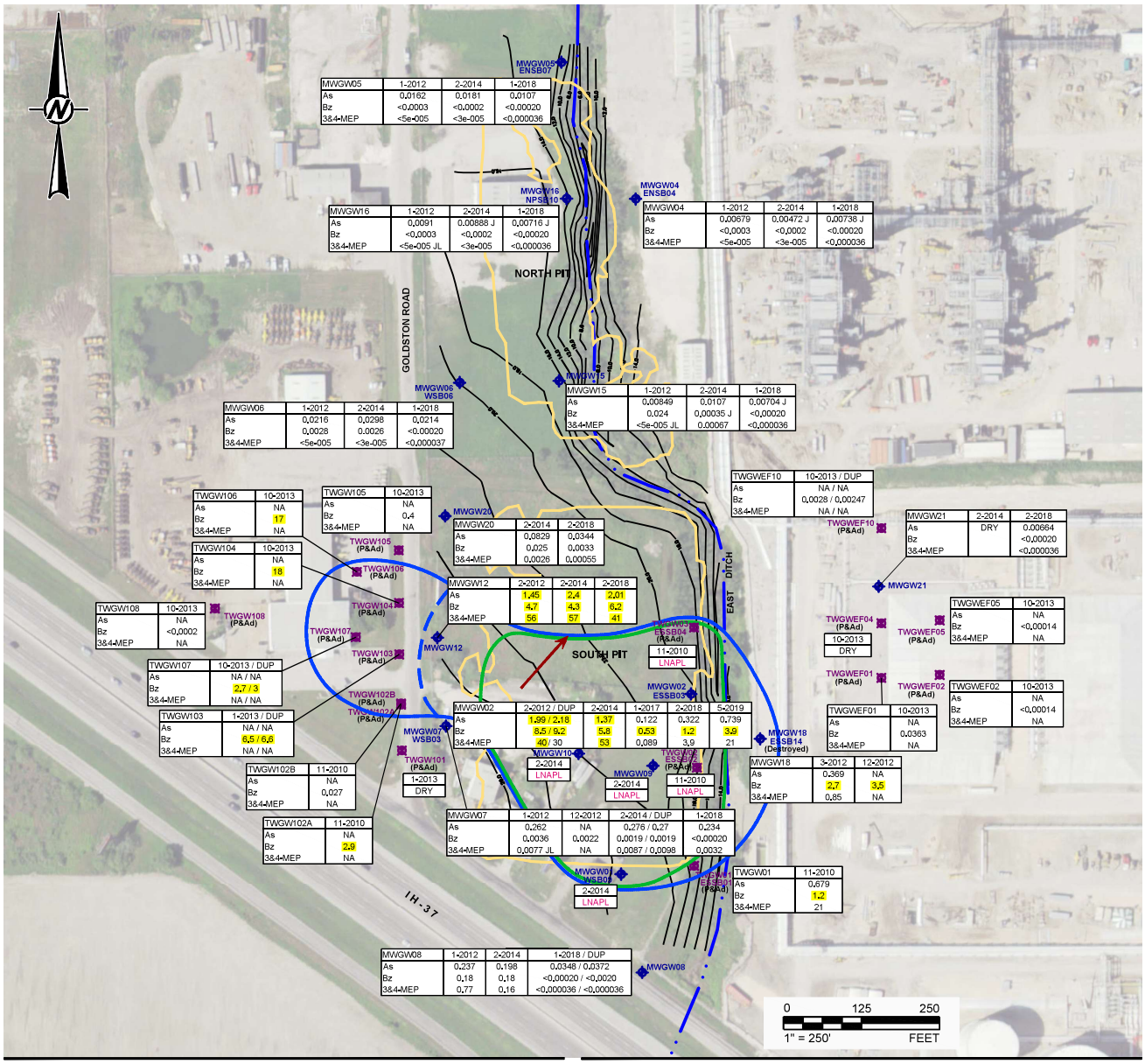
TITLE
ESTIMATED THICKNESS OF REWORKED SOIL/WASTE MIXTURE AND SLUDGE

CONSULTANT
GOLDER

YYYY-MM-DD	2020-08-04
DESIGNED	RS
PREPARED	RS
REVIEWED	BB
APPROVED	BB

PROJECT NO. 19124986 | REV. 0 | FIGURE 13

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



LEGEND

- 15 — TOPOGRAPHIC CONTOUR INTERVAL
- EXTENT OF HISTORICAL PITS
- TEMPORARY MONITORING WELL (UTU)
- PERMANENT MONITORING WELL (UTU)
- (P&Ad) — WELL PLUGGED AND ABANDONED
- BENZENE / DISSOLVED PHASE PLUME
- INFERRED BOUNDARY BETWEEN OFF-SITE AND ON-SITE DISSOLVED PHASE PLUME
- LNAPL PLUME (WEST SIDE INFERRED FROM BORINGS)
- GENERAL DIRECTION OF GROUNDWATER FLOW
- EAST DITCH

NOTE(S)

1. UTU - UPPER TRANSMISSIVE UNIT
2. ALL RESULTS REPORTED IN MILLIGRAMS PER LITER (mg/L).
3. "J" INDICATES ESTIMATED VALUE.
4. "NA" INDICATES NOT ANALYZED.
5. RESULTS HIGHLIGHTED IN YELLOW EXCEED THE SCREENING CRITERIA.
6. BENZENE DETECTIONS ON NUECES POWER PROPERTY ARE NOT BELIEVED TO BE ASSOCIATED WITH THE BRINE SITE.

SCREENING CRITERIA

ARSENIC (As)	1.0 mg/L
BENZENE (Bz)	0.5 mg/L
3&4-METHYLPHENOL (3&4-MEP)	37 mg/L

REFERENCE(S)

2015 TOP AERIAL IMAGE FROM TNRIS - 0.5M RESOLUTION
TOPOGRAPHIC ELEVATION CONTOURS AND SAMPLE LOCATIONS WERE SURVEYED BY FRONTIER SURVEYING.

CLIENT
BRINE SERVICE COMPANY

PROJECT
SUPERFUND SITE
CORPUS CHRISTI, TEXAS

CONSULTANT
GOLDER

YYYY-MM-DD	2019-08-06
DESIGNED	AJD
PREPARED	AJD
REVIEWED	BB
APPROVED	BB

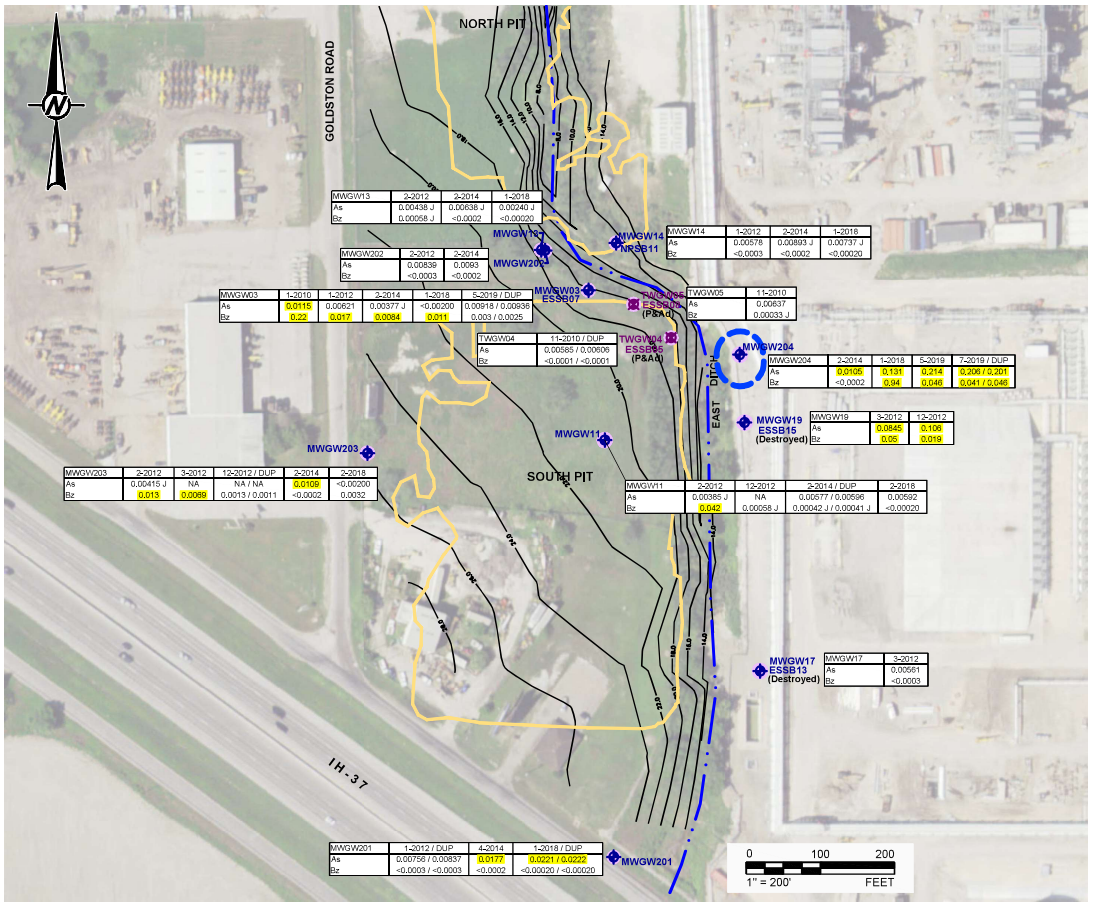
TITLE
UPPER TRANSMISSIVE UNIT GROUNDWATER CONCENTRATIONS

PROJECT NO.	REV.	FIGURE
19124986	0	14

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

Last Edited By: rsalazar Date: 2019-08-06 Time:11:32:21 AM | Printed By: RSalazar Date: 2020-07-27 Time:10:05:37 AM
Path: N:\Houston\Active\Projects - Houston_2019\19124986 - Brine\301-343 Aug\ | File Name: FIG 7 - UTU Groundwater Concentrations.dwg

Last Edited By: rsalazar Date: 2020-07-27 Time:10:06:08 AM | Printed By: RSalazar Date: 2020-07-28 Time:11:25:37 AM
Path: \\texarkana\data\Projects - Houston_2019\19124986 - Brine\2019-8 Aug\ | File Name: FIG 8 - STU Groundwater Concentrations.dwg



LEGEND

- 15 — TOPOGRAPHIC CONTOUR INTERVAL
- EXTENT OF HISTORICAL PITS
- TEMPORARY MONITORING WELL (STU)
- PERMANENT MONITORING WELL (STU)
- (P&Ad) — WELL PLUGGED AND ABANDONED
- EAST DITCH
- INFERRED DISSOLVED PHASE PLUME

NOTE(S)

1. STU - SECOND TRANSMISSIVE UNIT
2. ALL RESULTS REPORTED IN MILLIGRAMS PER LITER (mg/L).
3. RESULTS HIGHLIGHTED IN YELLOW EXCEED THE MCLs.

SCREENING CRITERIA

ARSENIC (As)	0.010 mg/L
BENZENE (Bz)	0.005 mg/L

REFERENCE(S)

2015 TOP AERIAL IMAGE FROM TNRIS - 0.5M RESOLUTION
TOPOGRAPHIC ELEVATION CONTOURS AND SAMPLE LOCATIONS
WERE SURVEYED BY FRONTIER SURVEYING.

CLIENT
BRINE SERVICE COMPANY

CONSULTANT
GOLDER

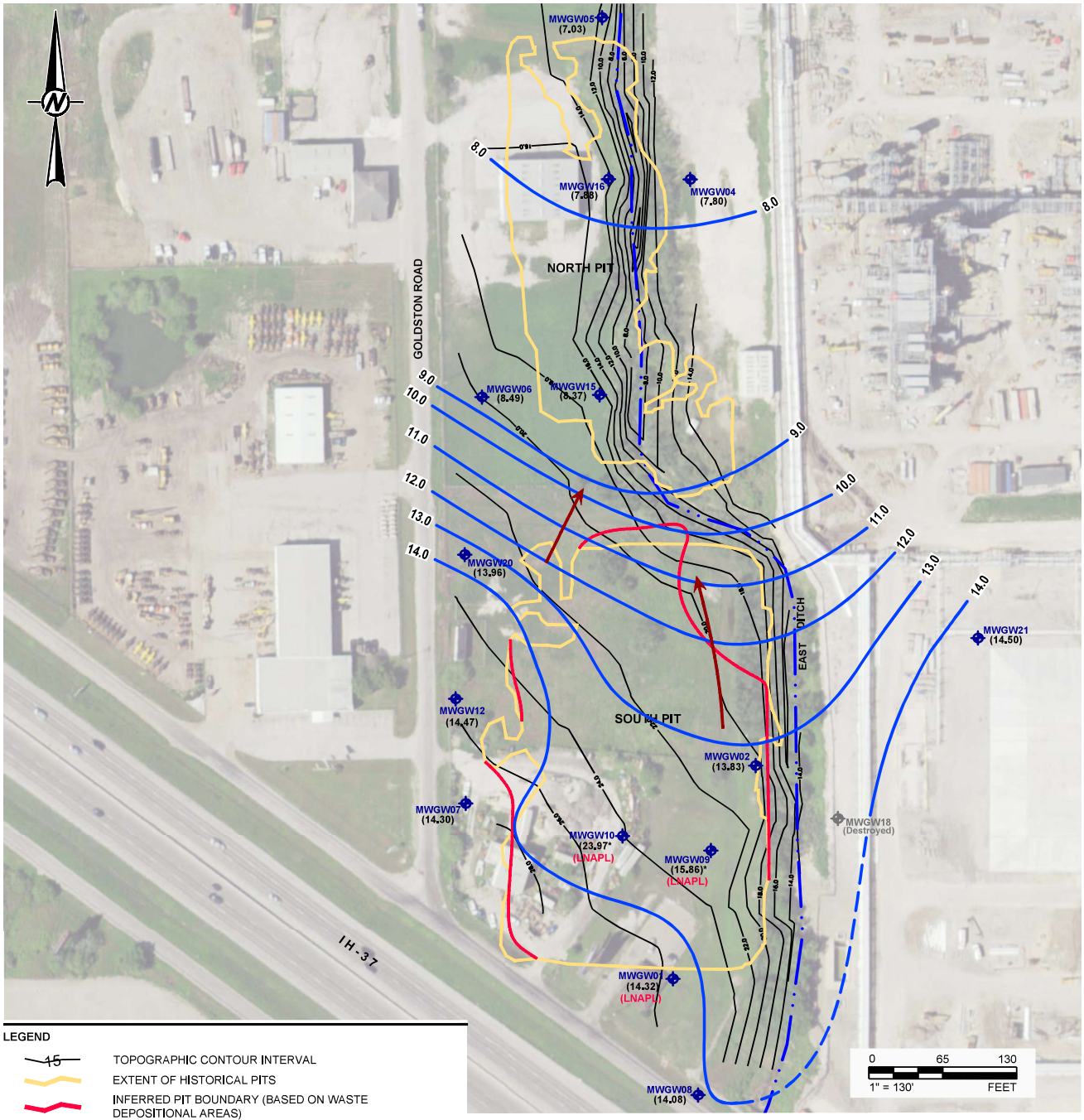
YYYY-MM-DD	2019-08-06
DESIGNED	AJD
PREPARED	AJD
REVIEWED	BB
APPROVED	BB

PROJECT
SUPERFUND SITE
CORPUS CHRISTI, TEXAS

TITLE
SECOND TRANSMISSIVE UNIT GROUNDWATER CONCENTRATIONS

PROJECT NO.	REV.	FIGURE
19124986	0	15

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



LEGEND

- 15 — TOPOGRAPHIC CONTOUR INTERVAL
- EXTENT OF HISTORICAL PITS
- INFERRED PIT BOUNDARY (BASED ON WASTE DEPOSITIONAL AREAS)
- PERMANENT MONITORING WELL (UTU)
- (8.35) — GROUNDWATER ELEVATION
- 10.0 — GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (C.I. = 1.0 FT)
- GENERAL DIRECTION OF GROUNDWATER FLOW
- EAST DITCH

NOTE(S)

1. UTU - UPPER TRANSMISSIVE UNIT
2. WATER ELEVATIONS MEASURED IN FEET RELATIVE TO MEAN SEAL LEVEL (MSL)
3. * NAPL WELL - NOT SCREENED IN A TRANSMISSIVE UNIT AND ELEVATION WAS NOT USED IN CONTOURING
4. LNAPL - PRODUCT OBSERVED IN WELL AT TIME OF GAUGING

REFERENCE(S)

2015 TOP AERIAL IMAGE FROM TNRIS - 0.5M RESOLUTION
TOPOGRAPHIC ELEVATION CONTOURS AND SAMPLE LOCATIONS WERE SURVEYED BY FRONTIER SURVEYING.

