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Our Ref.: 11215702-Howard-35

November 8, 2022

Ms. Ashley Howard Environmental Protection Agency Remedial Project Manager 1201 Elm Street, Suite 500 Dallas, Texas 75270

#### Pre-Final 90% Remedial Design - Northern Impoundment (Northwest Corner Component)

Dear Ms. Howard:

GHD Services Inc. (GHD), on behalf of International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC; collectively referred to as the Respondents), hereby submits to the United States Environmental Protection Agency (EPA) the northwest corner component of the Pre-Final 90% Remedial Design (90% RD Northwest Corner Component) for the Northern Impoundment of the San Jacinto River Waste Pits Superfund Site, located in Harris County, Texas. This 90% RD - Northwest Corner Component is the final component of the Pre-Final 90% Remedial Design - Northern Impoundment (90% RD), submitted to the EPA on June 27, 2022. The 90% RD was prepared pursuant to the requirements of the Administrative Settlement Agreement and Order on Consent for Remedial Design (AOC), Docket No. 06-02-18, with an effective date of April 11, 2018, and was developed based on input from the Technical Working Groups established under the AOC.

To expedite the review process, this submittal is limited to design components related to the northwest corner of the Northern Impoundment, which have been inserted into the existing framework of the 90% RD and appear in black font. The text, figures, tables, appendices, etc. from the June 2022 90% RD submittal that are not pertinent to the northwest corner design and to which substantive changes were not made are not included in this submittal. The text, tables, appendices, etc. that have not been included are indicated by grey font in the submittal.

Should you have any questions or require additional information regarding this submittal, please contact GHD at (225) 292-9007.

Regards,

GHD

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Encl.: Pre-Final 90% RD - Northern Impoundment (Northwest Corner Component)

cc: Lauren Poulos, EPA Robert Appelt, EPA Katie Delbecq, Texas Commission on Environmental Quality (TCEQ) Brent Sasser, IPC Judy Armour, MIMC

→ The Power of Commitment



# Pre-Final 90% Remedial Design - Northern Impoundment (Northwest Corner Component)

# San Jacinto River Waste Pits Site Harris County, Texas

International Paper Company & McGinnes Industrial Maintenance Corporation

November 8, 2022

The Power of Commitment

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### List of Acronyms

AASHTO	-	American Association of State Highway and Transportation Officials
ACBM	-	Articulated Concrete Block Mat
AISC	-	American Institute of Steel Construction
AMSL	-	Average Mean Sea Level
AOC	-	Administrative Settlement Agreement and Order on Consent for Remedial Design
ARAR	-	Applicable or Relevant and Appropriate Requirements
ASCE	-	American Society of Civil Engineers
ASTM	-	American Society for Testing and Materials
ABM	-	Articulating Block Mat
BBL	-	Barrel, measurement unit for barges, equivalent to 42 gallons of liquid
bgs	-	Below Ground Surface
BHHRA	-	Baseline Human Health Risk Assessment
BMP	-	Best Management Practice
<sup>137</sup> Cs	-	Cesium-137
CFR	-	Code of Federal Regulations
cm	-	Centimeter
cm/s	-	Centimeters per Second
cm/year	-	Centimeters per Year
CME	-	Central Mine Equipment
COD	-	Chemical Oxygen Demand
COPC	-	Constituent of Potential Concern
CPT	-	Cone Penetrometer Test
CQA/QCP	-	Construction Quality Assurance/Quality Control Plan
CU	-	Consolidated Undrained
CWA	-	Coastal Water Authority
CY	-	Cubic Yard
D	-	Dead Load
DI	-	Deionized
DPT	-	Direct Push Technology
DU	-	Decision Unit
EM	-	Engineer Manual by United States Army Corps of Engineers
EPA	-	Environmental Protection Agency
ERP	-	Emergency Response Plan
FSP	-	Field Sampling Plan
Evoqua	-	Evoqua Water Technologies LLC
F	-	Fluid Load
FEMA	-	Federal Emergency Management Agency
FS	-	Feasibility Study
ft	-	Feet, measurement unit for length, height, or distance
ft <sup>2</sup>	-	Square Feet
ft <sup>3</sup>	-	Cubic Feet
ft/day	-	Feet per Day
ft/s	-	Feet per Second
Fy	-	Yield Stress
GAC	-	Granular Activated Carbon
GCV	-	Generalized Cross Validation