SOURCE

BRINE FEASIBILITY STUDY, OCTOBER 2018

CLIENT
BRINE SERVICE COMPANY

PROJECT
SUPERFUND SITE
CORPUS CHRISTI, TEXAS

TITLE
UPPER TRANSMISSIVE UNIT
POTENTIOMETRIC SURFACE MAP - JANUARY 2018

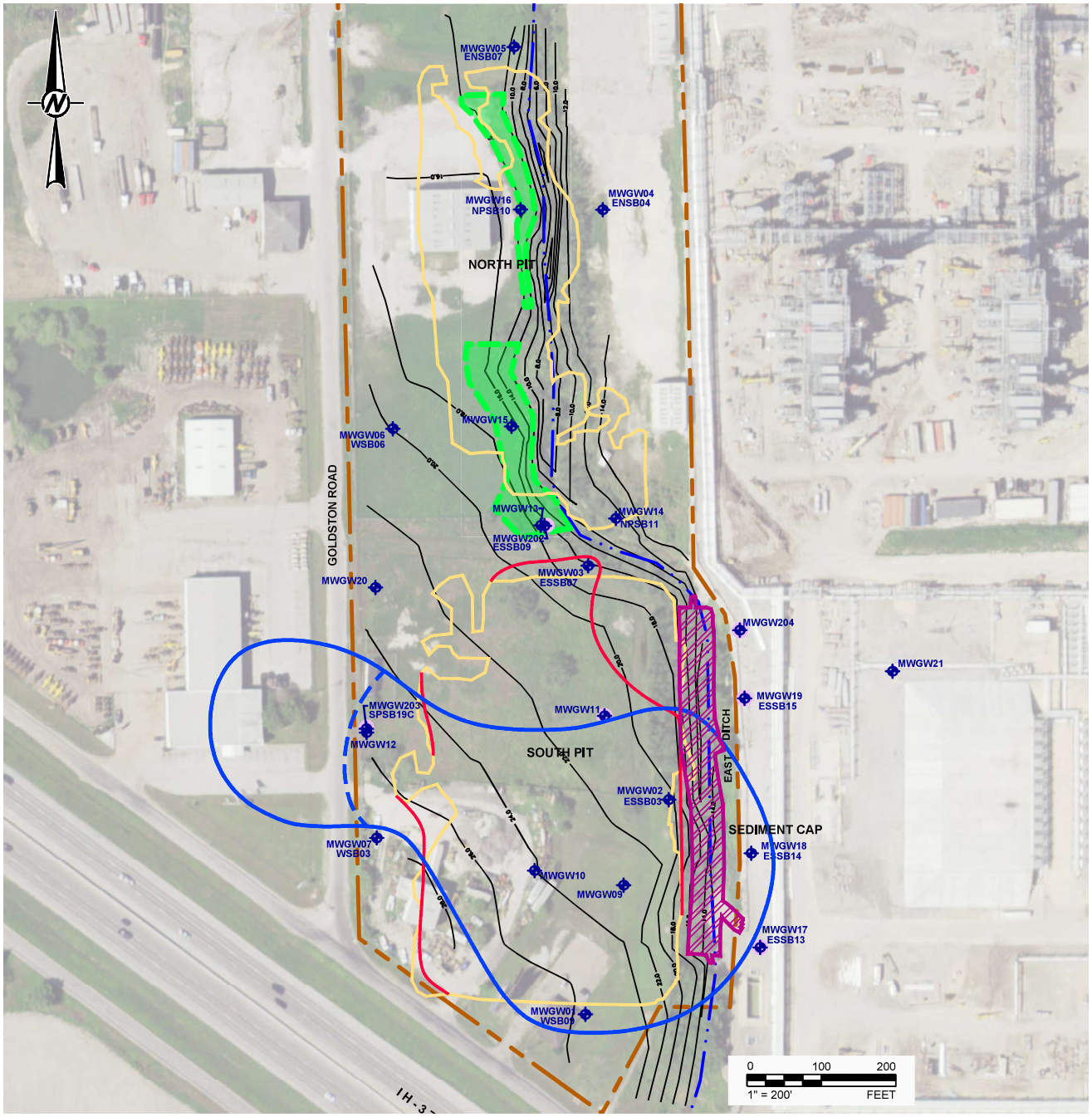
CONSULTANT
GOLDER

YYYY-MM-DD	2020-08-04
DESIGNED	RS
PREPARED	RS
REVIEWED	BB
APPROVED	BB

PROJECT NO. 19124986 | REV. 0 | FIGURE 16

Last Edited By: rsalazar Date: 2020-08-04 Time:2:52:21 PM | Printed By: RSalazar Date: 2020-08-04 Time:3:25:47 PM
Path: \\texarkana\data\Projects - Houston_2019\19124986 - Brine\2019-3 Aug\ | File Name: FIG 16 - UTU Pot Surface Map (January 2018).dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



LEGEND

- SITE BOUNDARY
- TOPOGRAPHIC CONTOUR INTERVAL
- EXTENT OF HISTORICAL PITS (AERIAL PHOTOS)
- INFERRED PIT BOUNDARY (BASED ON WASTE DEPOSITIONAL AREAS)
- BENZENE / LNAPL GROUNDWATER PLUME
- INFERRED BOUNDARY BETWEEN OFF-SITE AND SITE PLUMES
- NORTH PIT SURFACE SOIL HOT SPOT AREAS
- EAST DITCH
- PERMANENT MONITORING WELL (UTU)
- PERMANENT MONITORING WELL (STU)

CLIENT
BRINE SERVICE COMPANY

PROJECT
SUPERFUND SITE
CORPUS CHRISTI, TEXAS

TITLE
INFERRED SOUTH PIT BOUNDARY AND NORTH PIT REMEDIATION AREAS

CONSULTANT
GOLDER

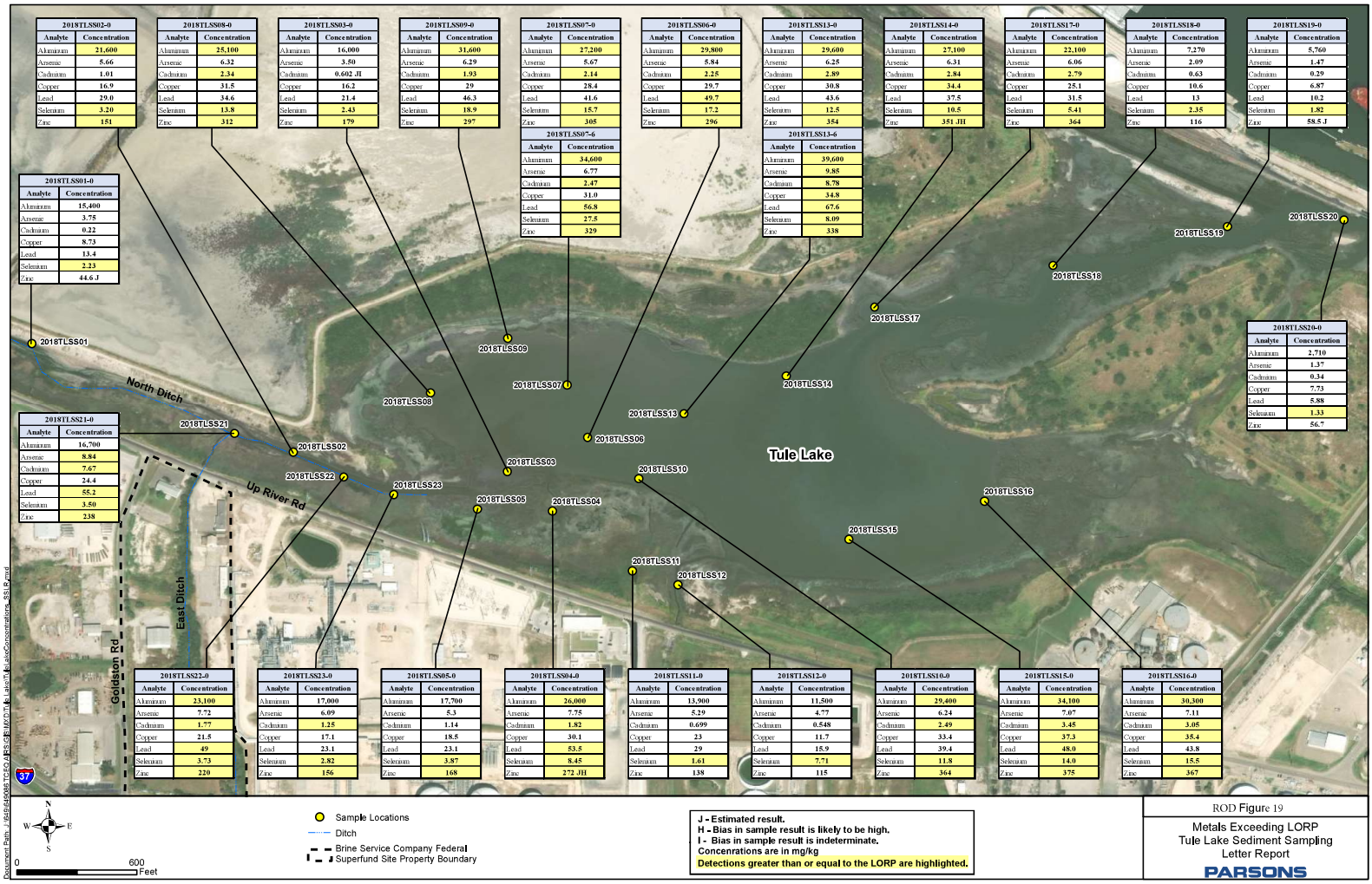
YYYY-MM-DD	2019-09-06
DESIGNED	AJD
PREPARED	AJD
REVIEWED	BB
APPROVED	BB

PROJECT NO. 30404056 | REV. 0 | FIGURE 17

Last Edited By: rsalazar Date: 2019-09-06 Time:8:59:27 AM | Printed By: RSalazar Date: 2020-05-28 Time:8:29:36 PM
Path: \\texarkana\data\Projects - Houston\4056 - Brine\2019-03 March\ | File Name: FIG 5 - Inferred South Pit Boundary & North Pit Remediation Areas.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A


2018TLSS01-0
2018TLSS021-0
2018TLSS02-0
2018TLSS22-0
2018TLSS23-0
2018TLSS05-0
2018TLSS04-0
2018TLSS03-0
2018TLSS08-0
2018TLSS09-0
2018TLSS07
2018TLSS06-0
2018TLSS10-0
2018TLSS13
2018TLSS14-0
2018TLSS17-0
2018TLSS18
2018TLSS19-0
2018TLSS20-0
2018TLSS16-0
2018TLSS15-0
2018TLSS11-0
2018TLSS12-0
North Ditch
Up River Rd
East Ditch
Goldston Rd
Tule Lake
37
N
W
E
S
0
600
Feet
Sediment Sample Location
Ditch
Brine Service Company Federal
Superfund Site Property Boundary
ROD Figure 18
Sample Location Map
Tule Lake Sediment Sampling
Letter Report
PARSONS


2018TLSS02-0
Analyte | Concentration
Aluminum | 21,600
Arsenic | 5.66
Cadmium | 1.01
Copper | 16.9
Lead | 29.0
Selenium | 3.20
Zinc | 151
2018TLSS08-0
Analyte | Concentration
Aluminum | 25,100
Arsenic | 6.32
Cadmium | 2.34
Copper | 31.5
Lead | 34.6
Selenium | 13.8
Zinc | 312
2018TLSS03-0
Analyte | Concentration
Aluminum | 16,000
Arsenic | 3.50
Cadmium | 0.602 JI
Copper | 16.2
Lead | 21.4
Selenium | 2.43
Zinc | 179
2018TLSS09-0
Analyte | Concentration
Aluminum | 31,600
Arsenic | 6.29
Cadmium | 1.93
Copper | 29
Lead | 46.3
Selenium | 18.9
Zinc | 297
2018TLSS07-0
Analyte | Concentration
Aluminum | 27,200
Arsenic | 5.67
Cadmium | 2.14
Copper | 28.4
Lead | 41.6
Selenium | 15.7
Zinc | 305
2018TLSS07-6
Analyte | Concentration
Aluminum | 34,600
Arsenic | 6.77
Cadmium | 2.47
Copper | 31.0
Lead | 56.8
Selenium | 27.5
Zinc | 329
2018TLSS06-0
Analyte | Concentration
Aluminum | 29,800
Arsenic | 5.84
Cadmium | 2.25
Copper | 29.7
Lead | 49.7
Selenium | 17.2
Zinc | 296
2018TLSS13-0
Analyte | Concentration
Aluminum | 29,600
Arsenic | 6.25
Cadmium | 2.89
Copper | 30.8
Lead | 43.6
Selenium | 12.5
Zinc | 354
2018TLSS13-6
Analyte | Concentration
Aluminum | 39,600
Arsenic | 9.85
Cadmium | 8.78
Copper | 34.8
Lead | 67.6
Selenium | 8.09
Zinc | 338
2018TLSS14-0
Analyte | Concentration
Aluminum | 27,100
Arsenic | 6.31
Cadmium | 2.84
Copper | 34.4
Lead | 37.5
Selenium | 10.5
Zinc | 351 JH
2018TLSS17-0
Analyte | Concentration
Aluminum | 22,100
Arsenic | 6.06
Cadmium | 2.79
Copper | 25.1
Lead | 31.5
Selenium | 5.41
Zinc | 364
2018TLSS18-0
Analyte | Concentration
Aluminum | 7,270
Arsenic | 2.09
Cadmium | 0.63
Copper | 10.6
Lead | 13
Selenium | 2.35
Zinc | 116
2018TLSS19-0
Analyte | Concentration
Aluminum | 5,760
Arsenic | 1.47
Cadmium | 0.29
Copper | 6.87
Lead | 10.2
Selenium | 1.82
Zinc | 58.5 J
2018TLSS01-0
Analyte | Concentration
Aluminum | 15,400
Arsenic | 3.75
Cadmium | 0.22
Copper | 8.73
Lead | 13.4
Selenium | 2.23
Zinc | 44.6 J
2018TLSS20
2018TLSS19
2018TLSS18
2018TLSS17
2018TLSS26-0
Analyte | Concentration
Aluminum | 2,710
Arsenic | 1.37
Cadmium | 0.34
Copper | 7.73
Lead | 5.88
Selenium | 1.33
Zinc | 56.7
2018TLSS01
2018TLSS09
2018TLSS07
2018TLSS14
2018TLSS08
2018TLSS13
2018TLSS21-0
Analyte | Concentration
Aluminum | 16,700
Arsenic | 8.84
Cadmium | 7.67
Copper | 24.4
Lead | 55.2
Selenium | 3.50
Zinc | 238
2018TLSS21
2018TLSS06
2018TLSS02
2018TLSS03
2018TLSS10
Tule Lake
2018TLSS22
2018TLSS23
2018TLSS05
2018TLSS04
2018TLSS16
2018TLSS15
2018TLSS11
2018TLSS12
North Ditch
Up River Rd
East Ditch
Goldston Rd
2018TLSS22-0
Analyte | Concentration
Aluminum | 23,100
Arsenic | 7.72
Cadmium | 1.77
Copper | 21.5
Lead | 49
Selenium | 3.73
Zinc | 220
2018TLSS23-0
Analyte | Concentration
Aluminum | 17,000
Arsenic | 6.09
Cadmium | 1.25
Copper | 17.1
Lead | 23.1
Selenium | 2.82
Zinc | 156
2018TLSS05-0
Analyte | Concentration
Aluminum | 17,700
Arsenic | 5.3
Cadmium | 1.14
Copper | 18.5
Lead | 23.1
Selenium | 3.87
Zinc | 168
2018TLSS04-0
Analyte | Concentration
Aluminum | 26,000
Arsenic | 7.75
Cadmium | 1.82
Copper | 30.1
Lead | 53.5
Selenium | 8.45
Zinc | 272 JH
2018TLSS11-0
Analyte | Concentration
Aluminum | 13,900
Arsenic | 5.29
Cadmium | 0.699
Copper | 23
Lead | 29
Selenium | 1.61
Zinc | 138
2018TLSS12-0
Analyte | Concentration
Aluminum | 11,500
Arsenic | 4.77
Cadmium | 0.548
Copper | 11.7
Lead | 15.9
Selenium | 7.71
Zinc | 115
2018TLSS10-0
Analyte | Concentration
Aluminum | 29,400
Arsenic | 6.24
Cadmium | 2.49
Copper | 33.4
Lead | 39.4
Selenium | 11.8
Zinc | 364
2018TLSS15-0
Analyte | Concentration
Aluminum | 34,100
Arsenic | 7.07
Cadmium | 3.45
Copper | 37.3
Lead | 48.0
Selenium | 14.0
Zinc | 375
2018TLSS16-0
Analyte | Concentration
Aluminum | 30,300
Arsenic | 7.11
Cadmium | 3.05
Copper | 35.4
Lead | 43.8
Selenium | 15.5
Zinc | 367
N
W
E
S
0
600
Feet
Sample Locations
Ditch
Brine Service Company Federal Superfund Site Property Boundary
J - Estimated result.
H - Bias in sample result is likely to be high.
I - Bias in sample result is indeterminate.
Concenrations are in mg/kg
Detections greater than or equal to the LORP are highlighted.
ROD Figure 19
Metals Exceeding LORP
Tule Lake Sediment Sampling
Letter Report
PARSONS
Document Path: J:\949\649086 TCEQ ARSG\GIS\MXD\Tule Lake\TuleLakeConcentrations_SSLR.mxd

APPENDIX C PHOTOGRAPHS

PHOTOGRAPHIC LOG

Brine Service Company Superfund Site	Site Location: Corpus Christi, Texas

Photo No. 1	Date: October 2010

Typical View of the Grassy Portion of the Site

Description:
Photo was taken from the South Pit Area Lot 5 (See Figure 2 – Site Map) looking east. The tree line in the background is the East Ditch riparian vegetation. Feature on the left side is the cellular tower and building (demolished in 2011).

Photo No. 2	Date: October 2010

Typical View of the Grassy Portion of the Site

Description:
Photo was taken from the South Pit Area Lot 5 (See Figure 2 – Site Map) looking south. The heavy equipment repair shop on Lot 6 is shown in the background.

PHOTOGRAPHIC LOG

Brine Service Company Superfund Site	Site Location: Corpus Christi, Texas

Photo No. 3	Date: October 2010

Typical View of the Grassy Portion of the Site

Description: Photo was taken from the South Pit Area Lot 5 (See Figure 2 – Site Map) looking north. The Goodyear facility that is located above the North Pit, can be seen in the background. View looking north from Lot 5. Grassy area is Lot 4.

Photo No. 4	Date: January 2017

Pipeline Markers

Description: View looking east from Lot 7 (See Figure 2 – Site Map). These pipelines continue onto the Site.

PHOTOGRAPHIC LOG

Brine Service Company Superfund Site	Site Location: Corpus Christi, Texas

Photo No. 5	Date: October 2010

View of the Lower Reach of the East Ditch at Up River Road

Description:
Looking downstream to culvert that is under Up River Road between Lot 1A (not part of the Site) and Lot 8A (See Figure 2 – Site Map). Drainage from Up River Road enters the East Ditch at this location as shown by the arrows.

Photo No. 6	Date:

Pipeline Markers

Description:
View to east from Lot 2 to Lot 8B (See Figure 2 – Site Map) with pipeline markers. Pipelines crossing East Ditch are visible in photograph.

PHOTOGRAPHIC LOG

Brine Service Company Superfund Site	Site Location: Corpus Christi, Texas

Photo No. 7	Date: February 2018

East Ditch Sediment Cap

Description:
View to south-southeast of sediment cap installed in December 2017.

Photo No. 8	Date: March 2020

East Ditch Sediment Cap Extension

Description:
View to the north-northeast of the sediment cap extension installed in February 2020.

Photo is looking north from the sediment cap (Photo 7) installed in December 2017. Photo shows vegetation infilling concrete erosion control mat.

PHOTOGRAPHIC LOG

Brine Service Company Superfund Site	Site Location: Corpus Christi, Texas

Photo No. 9	Date: March 2018

Arundo

Description:
Arundo growth in sediment cap looking northeast

Photo No. 10	Date: October 2010

Lower Reach of East Ditch

Description:
View of lower reach of East Ditch looking upstream.

PHOTOGRAPHIC LOG

Brine Service Company Superfund Site	Site Location: Corpus Christi, Texas

Photo No. 11	Date: November 2010

Concrete Erosion Control in East Ditch

Description:
View of concrete "S" turn in East Ditch – looking north. Location of sediment sample EDNSD01 adjacent to concrete (See Figure 11 – Barium, Mercury and Total PAH Concentrations in East Ditch and Up River Road (South).

Photo No. 12	Date: January 2017

Sub-Slab Soil Gas Sampling

Description:
Installing sampling port by drilling through concrete slab and placing a brass fitting to connect tubing

PHOTOGRAPHIC LOG

Brine Service Company Superfund Site	Site Location: Corpus Christi, Texas

Photo No. 13	Date: January 2017

Sub-Slab Soil Gas Sampling

Description:
Sub-slab soil gas sampling conducted at equipment repair facility on Lot 6 (See Figure 2 – Site Map).
Photograph shows:
1. Summa canister which holds vapor sample
2. Tubing between canister and sample port
3. Sample port drilled through concrete slab

Photo No. 14	Date: January 2017

Drill Rig

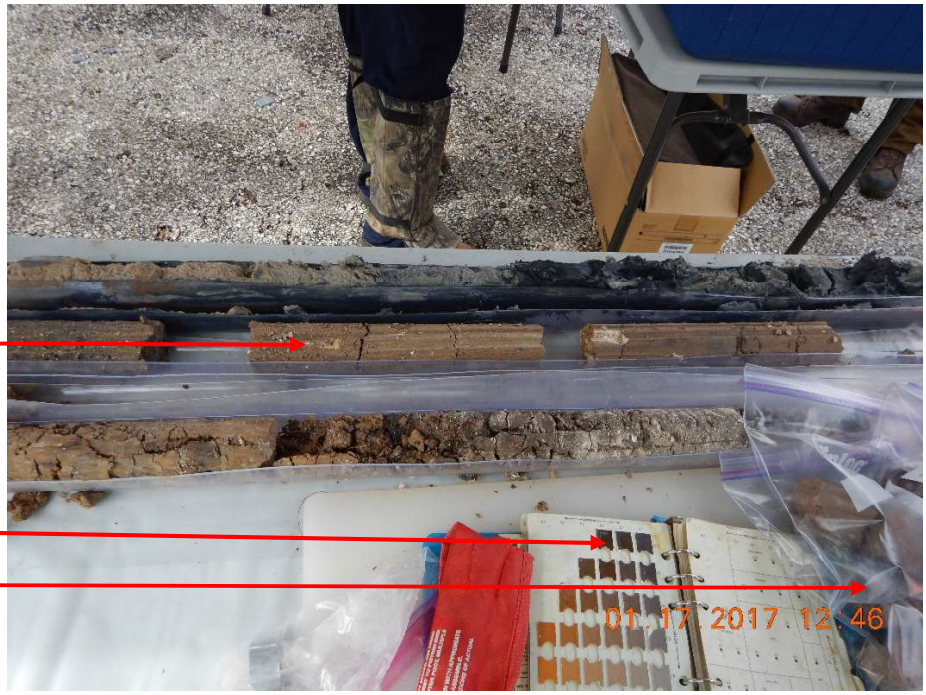
Description:
Drill rig installing soil boring on Lot 4 (See Figure 2 – Site Map). Monitor well MW-16 shown on left side of picture.

PHOTOGRAPHIC LOG

Brine Service Company Superfund Site	Site Location: Corpus Christi, Texas

Photo No. 15	Date: January 2017

Logging Soil Core



Description:
Photograph shows three sections of core in acetate liners. Geologist is recording soil types (clay, silty clay, silt, sand, etc.). Color is determined by comparing soil to Munsell color chart. Portions of core are placed in plastic bags. Bags are allowed to warm and a reading of the headspace in the bag is recorded in the field notes.

Photo No. 16	Date: 2/27/2020

EM61 Survey

Description:
Conducting EM61 survey on Lot 7 in South Pit area (See Figure 2 – Site Map). The purpose of the EM61 survey was to locate potentially buried metallic objects at the Site.

PHOTOGRAPHIC LOG

Brine Service Company Superfund Site	Site Location: Corpus Christi, Texas

Photo No. 17	Date: December 2010

Monitoring Well Installation

Description:
Installing polyvinyl chloride (PVC) casing for monitoring well MWGW03. Well is installed in second transmissive unit on Lot 5 (See Figure 2 – Site Map and Figure 14 – Second Transmissive Unit Groundwater Concentrations).

Photo No. 18	Date: December 2010

Monitoring Well Completion

Description:
Surface completion for MWGW03 showing concrete pad, yellow bollards, and black stickup which has PVC casing inside. Drums contain soil cuttings from well installation. Soil cuttings were disposed of off-site at a permitted waste facility.

PHOTOGRAPHIC LOG

Brine Service Company Superfund Site	Site Location: Corpus Christi, Texas

Photo No. 19	Date: February 2020

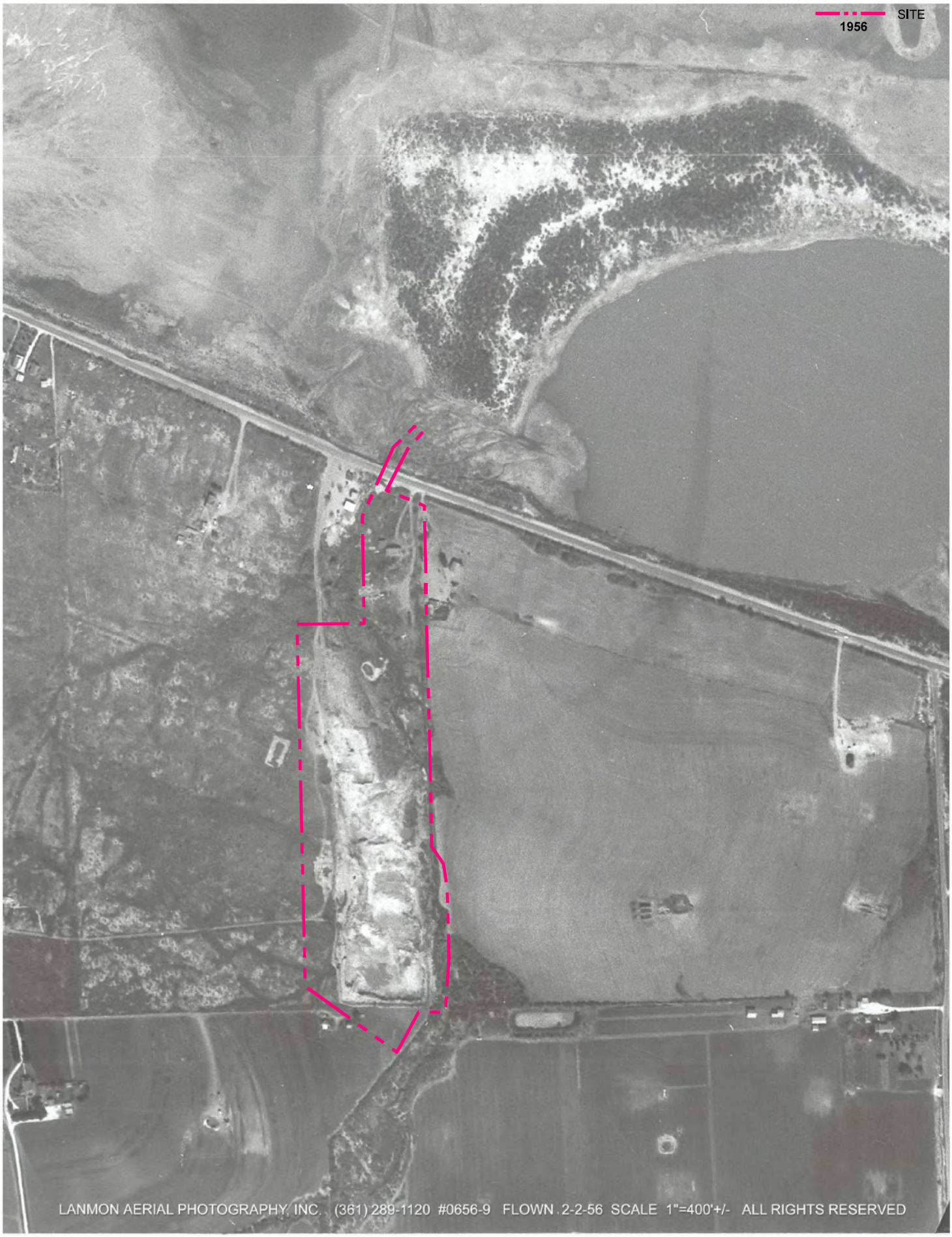
East Ditch Sediment Cap Extension Installation

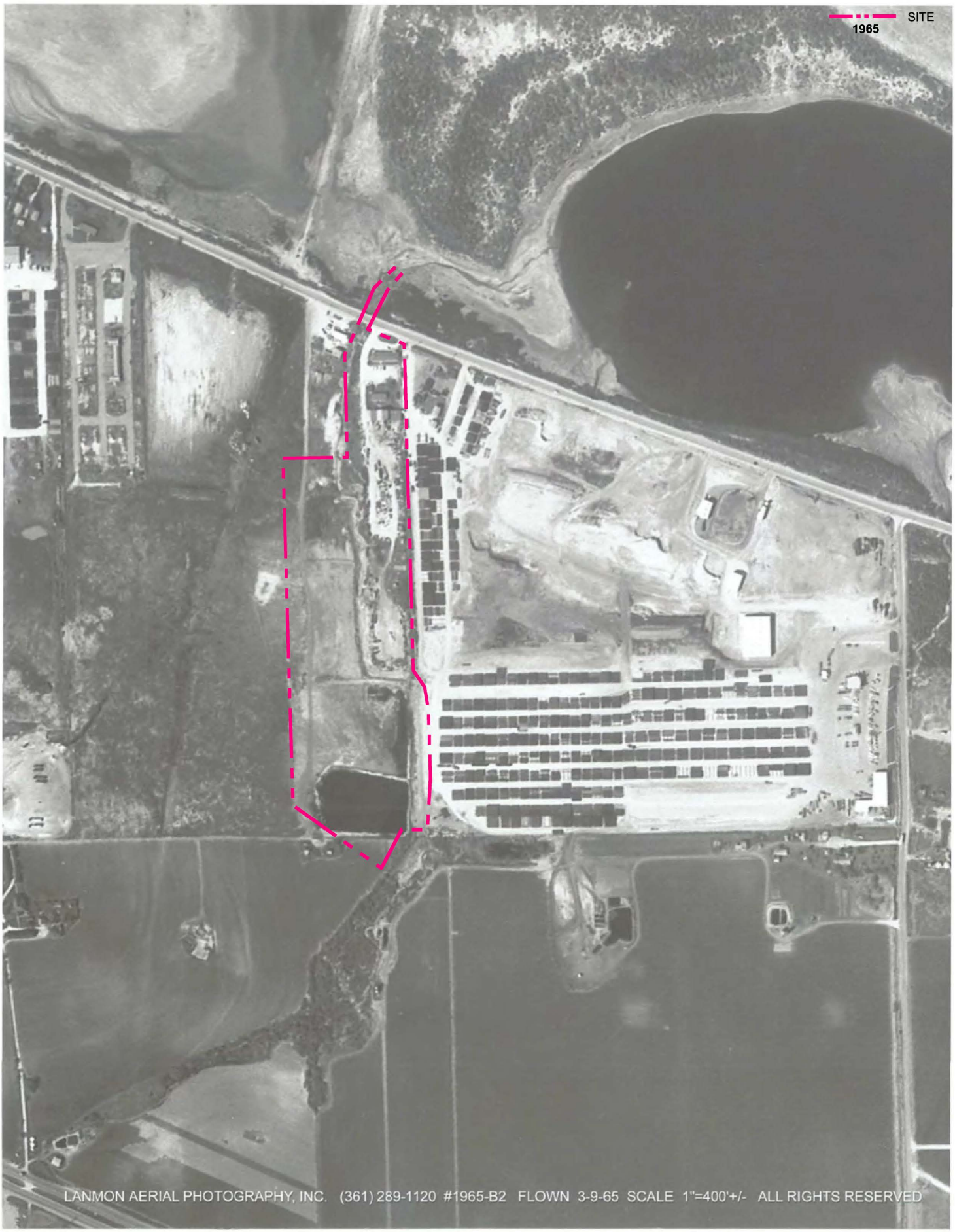
Description:
View looking south of clay subsurface for cap extension, existing high-density polyethylene (HDPE) geomembrane, clay overlying HDPE geomembrane, and erosion control mat.

Photo No. 20	Date: March 2020

East Ditch Sediment Cap Extension Installation

Description:
View looking south from erosion control mat interface between sediment cap and concrete "S" turn.


SITE
1956
LANMON AERIAL PHOTOGRAPHY, INC. (361) 289-1120 #0656-9 FLOWN 2-2-56 SCALE 1"=400'+/- ALL RIGHTS RESERVED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1965
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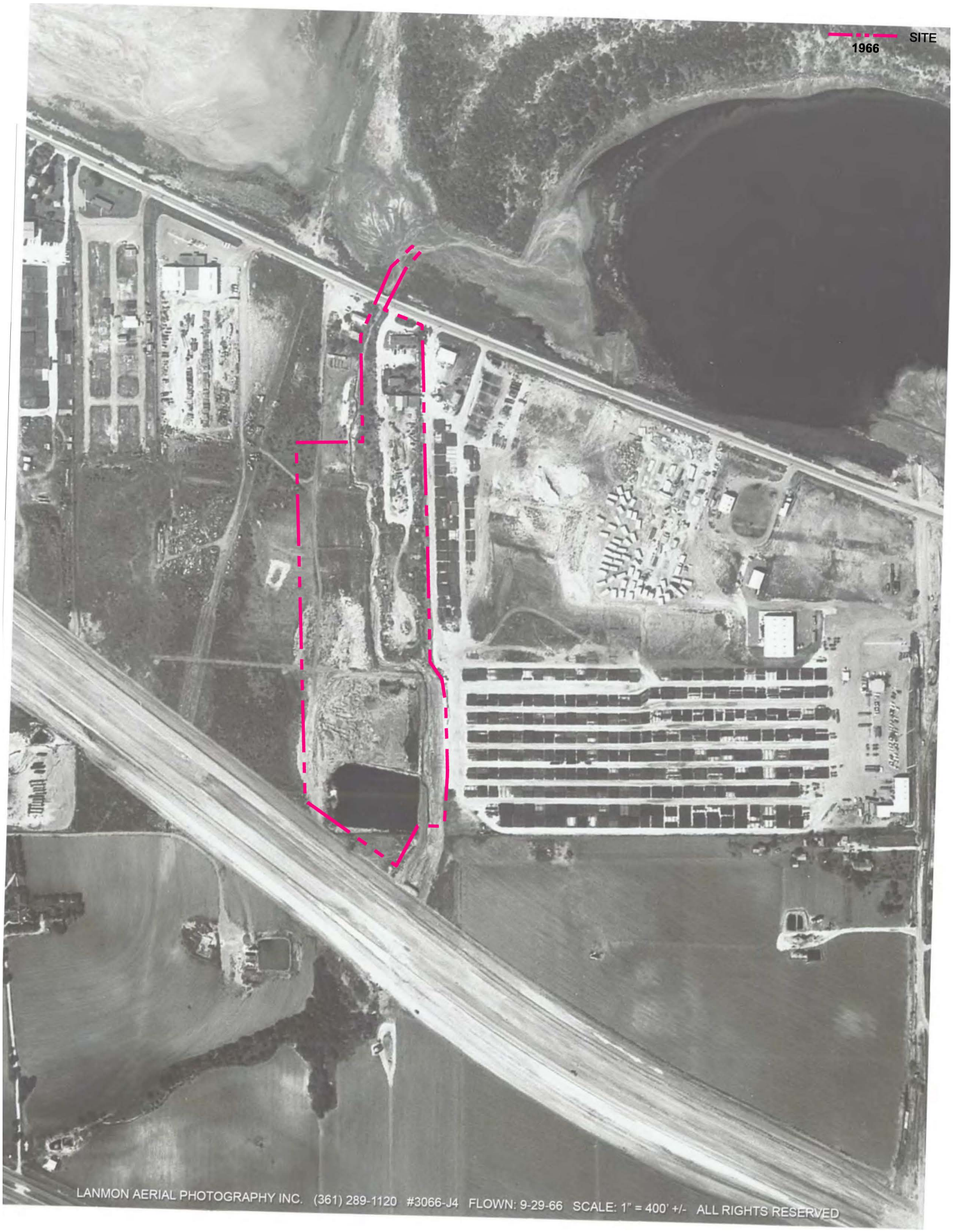
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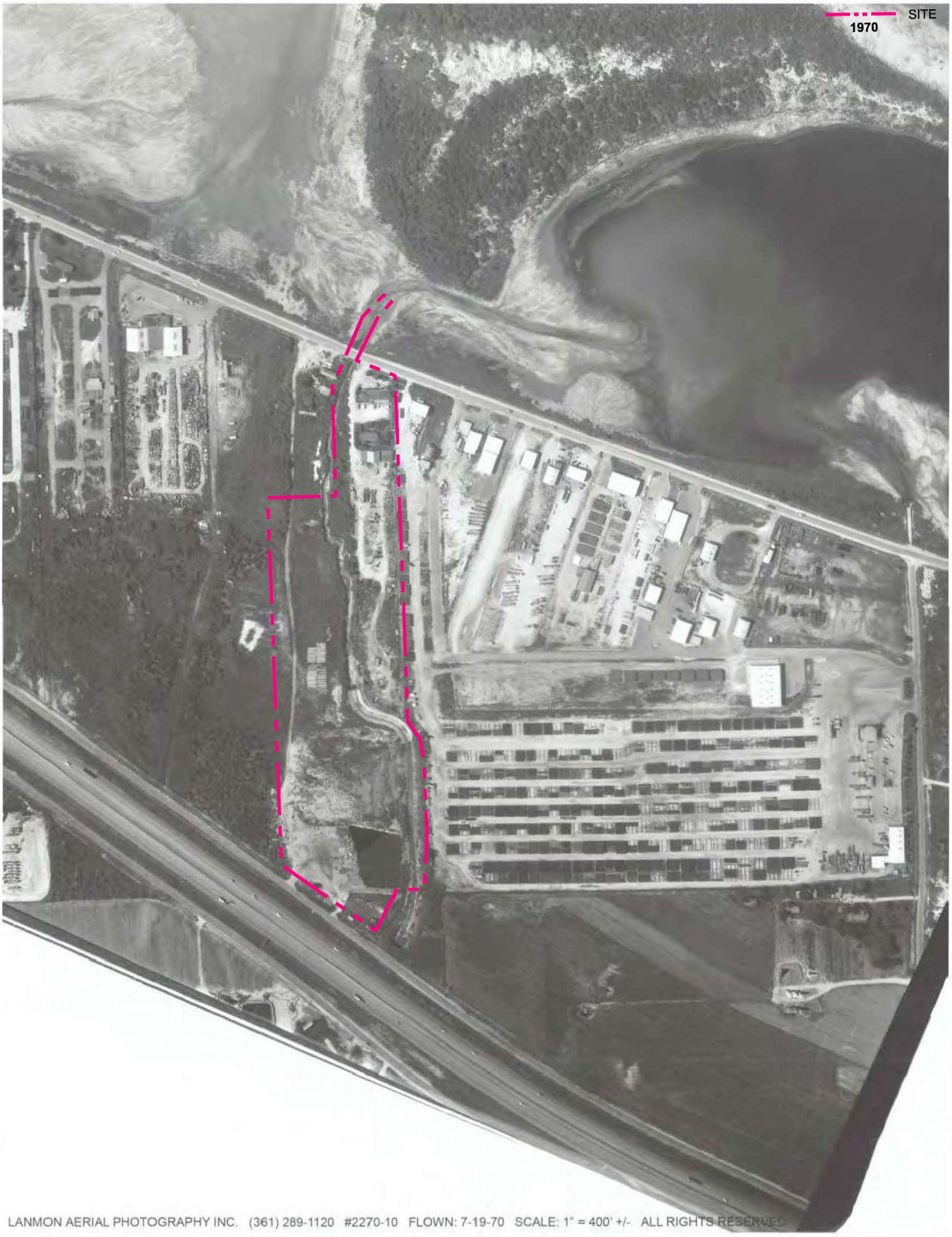
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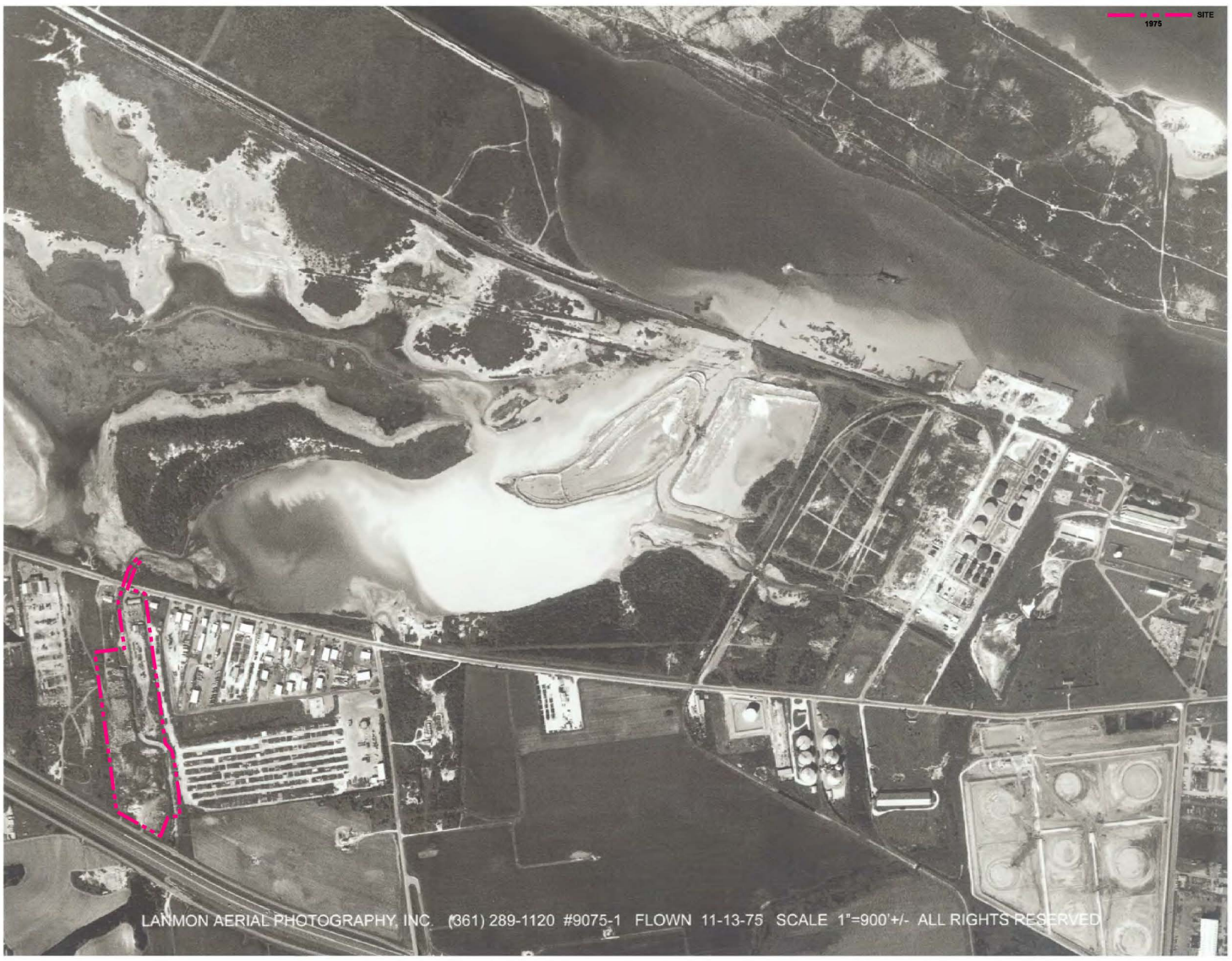
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1975
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SITE
1980
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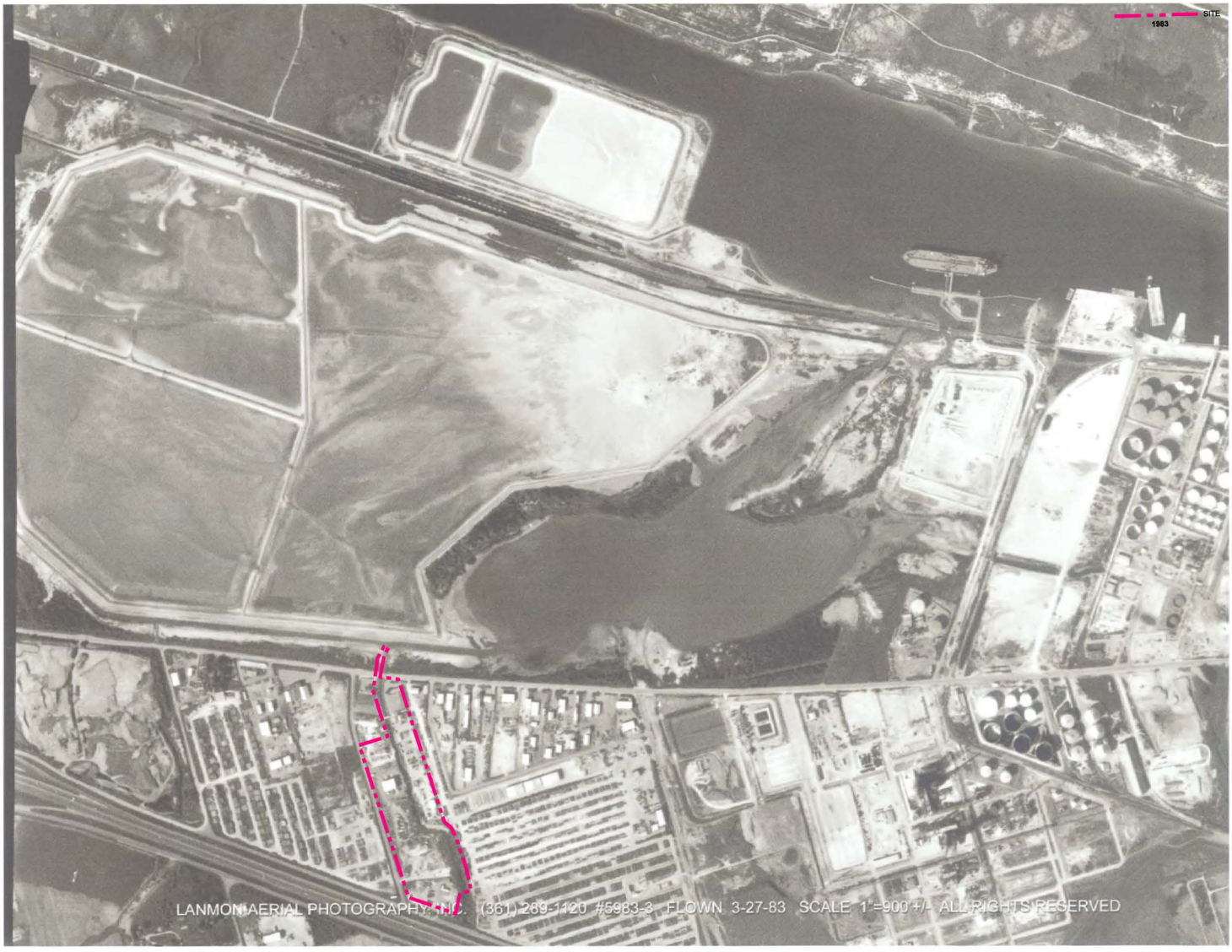
5980-2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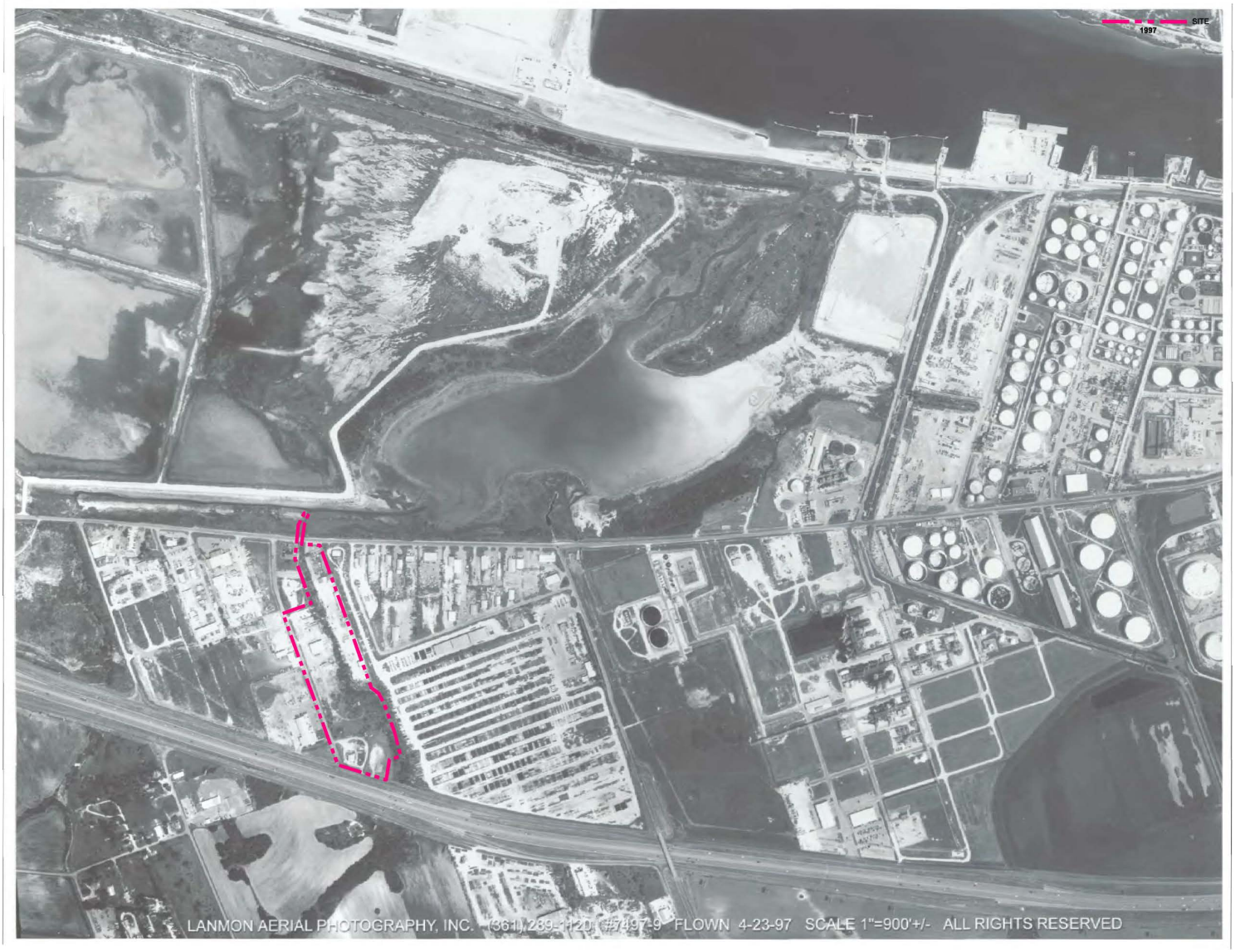
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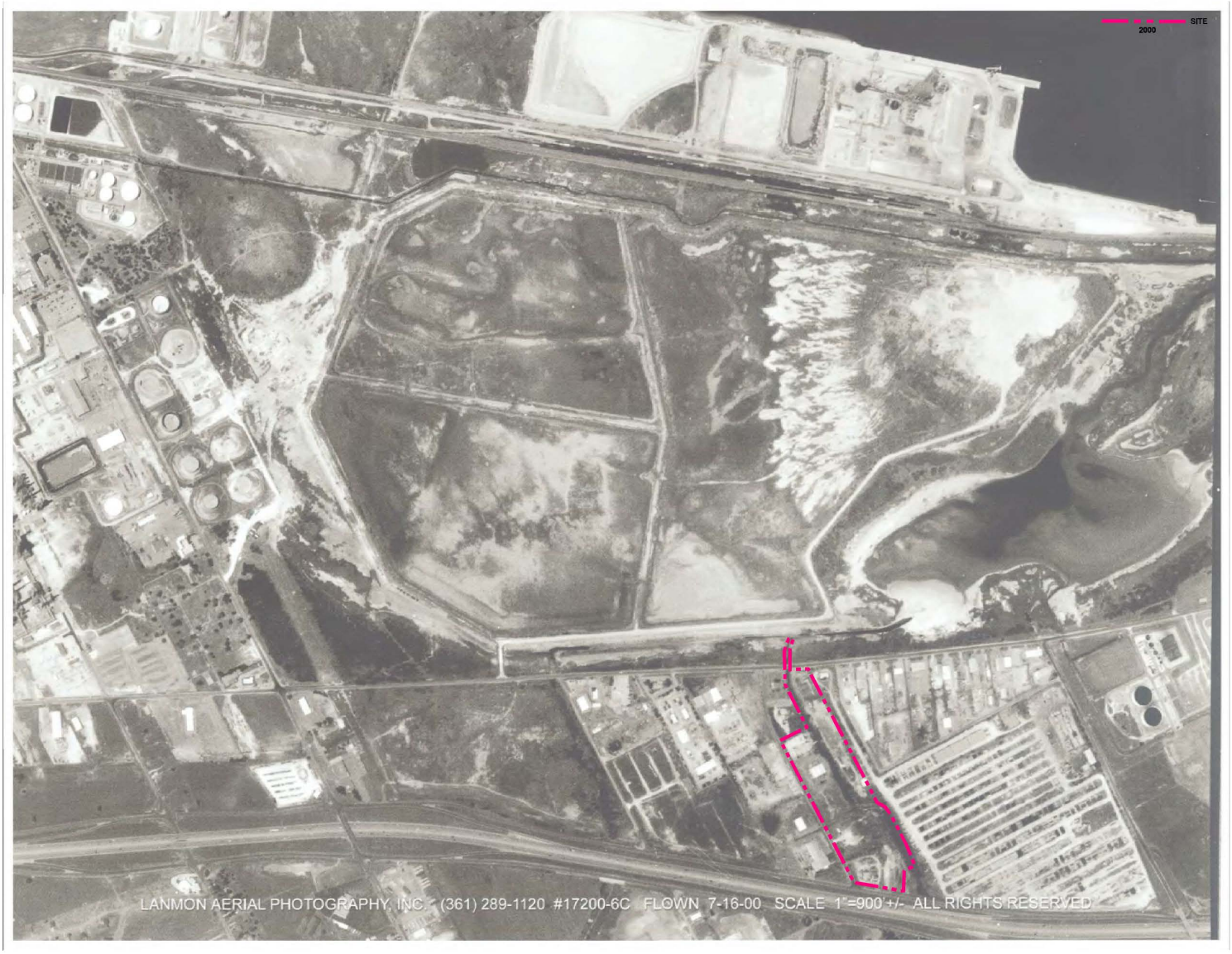

SITE
2000
LANMON AERIAL PHOTOGRAPHY, INC. (361) 289-1120 #17200-6C FLOWN 7-16-00 SCALE 1"=900'+/- ALL RIGHTS RESERVED

APPENDIX B

GOODYEAR NORTH PIT STATEMENT OF WORK

BRINE SERVICE COMPANY SUPERFUND SITE

Corpus Christi, Nueces County, State of Texas

EPA Region 6

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Purpose of this Goodyear North Pit SOW. This North Pit Statement of Work ("Goodyear North Pit SOW") sets forth the procedures and requirements for implementing the Goodyear North Pit Work required by the Partial Consent Decree for Remedial Design and Remedial Action ("Decree").

1.2 Structure of this SOW

- Section 2 (Community Involvement) sets forth EPA's and Settling Defendant's responsibilities for community involvement.
- Section 3 (Coordination and Supervision) contains the provisions for selecting the Supervising Contractor and Project Coordinators regarding the Goodyear North Pit Work.
- Section 4 (Goodyear North Pit Remedial Design) sets forth the process for developing the Goodyear North Pit Remedial Design, which includes the submission of specified primary deliverables.
- Section 5 (Goodyear North Pit Work) sets forth requirements regarding the completion of the Goodyear North Pit Work, including primary deliverables related to completion of the Goodyear North Pit Work.
- Section 6 (Reporting) sets forth Settling Defendant's reporting obligations.
- Section 7 (Deliverables) describes the content of the supporting deliverables and the general requirements regarding Settling Defendant's submission of, and EPA's review of, approval of, comment on, and/or modification of, the deliverables.
- Section 8 (Schedules) sets forth the schedule for submitting the primary deliverables, specifies the supporting deliverables that must accompany each primary deliverable, and sets forth the schedule of milestones regarding the completion of the Goodyear North Pit Work.
- Section 9 (State Participation) addresses State participation.
- Section 10 (References) provides a list of references, including URLs.

1.3 The Goodyear North Pit Work as implemented in this Goodyear North Pit SOW comprises the following actions described in Section 19, third bullet on page 74 of the Record of Decision for the Site:

- **Surface soil removal (North Pit area)** – Approximately 1,250 cubic yards of soil in the North Pit area and adjacent to the East Ditch will be excavated to a depth of 18 inches below ground surface, containerized, and transported to a regulated off-site disposal facility.
- The final limits of the excavation will be determined after the encroachment agreements are finalized with the pipeline companies.
- The excavated areas will be backfilled with clean soil, with the top six inches being of topsoil quality ("topsoil quality" defined by the A soil horizon and able to support vegetational growth), graded for adequate drainage, and re-vegetated using the Texas

Department of Transportation's (TXDOT's) permanent rural seed mixture from their latest standard specification guidance for the Corpus Christi district.

1.4 **Definitions.** The terms used in this Goodyear North Pit SOW that are defined in CERCLA, in regulations promulgated under CERCLA, or in the Decree, have the meanings assigned to them in CERCLA, in such regulations, or in the Decree, except that the terms "Paragraph" or "¶" means a paragraph of this Goodyear North Pit SOW, and the term "Section" means a section of this Goodyear North Pit SOW, unless otherwise stated.

2. COMMUNITY INVOLVEMENT

2.1 As requested by EPA, Settling Defendant shall conduct community involvement activities under EPA's oversight as provided for in, and in accordance with this Section. Such activities must include designation of a Community Involvement Coordinator (CI Coordinator).

2.2 **Goodyear North Pit Work Community Involvement Responsibilities**

(a) EPA has the lead responsibility for developing and implementing community involvement activities at the Site. Previously, during the Remedial Investigation/Feasibility Study ("RI/FS") phase, EPA developed a Community Involvement Plan ("CIP") for the Site. The CIP was updated in March 2019. In accordance with 40 C.F.R. § 300.435(c), EPA shall review the existing CIP and determine whether it should be revised to describe further public involvement activities during the Goodyear North Pit Work that are not already addressed or provided for in the existing CIP.

(b) As requested by EPA, Settling Defendant shall participate in community involvement activities relating only to the Goodyear North Pit Work, including participation in public meetings, community meetings, and information sessions that may be held or sponsored by EPA to explain activities at or relating to the Goodyear North Pit Work (with interpreters present for community members with limited English proficiency to be coordinated by EPA). Settling Defendant's support of EPA's community involvement activities may include providing online access to initial submissions and updates of deliverables related to the Goodyear North Pit Work to: (1) any Community Advisory Groups, (2) any Technical Assistance Grant ("TAG") recipients and their advisors, and (3) other entities to provide them with a reasonable opportunity for review and comment. EPA may describe in its CIP Settling Defendant's responsibilities for community involvement activities relating to the Goodyear North Pit Work. All community involvement activities conducted by Settling Defendant at EPA's request are subject to EPA's oversight. Upon EPA's request, Settling Defendant shall add information to the community information repository established for the Site. The information repository houses the administrative record for the Site and is at the:

Owen R. Hopkins Public Library
3202 McKinzie Rd,

Corpus Christi, TX 78410

Texas Commission on Environmental Quality, Central Records
Building E, Records Management, First Floor
12100 Park 35 Circle, Austin, TX 78753

(c) **Information for the Community**. As requested by EPA, Settling Defendant shall develop and provide to EPA information about the design and implementation of the Goodyear North Pit Work described in ⁋1.3 of this Goodyear North Pit SOW, including: (1) any validated data from monitoring of impacts to communities as provided in the Community Impact Mitigation Plan under ¶ 7.7(e); (2) a copy of the Community Impact Mitigation Plan required under ¶ 7.7(e); (3) schedules prepared under Section 8; (4) dates that Settling Defendant completed each task listed in the schedules; and (5) digital photographs of the Goodyear North Pit Work being performed, together with descriptions of the Goodyear North Pit Work depicted in each photograph, the purpose of the Goodyear North Pit Work, the equipment being used, and the location of the Goodyear North Pit Work. The EPA Project Coordinator may use this information for communication to the public via EPA's website, social media, or local and mass media. The information provided to EPA should be suitable for sharing with the public and the education levels of the community as indicated in EJ Screen. Translations should be in the dominant language(s) of community members with limited English proficiency.

(d) **Settling Defendant's CI Coordinator**. As requested by EPA, Settling Defendant shall, within 30 days, designate and notify EPA of Settling Defendant's Community Involvement Coordinator ("Settling Defendant's CI Coordinator"). Settling Defendant may hire a contractor for this purpose. Settling Defendant's notice must include the name, title, and qualifications of the Settling Defendant's CI Coordinator. Settling Defendant's CI Coordinator shall coordinate his/her activities with EPA's CI Coordinator, provide support regarding EPA's community involvement activities, and, as requested by EPA's CI Coordinator, provide draft responses to the public's inquiries including requests for information or data about the Site. Settling Defendant's CI Coordinator has the responsibility to ensure that when they communicate with the public, Settling Defendant protects any "Personally Identifiable Information" ("PII") in accordance with "EPA Policy 2151.0: Privacy Policy."

3. COORDINATION AND SUPERVISION

3.1 Project Coordinators

(a) Settling Defendant' Project Coordinator must have sufficient technical expertise to coordinate the Goodyear North Pit Work. Settling Defendant' Project Coordinator may not be an attorney representing Settling Defendant in this matter and may not act as the Supervising Contractor. Settling Defendant' Project Coordinator may assign other representatives, including other contractors, to assist in coordinating the Goodyear North Pit Work.

(b) EPA shall designate and notify Settling Defendant of EPA's Project Coordinator and Alternate Project Coordinator. EPA may designate other representatives, which may include its employees, contractors, and/or consultants, to oversee the Goodyear North Pit Work. EPA's Project Coordinator/Alternate Project Coordinator will have the same authority as a remedial project manager and/or an on-scene coordinator, as described in the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"). This includes the authority to halt the Goodyear North Pit Work and/or to conduct or direct any necessary response action when it is determined that conditions at the Site constitute an emergency or may present an immediate threat to public health or welfare or the environment due to a release or threatened release of Waste Material.

(c) The State shall designate and notify EPA and Settling Defendant of its Project Coordinator and Alternate Project Coordinator. The State may designate other representatives, including its employees, contractors and/or consultants to oversee the Goodyear North Pit Work. For any meetings and inspections in which EPA's Project Coordinator participates, the State's Project Coordinator also may participate. EPA shall notify the State reasonably in advance of any such meetings or inspections.

(d) Settling Defendant's Project Coordinator shall communicate with EPA's and the State's Project Coordinators monthly or as otherwise needed.

3.2 Supervising Contractor. Settling Defendant's proposed Supervising Contractor must have sufficient technical expertise to supervise the Goodyear North Pit Work and a quality assurance system that complies with the most recent version of *Quality Systems for Environmental Data and Technology Programs – Requirements with Guidance for Use* (American National Standard), ANSI/ASQC E4 (Feb. 2014).

3.3 Procedures for Disapproval/Notice to Proceed

(a) Settling Defendant shall designate, and notify EPA, within 30 days after the Effective Date, of the names, title, contact information, and qualifications of Settling Defendant's proposed Project Coordinator and Supervising Contractor, whose qualifications shall be subject to EPA's review for verification based on objective assessment criteria (*e.g.*, experience, capacity, technical expertise) and do not have a conflict of interest with respect to the project.

(b) EPA shall issue notices of disapproval and/or authorizations to proceed regarding any proposed Project Coordinator and Supervising Contractor, as applicable. If EPA issues a notice of disapproval, Settling Defendant shall, within 30 days, submit to EPA a list of supplemental proposed Project Coordinators and/or Supervising Contractors, as applicable, including a description of the qualifications of each. Settling Defendant may select any coordinator/contractor covered by an authorization to proceed and shall, within 21 days, notify EPA of Settling Defendant's selection.

(c) EPA may disapprove the proposed Project Coordinator, the Supervising Contractor, or both, based on objective assessment criteria (*e.g.*, experience, capacity, technical expertise), if they have a conflict of interest regarding the project, or any combination of these factors.

(d) Settling Defendant may change its Project Coordinator and/or Supervising Contractor, or both, by following the procedures of ¶¶ 3.3(a) and 3.3(b).

4. GOODYEAR NORTH PIT REMEDIAL DESIGN

4.1 **Goodyear North Pit Remedial Design Work Plan ("Goodyear North Pit RDWP")**. Settling Defendant shall submit a North Pit RDWP for EPA approval. The North Pit RDWP will be limited to:

(a) Plans for implementing all Goodyear North Pit Work activities identified in this Goodyear North Pit SOW and the Goodyear North Pit RDWP;

(b) A description of the overall management strategy for performing the Goodyear North Pit Work, including a proposal for phasing of design and construction, if applicable and as necessary to implement the Goodyear North Pit Work;

(c) A description of the proposed general approach to contracting, construction, operation, maintenance, and monitoring of the Goodyear North Pit Work as necessary to implement the Goodyear North Pit Work;

(d) A description of the responsibility and authority of all organizations and key personnel involved with the development of the Goodyear North Pit RD;

(e) Descriptions of any areas requiring clarification and/or anticipated problems (*e.g.*, areas needed for pipeline encroachment agreements);

(e) Descriptions of any applicable permitting requirements and other regulatory requirements;

(f) Description of plans for obtaining access in connection with the Goodyear North Pit Work, such as easements; and

(g) The following supporting deliverables for the Goodyear North Pit Work described in ¶ 7.7 (Supporting Deliverables): Health and Safety Plan, Waste Materials Characterization Plan, Emergency Response Plan, and Quality Assurance Project Plan.

4.2 Settling Defendant shall meet regularly with EPA to discuss design issues as necessary, as directed or determined by EPA.

4.3 **Draft Final Goodyear North Pit Remedial Design ("Draft Final Goodyear North Pit RD")**. Settling Defendant shall submit a Draft Final Goodyear North Pit RD for EPA's comment. The Draft Final Goodyear North Pit RD will serve as the approved Final

Goodyear North Pit RD if EPA approves the Draft Final Goodyear North Pit RD without comments. The Draft Final Goodyear North Pit RD must include:

(a) A complete set of construction drawings and specifications that are: (1) certified by a registered professional engineer; (2) suitable for procurement; and (3) follow the Construction Specifications Institute's MasterFormat 2020 Edition https://www.csiresources.org/home;

(b) A survey and engineering drawings showing existing Site features, such as property borders, easements, and Site conditions in relation to the Goodyear North Pit Work;

(c) A design criteria report, as described in the *Remedial Design/Remedial Action Handbook*, EPA 540/R-95/059 (June 1995);

(d) Descriptions of permit requirements, if applicable;

(e) A description of how the Goodyear North Pit Work will be implemented in a manner that minimizes environmental impacts in accordance with EPA's *Principles for Greener Cleanups* (Aug. 2009);

(f) A description of monitoring and control measures to protect human health and the environment, such as air monitoring, and measures to reduce and manage traffic, noise, odors, and dust, during the Goodyear North Pit Work in accordance with the Community Involvement Handbook pp. 53-66 (text box on p. 55) to minimize community impacts;

(g) Any proposed revisions to the Goodyear North Pit Work Schedule ("Goodyear North Pit Work Schedule") that is set forth in ¶ 8.3 (Goodyear North Pit Work Schedule); and

(h) Updates of all supporting deliverables required to accompany the Goodyear North Pit RDWP and the following additional supporting deliverables described in ¶ 7.7 (Supporting Deliverables): Waste Materials Characterization Plan; Quality Assurance Project Plan; Community Impacts Mitigation Plan; Construction Quality Assurance/Quality Control Plan; and Transportation and Off-Site Disposal Plan; and

(i) A specification for photographic documentation of the Goodyear North Pit Work.

4.4 Final Goodyear North Pit Remedial Design ("Final Goodyear North RD"). Settling Defendant shall submit the Final North Pit RD for EPA approval. The Final North Pit RD must address EPA's comments on the Draft Final North Pit RD, subject to the Dispute Resolution provisions in the Consent Decree, and must include final versions of all Draft Final North Pit RD deliverables.

5. GOODYEAR NORTH PIT WORK PLAN

5.1 Goodyear North Pit Work Plan ("Goodyear North Pit WP"). Settling Defendant shall submit a Goodyear North Pit WP for EPA approval that includes:

(a) A proposed Goodyear North Pit Work Construction Plan ("Goodyear North Pit Work Construction Plan") in a critical path method and Gantt chart format;

(b) An updated health and safety plan that covers activities during the Goodyear North Pit Work;

(d) An Emergency Response Plan for the Goodyear North Pit Work;

(e) Plans for satisfying permitting requirements, if applicable, including obtaining permits for off-site activity and for satisfying substantive requirements of permits for on-site activity.

5.2 Communications and Inspections

(a) **Periodic Communications**. During the construction portion of the Goodyear North Pit Work Construction, Settling Defendant shall communicate on a weekly basis with EPA, and others as directed or determined by EPA, to discuss construction issues. Settling Defendant shall distribute an agenda and list of attendees to all Parties prior to each meeting or telephone call. Settling Defendant shall prepare minutes of the meetings or calls and shall distribute the minutes to all Parties within five (5) business days of the meeting or call.

(b) **Inspections**

(1) EPA or its representative shall conduct periodic inspections of and/or have an on-site presence during the Goodyear North Pit Work. At EPA's request, the Supervising Contractor or other designee shall accompany EPA or its representative during inspections.

(2) Upon notification by EPA of any deficiencies in the Goodyear North Pit Work Construction Plan, Settling Defendant shall take all necessary steps to correct the deficiencies and/or bring the Goodyear North Pit Work Construction Plan into compliance with the approved Final Goodyear North Pit RD, any approved design changes, and/or the approved Goodyear North Pit WP. If applicable, Settling Defendant shall comply with any schedule provided by EPA in its notice of deficiency.

5.3 Emergency Response and Reporting

(a) **Emergency Response and Reporting**. If any event occurs during performance of the Goodyear North Pit Work that causes or threatens to cause a release of Waste Material on, at, or from the Site and that either constitutes an emergency situation or that may present an immediate threat to public health or welfare or the

environment, Settling Defendant shall: (1) immediately take all appropriate action to prevent, abate, or minimize such release or threat of release; (2) immediately notify the authorized EPA officer (as specified in ¶ 5.3(c)) orally; and (3) take such actions in consultation with the authorized EPA officer and in accordance with all applicable provisions of the Health and Safety Plan, the Emergency Response Plan, and any other deliverable approved by EPA under this Goodyear North Pit SOW.

(b) **Release Reporting**. Upon the occurrence of any event during performance of the Goodyear North Pit Work that Settling Defendant is required to report pursuant to Section 103 of CERCLA, 42 U.S.C. § 9603, or Section 304 of the Emergency Planning and Community Right-to-know Act (EPCRA), 42 U.S.C. § 11004, Settling Defendant shall immediately notify the authorized EPA officer orally.

(c) The "authorized EPA officer" for purposes of immediate oral notifications and consultations under ¶ 5.3(a) and ¶ 5.3(b) is the EPA Project Coordinator, the EPA Alternate Project Coordinator (if the EPA Project Coordinator is unavailable), or the EPA Emergency Response Unit, Region 6 (if neither EPA Project Coordinator is available).

(d) For any event covered by ¶ 5.3(a) and ¶ 5.3(b), Settling Defendant shall: (1) within 14 days after the onset of such event, submit a report to EPA describing the actions or events that occurred and the measures taken, and to be taken, in response thereto; and (2) within 30 days after the conclusion of such event, submit a report to EPA describing all actions taken in response to such event.

(e) The reporting requirements under ¶ 5.3 are in addition to the reporting required by CERCLA § 103 or EPCRA § 304.

5.4 Off-Site Shipments

(a) Settling Defendant may ship hazardous substances, pollutants, and contaminants from the Site to an off-Site facility only if it complies with Section 121(d)(3) of CERCLA, 42 U.S.C. § 9621(d)(3), and 40 C.F.R. § 300.440. Settling Defendant will be deemed to be in compliance with CERCLA § 121(d)(3) and 40 C.F.R. § 300.440 regarding a shipment if Settling Defendant obtains a prior determination from EPA that the proposed receiving facility for such shipment is acceptable under the criteria of 40 C.F.R. § 300.440(b).

(b) Settling Defendant may ship Waste Material from the Site to an out-of-state waste management facility only if, prior to any shipment, it provides notice to the appropriate state environmental official in the receiving facility's state and to the EPA Project Coordinator. This notice requirement will not apply to any off-Site shipments when the total quantity of all such shipments does not exceed 10 cubic yards. The notice must include the following information, if available: (1) the name and location of the receiving facility; (2) the type and quantity of Waste Material to be shipped; (3) the schedule for the shipment; and (4) the method of transportation. Settling Defendant also shall notify the state environmental official

referenced above and the EPA Project Coordinator of any major changes in the shipment plan, such as a decision to ship the Waste Material to a different out-of-state facility. Settling Defendant shall provide the notice after the award of the contract for Goodyear North Pit Work construction and before the Waste Material is shipped.

(c) Settling Defendant may ship Investigation Derived Waste ("IDW") from the Site to an off-Site facility only if it complies with Section 121(d)(3) of CERCLA, 42 U.S.C. § 9621(d)(3), 40 C.F.R. § 300.440, EPA's *Guide to Management of Investigation Derived Waste*, OSWER 9345.3-03FS (Jan. 1992), and any IDW-specific requirements contained in the Record of Decision. Wastes shipped off-Site to a laboratory for characterization, and RCRA hazardous wastes that meet the requirements for an exemption from RCRA under 40 C.F.R. § 261.4(e) shipped off-site for treatability studies, are not subject to 40 C.F.R. § 300.440.

5.5 Notice of Goodyear North Pit Work Completion ("Goodyear North Pit Work Completion")

(a) **Goodyear North Pit Work Completion Inspection**. The Goodyear North Pit Work is "Complete" for purposes of this ¶ 5.5 when it has been fully performed. Settling Defendant shall schedule an inspection for the purpose of obtaining EPA's Notice of Goodyear North Pit Work Completion. The inspection must be attended by Settling Defendant and EPA and/or their representatives.

(b) **Goodyear North Pit Work Final Report**. Following the inspection, Settling Defendant shall submit a Goodyear North Pit Work Final Report to EPA requesting EPA's Notice of Goodyear North Pit Work Completion. The report must: (1) include certifications by a registered professional engineer and by Settling Defendant's Project Coordinator that the Goodyear North Pit Work is complete; (2) include as-built drawings signed and stamped by a registered professional engineer; (3) be prepared in accordance with Chapter 2 (Remedial Action Completion) of EPA's *Close Out Procedures for NPL Sites* guidance (May 2011), as supplemented by *Guidance for Management of Superfund Remedies in Post Construction*, OLEM 9200.3-105 (Feb. 2017); and (4) be certified in accordance with ¶ 7.5 (Certification).

(c) If EPA concludes that the Goodyear North Pit Work is not Complete, EPA shall so notify Settling Defendant. EPA's notice must include a description of any deficiencies. EPA's notice may include a schedule for addressing such deficiencies or may require Settling Defendant to submit a schedule for EPA approval. Settling Defendant shall perform all activities described in the notice in accordance with the schedule and subject to Dispute Resolution in the Consent Decree.

(d) If EPA concludes, based on the initial or any subsequent Goodyear North Pit Work Final Report requesting Notice of Goodyear North Pit Work Completion, that the Goodyear North Pit Work is Complete, EPA shall so notify Settling Defendant. This notice will constitute the Notice of Goodyear North Pit Work Completion for

purposes of the Decree. Issuance of the Notice of Goodyear North Pit Work Completion will not affect Settling Defendant's remaining obligations under the Decree.

6. REPORTING

6.1 **Progress Report**. Commencing with the month following the Effective Date of the Decree and until EPA approves the Goodyear North Pit Work Construction Completion, Settling Defendant shall submit progress reports to EPA on a monthly basis, or as otherwise requested by EPA. The reports must cover all activities that took place during the prior reporting period, including, as applicable:

(a) The actions that have been taken toward achieving compliance with the Decree;

(b) A summary of all results of waste characterization, tests, and all other data received or generated by Settling Defendant;

(c) A description of all deliverables that Settling Defendant submitted to EPA;

(d) A description of all activities relating to Goodyear North Pit Work Construction that are scheduled;

(e) An updated Goodyear North Pit Work Construction Schedule, together with information regarding percentage of completion, delays encountered or anticipated that may affect the future schedule for implementation of the Goodyear North Pit Work, and a description of efforts made to mitigate those delays or anticipated delays;

(f) A description of any modifications to the work plans or other schedules that Settling Defendant have proposed or that have been approved by EPA; and

(g) A description of all activities undertaken in support of the Community Involvement Plan

6.2 **Notice of Progress Report Schedule Changes**. If the schedule for any activity described in the Progress Reports, including activities required to be described under ¶ 6.1(d), changes, Settling Defendant shall notify EPA of such change at least 5 days before performance of the activity.

7. DELIVERABLES

7.1 **Applicability**. Settling Defendant shall submit deliverables for EPA approval or for EPA comment as specified in this Goodyear North Pit SOW. If neither is specified, the deliverable does not require EPA's approval or comment. Paragraphs 7.2 (In Writing) through 7.4 (Technical Specifications) apply to all deliverables. Paragraph 7.5 (Certification) applies to any deliverable that is required to be certified. Paragraph 7.6 (Approval of Deliverables) applies to any deliverable that is required to be submitted for EPA approval.

7.2 **In Writing**. All deliverables under this Goodyear North Pit SOW must be in writing unless otherwise specified.

7.3 **General Requirements for Deliverables** All deliverables required under this Goodyear North Pit SOW must be submitted by the deadlines in the Goodyear North Pit Remedial Design Schedule ("Goodyear North Pit RD Schedule") or Goodyear North Pit Work Schedule, as applicable. Settling Defendant shall submit all deliverables in electronic form. Technical specifications for waste characterization and spatial data are addressed in ¶ 7.4. All other deliverables shall be submitted to EPA in portable document format (PDF) and, upon request, in its original MS Office format (*e.g.*, Word, Excel, Project, etc.), or in native or raw data formats, as specified by the EPA Project Coordinator. All Excel spreadsheets submitted shall include all underlying formulas and calculations. If any deliverable includes maps, drawings, or other exhibits that are larger than 8.5" by 11", Settling Defendant shall also provide EPA with paper copies of such exhibits, as requested.

7.4 **Technical Specifications**

(a) Waste characterization data should be submitted in standard regional Electronic Data Deliverable (EDD) format, including PDF and, upon request, in its original MS Office format (*e.g.*, Word, Excel, Project, etc.), or in native or raw data formats, as specified by the EPA Project Coordinator. All Excel spreadsheets submitted shall include all underlying formulas and calculations. Other delivery methods may be allowed if electronic direct submission presents a significant burden or as technology changes.

(b) Spatial data, including spatially-referenced data and geospatial data, should be submitted: (1) in the ESRI File Geodatabase format; and (2) as unprojected geographic coordinates in decimal degree format using North American Datum 1983 (NAD83) or World Geodetic System 1984 (WGS84) as the datum. If applicable, submissions should include the collection method(s). Projected coordinates may optionally be included but must be documented. Spatial data should be accompanied by metadata, and such metadata should be compliant with the Federal Geographic Data Committee ("FGDC") Content Standard for Digital Geospatial Metadata and its EPA profile, the EPA Geospatial Metadata Technical Specification. An add-on metadata editor for ESRI software, the EPA Metadata Editor (EME), complies with these FGDC and EPA metadata requirements and is available at https://www.epa.gov/geospatial/epa-metadata-editor.

(c) Each file must include an attribute name for each Site unit or sub-unit submitted. Consult http://www.epa.gov/geospatial/geospatial-policies-and-standards for any further available guidance on attribute identification and naming.

(d) Spatial data submitted by Settling Defendant does not, and is not intended to, define the boundaries of the Site.

7.5 **Certification**. All deliverables that require compliance with this ¶ 7.5 must be signed by the Settling Defendant's Project Coordinator, or other responsible official of Settling Defendant, and must contain the following statement:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

7.6 **Approval of Deliverables**

(a) **Initial Submissions**

(1) After review of any deliverable that is required to be submitted for EPA approval under the Decree or this Goodyear North Pit SOW, EPA shall: (i) approve, in whole or in part, the submission; (ii) approve the submission upon specified conditions; (iii) disapprove, in whole or in part, the submission; or (iv) any combination of the foregoing.

(2) EPA also may modify the initial submission to cure deficiencies in the submission if: (i) EPA determines that disapproving the submission and awaiting a resubmission would cause substantial disruption to the Goodyear North Pit Work; or (ii) previous submission(s) have been disapproved due to material defects and the deficiencies in the initial submission under consideration indicate a bad faith lack of effort to submit an acceptable deliverable.

(b) **Resubmissions**. Upon receipt of a notice of disapproval under ¶ 7.6(a) (Initial Submissions), or if required by a notice of approval upon specified conditions under ¶ 7.6(a), Settling Defendant shall, within 15 days or such longer time as specified by EPA in such notice, correct the deficiencies and resubmit the deliverable for approval. After review of the resubmitted deliverable, EPA may: (1) approve, in whole or in part, the resubmission; (2) approve the resubmission upon specified conditions; (3) modify the resubmission; (4) disapprove, in whole or in part, the resubmission, requiring Settling Defendant to correct the deficiencies; or (5) any combination of the foregoing.

(c) **Implementation**. Upon approval, approval upon conditions, or modification by EPA under ¶ 7.6(a) (Initial Submissions) or ¶ 7.6(b) (Resubmissions), of any deliverable, or any portion thereof: (1) such deliverable, or portion thereof, will be

incorporated into and enforceable under the Decree; and (2) Settling Defendant shall take any action required by such deliverable, or portion thereof.

7.7 **Supporting Deliverables**. Settling Defendant shall submit each of the following supporting deliverables for EPA approval, except as specifically provided. Settling Defendant shall develop the deliverables in accordance with all applicable regulations, guidance, and policies (see Section 10 (References)). Settling Defendant shall update each of these supporting deliverables as necessary or appropriate during the course of the Goodyear North Pit Work, and/or as requested by EPA.

(a) **Health and Safety Plan ("HASP")**. The HASP describes all activities to be performed to protect on site personnel and area residents from physical, chemical, and all other hazards posed by the Goodyear North Pit Work. Settling Defendant shall develop the HASP in accordance with EPA's Emergency Responder Health and Safety and Occupational Safety and Health Administration ("OSHA") requirements under 29 C.F.R. §§ 1910 and 1926. The HASP should cover Goodyear North Pit RD activities and should be, as appropriate, updated to cover activities during the Goodyear North Pit Work and updated to cover activities after Goodyear North Pit Work completion. EPA does not approve the HASP but will review it to ensure that all necessary elements are included and that the plan provides for the protection of human health and the environment.

(b) **Emergency Response Plan ("ERP")**. The ERP must describe procedures to be used in the event of an accident or emergency at the Site (for example, power outages, water impoundment failure, treatment plant failure, slope failure, etc.). The ERP must include:

(1) Name of the person or entity responsible for responding in the event of an emergency incident;

(2) Plan and date(s) for meeting(s) with the local community, including local, State, and federal agencies involved in the cleanup, as well as local emergency squads and hospitals;

(3) Spill Prevention, Control, and Countermeasures (SPCC) Plan (if applicable), consistent with the regulations under 40 C.F.R. Part 112, describing measures to prevent, and contingency plans for, spills and discharges;

(4) Notification activities in accordance with ¶ 5.3(b) (Release Reporting) in the event of a release of hazardous substances requiring reporting under Section 103 of CERCLA, 42 U.S.C. § 9603, or Section 304 of the Emergency Planning and Community Right-to-know Act (EPCRA), 42 U.S.C. § 11004; and

(5) A description of all necessary actions to ensure compliance with ¶ 5.3 in the event of an occurrence during the performance of the Goodyear North Pit Work that causes or threatens a release of Waste Material from the Site that

constitutes an emergency or may present an immediate threat to public health or welfare or the environment.

(c) **Waste Materials Characterization Plan ("WMCP")**. The WMCP addresses all sampling for the purpose of waste characterization prior to off-site disposal. The WMCP must be written so that a waste characterization team unfamiliar with the project would be able to gather the waste collection samples and field information required. Settling Defendant shall develop the WMCP in accordance with *Guidance for Conducting Remedial Investigations and Feasibility Studies*, EPA/540/G 89/004 (Oct. 1988).

(d) **Quality Assurance Project Plan ("QAPP")**. The QAPP supplements the WMCP and addresses sample analysis and data handling regarding the Goodyear North Pit Work. The QAPP must include a detailed explanation of Settling Defendant's quality assurance, quality control, and chain of custody procedures for all samples taken. Settling Defendant shall develop the QAPP in accordance with *EPA Requirements for Quality Assurance Project Plans*, QA/R-5, EPA/240/B-01/003 (Mar. 2001, reissued May 2006); *Guidance for Quality Assurance Project Plans*, QA/G-5, EPA/240/R 02/009 (Dec. 2002); and *Uniform Federal Policy for Quality Assurance Project Plans*, Parts 1-3, EPA/505/B-04/900A though 900C (Mar. 2005). The QAPP also must include procedures:

(1) To ensure that EPA and its authorized representative have reasonable access to laboratories used by Settling Defendant in implementing the Goodyear North Pit Work (Settling Defendant's Labs);

(2) To ensure that Settling Defendant's Labs analyze all samples submitted by EPA pursuant to the QAPP for quality assurance monitoring;

(3) To ensure that Settling Defendant's Labs perform all analyses using EPA-accepted methods (i.e., the methods documented in *USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis*, ILM05.4 (Dec. 2006); *USEPA Contract Laboratory Program Statement of Work for Organic Analysis*, SOM01.2 (amended Apr. 2007); and *USEPA Contract Laboratory Program Statement of Work for Inorganic Superfund Methods (Multi-Media, Multi-Concentration)*, ISM01.2 (Jan. 2010)) or other methods acceptable to EPA;

(4) To ensure that Settling Defendant's Labs participate in an EPA-accepted QA/QC program or other QA/QC program acceptable to EPA;

(5) For Settling Defendant to provide EPA with notice at least 28 days prior to any sample collection activity;

(6) For Settling Defendant to provide to EPA, upon request, split samples and/or duplicate samples;

(7) For EPA to take any additional samples that it deems necessary;

(8) For EPA to provide to Settling Defendant, upon request, split samples and/or duplicate samples collected in connection with EPA's oversight sampling; and

(9) For Settling Defendant to submit to EPA all sampling and tests results and other data obtained in connection with the implementation of the Goodyear North Pit Work.

(e) **Community Impact Mitigation Plan ("CIMP")**. The CIMP describes all activities to be performed: (1) to reduce and manage the impacts from implementation of the Goodyear North Pit Work (*e.g.*, air emissions, traffic, noise, odor, temporary or permanent relocation) to residential areas, schools, playgrounds, healthcare facilities, or recreational or impacted public areas ("Community Areas") from and during implementation of the Goodyear North Pit Work, (2) to conduct monitoring in Community Areas of impacts from implementation of the Goodyear North Pit Work, if necessary, (3) to expeditiously communicate any validated monitoring data, (4) to make adjustments during remedy implementation in order to further reduce and manage impacts from implementation of the Goodyear North Pit Work to affected Community Areas, and (5) to expeditiously restore community resources damaged during the Goodyear North Pit Work such as roads and culverts. The CIMP should contain information about impacts to Community Areas that is sufficient to assist EPA's Project Coordinator in performing the evaluations recommended under the *Superfund Community Involvement Handbook*, OLEM 9230.0-51 (March 2020), pp. 53-56.

(f) **Construction Quality Assurance/Quality Control Plan ("CQA/QCP")**. The purpose of the Construction Quality Assurance Plan ("CQAP") is to describe planned and systemic activities that provide confidence that the Goodyear North Pit Work Construction will satisfy all plans, specifications, and related requirements, including quality objectives. The purpose of the Construction Quality Control Plan ("CQCP") is to describe the activities to verify that Goodyear North Pit Work construction has satisfied all plans, specifications, and related requirements, including quality objectives. The CQA/QCP must:

(1) Identify, and describe the responsibilities of, the organizations and personnel implementing the CQA/QCP;

(2) Describe the activities to be performed;

(3) Describe verification activities, such as inspections, sampling, testing, monitoring, and production controls, under the CQA/QCP;

(4) Describe industry standards and technical specifications used in implementing the CQA/QCP;

(5) Describe procedures for tracking construction deficiencies from identification through corrective action;

(6) Describe procedures for documenting all CQA/QCP activities; and

(7) Describe procedures for retention of documents and for final storage of documents.

(g) **Transportation and Off-Site Disposal Plan ("TODP")**. The TODP describes plans to ensure compliance with ¶ 5.4 (Off-Site Shipments). The TODP must include:

(1) Proposed routes for off-site shipment of Waste Material;

(2) Identification of communities affected by shipment of Waste Material; and

(3) Description of plans to minimize impacts on affected communities.

8. SCHEDULES

8.1 Applicability and Revisions. All deliverables and tasks required under this Goodyear North Pit SOW must be submitted or completed by the deadlines or within the time durations listed in the Goodyear North Pit RD and Goodyear North Pit Work Schedules set forth below. Settling Defendant may submit proposed revised Goodyear North Pit RD Schedules or North Pit Work Schedules for EPA approval. Upon EPA's approval, the revised Goodyear North Pit RD and/or Goodyear North Pit Work Schedules supersede the Goodyear North Pit RD and North Pit Work Schedules set forth below, and any previously-approved Goodyear North Pit RD and/or Goodyear North Pit Work Schedules.

8.2 Goodyear North Pit RD Schedule

	Description of Deliverable, Task	**¶ Ref.**	**Deadline**
1	Goodyear North Pit RDWP	4.1	60 days after EPA's Authorization to Proceed regarding Supervising Contractor under ¶ 3.3 of this Goodyear North Pit SOW
2	Draft Final Goodyear North Pit RD	4.3	45 days after EPA approves Goodyear North Pit RDWP
3	Final Goodyear North Pit RD	4.4	30 days after EPA comments on Draft Final Goodyear North Pit RD

8.3 Goodyear North Pit Work Schedule

	Description of Deliverable / Task	¶ Ref.	Deadline
1	Award Goodyear North Pit Work Contract		60 days after EPA Notice of Authorization to Proceed with Goodyear North Pit Work
2	Goodyear North Pit Work WP	5.1	45 days after Award of Goodyear North Pit Work Contract
3	Start of Construction		30 days after Approval of Goodyear North Pit Work Plan
4	Completion of Construction		See deadline in Goodyear North Pit Work Plan
5	Final Inspection	5.5(a)	45 days after Completion of Goodyear North Pit Work
6	Goodyear North Pit Work Final Report	5.5(b)	60 days after Final Inspection
7	Goodyear North Pit Work Completion Report	5.5(d)	60 days after Goodyear North Pit Work Final Report

9. STATE PARTICIPATION

9.1 **Copies**. Settling Defendant shall, at any time it sends a deliverable to EPA, send a copy of such deliverable to the State. EPA shall, at any time it sends a notice, authorization, approval, disapproval, or certification to Settling Defendant, send a copy of such document to the State.

9.2 **Review and Comment**. The State will have a reasonable opportunity for review and comment prior to:

(a) Any EPA approval or disapproval under ¶ 7.6 (Approval of Deliverables) of any deliverables that are required to be submitted for EPA approval; and

(b) Any approval or disapproval of the Notice of Goodyear North Pit Work Completion under ¶ 5.5 (Notice of Goodyear North Pit Work Completion), and any disapproval of, or Notice of Goodyear North Pit Work Completion under ¶ 5.5 (Notice of Goodyear North Pit Work Completion).

10. REFERENCES

10.1 The following regulations and guidance documents, among others, apply to the Goodyear North Pit Work. Any item for which a specific URL is not provided below is available on one of the two EPA Web pages listed in ¶ 10.2:

(a) A Compendium of Superfund Field Operations Methods, OSWER 9355.0-14, EPA/540/P-87/001a (Aug. 1987).

(b) CERCLA Compliance with Other Laws Manual, Part I: Interim Final, OSWER 9234.1-01, EPA/540/G-89/006 (Aug. 1988).

(c) Guidance for Conducting Remedial Investigations and Feasibility Studies, OSWER 9355.3-01, EPA/540/G-89/004 (Oct. 1988).

(d) CERCLA Compliance with Other Laws Manual, Part II, OSWER 9234.1-02, EPA/540/G-89/009 (Aug. 1989).

(e) Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties, OSWER 9355.5-01, EPA/540/G-90/001 (Apr.1990).

(f) Guidance on Expediting Remedial Design and Remedial Actions, OSWER 9355.5-02, EPA/540/G-90/006 (Aug. 1990).

(g) Guide to Management of Investigation-Derived Wastes, OSWER 9345.3-03FS (Jan. 1992).

(h) Permits and Permit Equivalency Processes for CERCLA On-Site Response Actions, OSWER 9355.7-03 (Feb. 1992).

(i) Guidance for Conducting Treatability Studies under CERCLA, OSWER 9380.3-10, EPA/540/R-92/071A (Nov. 1992).

(j) National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule, 40 C.F.R. Part 300 (Oct. 1994).

(k) Guidance for Scoping the Remedial Design, OSWER 9355.0-43, EPA/540/R-95/025 (Mar. 1995).

(l) Remedial Design/Remedial Action Handbook, OSWER 9355.0-04B, EPA/540/R-95/059 (June 1995).

(m) EPA Guidance for Data Quality Assessment, Practical Methods for Data Analysis, QA/G-9, EPA/600/R-96/084 (July 2000).

(n) Comprehensive Five-year Review Guidance, OSWER 9355.7-03B-P, 540-R-01-007 (June 2001).

(o) Guidance for Quality Assurance Project Plans, QA/G-5, EPA/240/R-02/009 (Dec. 2002).

(p) Quality management systems for environmental information and technology programs - Requirements with guidance for use, ASQ/ANSI E4:2014 (American Society for Quality, February 2014).

(q) Uniform Federal Policy for Quality Assurance Project Plans, Parts 1-3, EPA/505/B-04/900A though 900C (Mar. 2005).

(r) Superfund Community Involvement Handbook, OLEM 9230.0-51 (March 2020). More information on Superfund community involvement is available on the Agency's Superfund Community Involvement Tools and Resources web page at https://www.epa.gov/superfund/superfund-community-involvement-tools-and-resources.

(s) EPA Guidance on Systematic Planning Using the Data Quality Objectives Process, QA/G-4, EPA/240/B-06/001 (Feb. 2006).

(t) EPA Requirements for Quality Assurance Project Plans, QA/R-5, EPA/240/B-01/003 (Mar. 2001, reissued May 2006).

(u) EPA Requirements for Quality Management Plans, QA/R-2, EPA/240/B-01/002 (Mar. 2001, reissued May 2006).

(v) USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, ILM05.4 (Dec. 2006).

(w) USEPA Contract Laboratory Program Statement of Work for Organic Analysis, SOM01.2 (amended Apr. 2007).

(x) EPA National Geospatial Data Policy, CIO Policy Transmittal 05-002 (Aug. 2008), http://www.epa.gov/geospatial/geospatial-policies-and-standards and http://www.epa.gov/geospatial/epa-national-geospatial-data-policy.

(y) Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration, OSWER 9283.1-33 (June 2009).

(z) Principles for Greener Cleanups (Aug. 2009), http://www.epa.gov/greenercleanups/epa-principles-greener-cleanups.

(aa) USEPA Contract Laboratory Program Statement of Work for Inorganic Superfund Methods (Multi-Media, Multi-Concentration), ISM01.2 (Jan. 2010).

(bb) Close Out Procedures for National Priorities List Sites, OSWER 9320.2-22 (May 2011).

(cc) Groundwater Road Map: Recommended Process for Restoring Contaminated Groundwater at Superfund Sites, OSWER 9283.1-34 (July 2011).

(dd) Construction Specifications Institute's MasterFormat 2020 Edition, available from the Construction Specifications Institute, https://www.csiresources.org/home.

(ee) Updated Superfund Response and Settlement Approach for Sites Using the Superfund Alternative Approach, OSWER 9200.2-125 (Sep. 2012)

(ff) EPA's Emergency Responder Health and Safety Manual, OSWER 9285.3-12 (July 2005 and updates), http://www.epaosc.org/_HealthSafetyManual/manual-index.htm

(gg) Broader Application of Remedial Design and Remedial Action Pilot Project Lessons Learned, OSWER 9200.2-129 (Feb. 2013).

(hh) Guidance for Evaluating Completion of Groundwater Restoration Remedial Actions, OSWER 9355.0-129 (Nov. 2013).

(ii) Groundwater Remedy Completion Strategy: Moving Forward with the End in Mind, OSWER 9200.2-144 (May 2014).

(jj) Guidance for Management of Superfund Remedies in Post Construction, OLEM 9200.3-105 (Feb. 2017), https://www.epa.gov/superfund/superfund-post-construction-completion.

10.2 A more complete list may be found on the following EPA Web pages:

Laws, Policy, and Guidance: http://www.epa.gov/superfund/superfund-policy-guidance-and-laws

Test Methods Collections: http://www.epa.gov/measurements/collection-methods

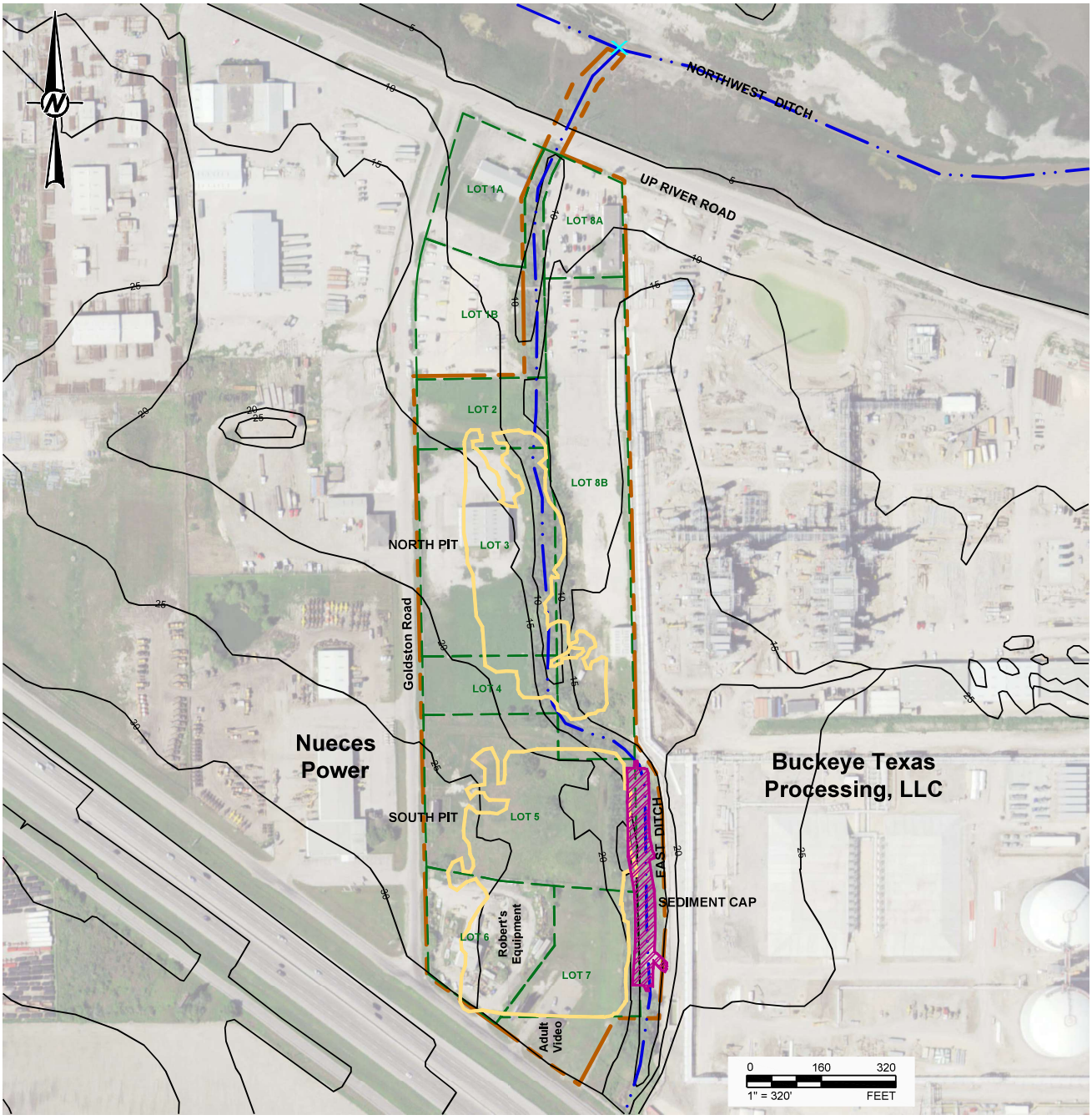
10.3 For any regulation or guidance referenced in the Decree or this Goodyear North Pit SOW, the reference will be read to include any subsequent modification, amendment, or replacement of such regulation or guidance. Such modifications, amendments, or replacements apply to the Goodyear North Pit Work only after Settling Defendant receives notification from EPA of the modification, amendment, or replacement.

APPENDIX C

MAP OF THE SITE SHOWING THE HISTORICAL BOUNDARY OF THE NORTH PIT

Source: Page 129 of EPA's Record of Decision

BRINE SERVICE COMPANY SUPERFUND SITE
Corpus Christi, Nueces County, State of Texas
EPA Region 6



LEGEND

- 15 — TOPOGRAPHIC CONTOUR INTERVAL
- EAST DITCH
- SITE BOUNDARY
- LOT BOUNDARY
- EXTENT OF HISTORICAL PITS
- DOWNSTREAM AOC LIMIT OF INVESTIGATION

REFERENCE(S)

IMAGERY TAKEN FROM WWW.TNRIS.GOV, 2015 AERIAL IMAGERY, 0.5M RESOLUTION. TOPOGRAPHIC ELEVATION CONTOURS FROM THE USGS 7.5 MIN. SERIES TOPOGRAPHIC QUADRANGLE MAPS OF ANNAVILLE AND CORPUS CHRISTI, TX, 1975.

CLIENT
BRINE SERVICE COMPANY

PROJECT
SUPERFUND SITE
CORPUS CHRISTI, TEXAS

TITLE
SITE MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2019-04-09
DESIGNED	AJD
PREPARED	AJD
REVIEWED	BB
APPROVED	BB

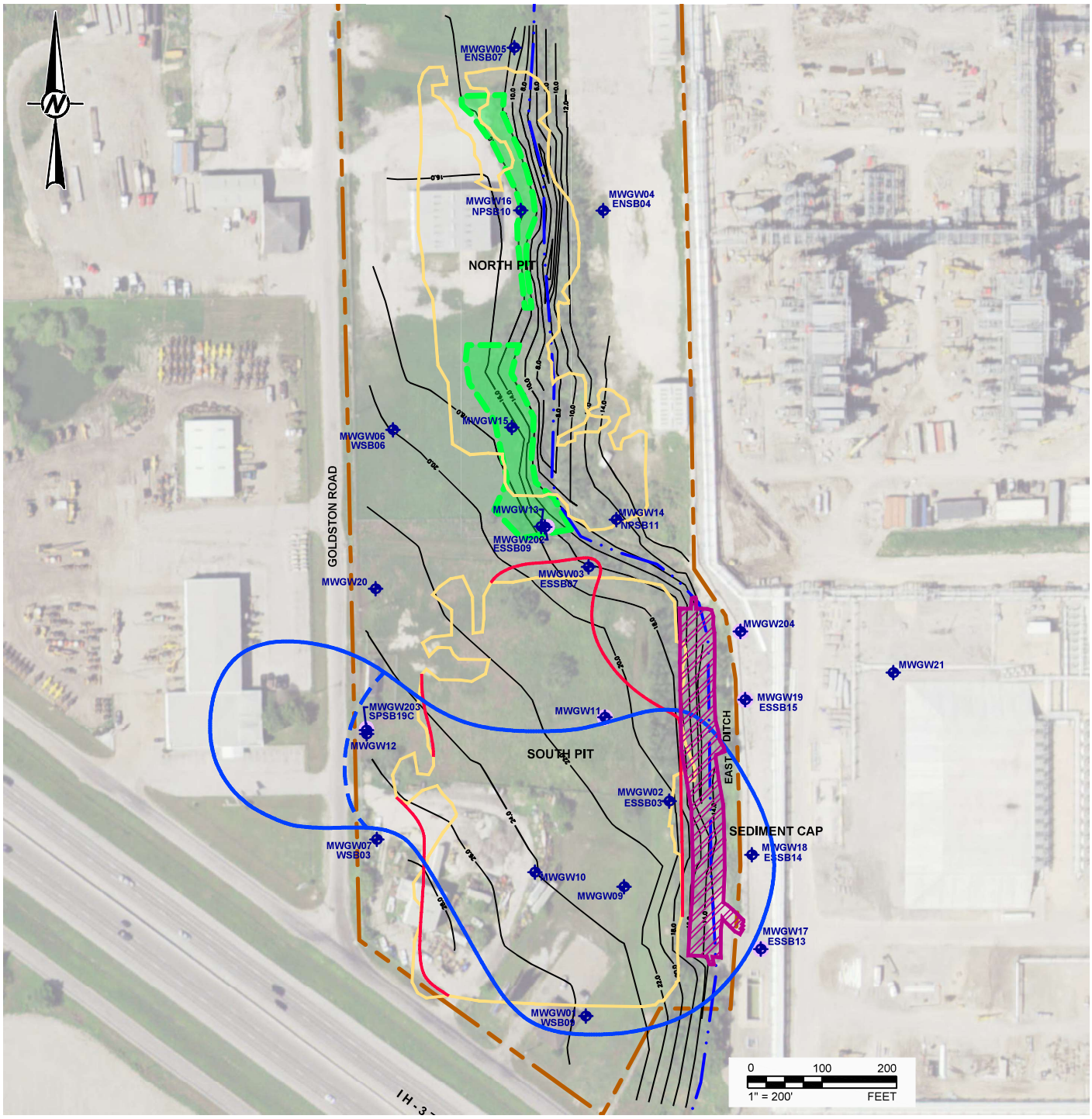
PROJECT NO. 30404056 | REV. 0 | FIGURE 2

APPENDIX D

MAP SHOWING THE OUTLINE OF THE AREAS (SHOWN IN GREEN) OF THE NORTH PIT THAT ARE THE SUBJECT OF THE GOODYEAR NORTH PIT WORK UNDER THE GOODYEAR NORTH PIT SOW

Source: Page 144 of EPA's Record of Decision

BRINE SERVICE COMPANY SUPERFUND SITE
Corpus Christi, Nueces County, State of Texas
EPA Region 6



LEGEND

- SITE BOUNDARY
- TOPOGRAPHIC CONTOUR INTERVAL
- EXTENT OF HISTORICAL PITS (AERIAL PHOTOS)
- INFERRED PIT BOUNDARY (BASED ON WASTE DEPOSITIONAL AREAS)
- BENZENE / LNAPL GROUNDWATER PLUME
- INFERRED BOUNDARY BETWEEN OFF-SITE AND SITE PLUMES
- NORTH PIT SURFACE SOIL HOT SPOT AREAS
- EAST DITCH
- PERMANENT MONITORING WELL (UTU)
- PERMANENT MONITORING WELL (STU)

CLIENT
BRINE SERVICE COMPANY

PROJECT
SUPERFUND SITE
CORPUS CHRISTI, TEXAS

TITLE
INFERRED SOUTH PIT BOUNDARY AND NORTH PIT REMEDIATION AREAS

CONSULTANT
GOLDER

YYYY-MM-DD	2019-09-06
DESIGNED	AJD
PREPARED	AJD
REVIEWED	BB
APPROVED	BB

PROJECT NO. 30404056 | REV. 0 | FIGURE 17