GHD	-	GHD Services Inc.
GHG	-	Greenhouse Gas
gpd	-	Gallons per Day
gpm	-	Gallons per Minute
GPS	-	Global Positioning System
Н	_	Lateral Earth Pressure
HASP	_	Health and Safety Plan
HCFCD	_	Harris County Flood Control District
HDPE	_	High-Density Polvethylene
1	_	Barge Impact
I-10	_	Interstate Highway-10
IBC	_	Intermediate Bulk Containers
IC	_	Institutional Control
ICIAP	_	Institutional Controls Implementation and Assurance Plan
IPC	_	International Paper Company
K.		Wind Directionality
	-	Ground Elevation Easter
r\e kip	-	Kilonound
KIP kip/ft	-	Kilopoulia Kilopoulia
кір/п	-	Kilopound per Fool
KSI	-	Kilopound per Square Inch
Kz	-	Velocity Pressure Exposure Coemicient
Kzt	-	l opographic Factor
	-	Pound
lb/tt²	-	Pounds per Square Foot
lb/tt <sup>3</sup>	-	Pounds per Cubic Foot
LC	-	Load Combination
Lsh,t	-	Rising or Falling Limb of the Hydrograph at the Sheldon Gage at Time, t
MARS	-	Multivariate Adaptive Regression Splines
MIMC	-	McGinnes Industrial Maintenance Corporation
mg/L	-	Milligrams per Liter
ML	-	Minimum Level
MNR	-	Monitored Natural Recovery
mph	-	Miles per Hour
MRI	-	Maximum Recurrence Interval
Ν	-	Number of Observations
Ne	-	Effective Number of Parameters
NAVD88	-	North American Vertical Datum of 1988
ng/kg	-	Nanograms per Kilogram
NTU	-	Nephelometric Turbidity Units
O&M	-	Operations and Maintenance
Pa	-	Pascal
<sup>210</sup> Pb	-	Lead-210
PBR	-	Permit By Rule
PCBs	-	Polychlorinated Biphenyls
PCF	-	Pounds per Cubic Foot
PDI	-	Pre-Design Investigation
PDI-1	-	First Phase Pre-Design Investigation
PDI-2	-	Second Phase Pre-Design Investigation

PFD	-	Process Flow Diagram
pg/L	-	Picograms per Liter
PMT	-	Pressuremeter Test
POHA	-	Port of Houston Authority
psi	-	Pounds per Square Inch
PTW	-	Principal Threat Waste
PVC	_	Polyvinyl Chloride
QAPP	-	Quality Assurance Project Plan
qz	-	Velocity Pressure
RA	-	Remedial Action
RAO	-	Remedial Action Objective
RC	-	Remedial Contractor
RCRA	-	Resource Conservation and Recovery Act
RD	-	Remedial Design
RDWP	-	Remedial Design Work Plan
RI	-	Remedial Investigation
RI/FS	-	Remedial Investigation/Feasibility Study
ROD	-	Record of Decision
ROW	-	Right-of-Way
RTK	-	Real-Time Kinetic
RPD	_	Relative Percent Difference
RSS	_	Residual Sum of Squares
SSA	_	Sand Separation Area
SDI	_	Supplemental Design Investigation
SF	_	Safety Factor
SM	_	Standard Method
SOW	_	Statement of Work
SPT	_	Standard Penetration Test
SVOC	_	Semi-volatile Organic Compound
SWMP	_	Site Wide Monitoring Plan
SWPPP	_	Stormwater Pollution Prevention Plan
TAC	_	Texas Administrative Code
TCDD	_	2,3,7,8-tetrachlorinated dibenzo-p-dioxin
TCEQ	_	Texas Commission on Environmental Quality
TCLP	_	Toxicity Characteristic Leaching Procedure
TCRA	-	Time Critical Removal Action
TDS	_	Total Dissolved Solids
TEQ <sub>DF,M</sub>	-	TCDD Toxicity Equivalent for Mammals
TexTox	-	Texas Toxicity Screening
TOC	-	Total Organic Carbon
TODP	-	Transportation and Off-Site Disposal Plan
TSS	-	Total Suspended Solids
TSWP	-	Treatability Study Work Plan
TSWQS	-	Texas Surface Water Quality Standard
TWG	-	Technical Working Group
TxDOT	-	Texas Department of Transportation
USACE	-	United States Army Corps of Engineers
UCS	-	Unconfined Compressive Strength

-	United States Geological Survey
-	Unified Soil Classification System
-	Unconsolidated Undrained
-	Design wind velocity with MRI of 100 years
-	Design wind velocity with MRI of 3000 years
-	Volatile Organic Compound
-	Water Quality-Based Effluent Limitation
-	Wind Load
-	Wind Load, Exterior
-	Wind Load, Interior
-	Water Surface Elevation at the Sheldon Gage at Time, t
-	Water Surface Elevation at the Northern Impoundment at Time, t
-	Water Treatment System
-	Micron
-	Micrograms per Liter

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### 5.12 Northwest Corner

### 5.12.1 Background

The following sections provide a full Pre-Final 90% Remedial Design for the northwest corner of the Northern Impoundment of the San Jacinto River Waste Pits Superfund Site (90% RD - Northwest Corner Component). The *Pre-Final (90%) Remedial Design - Northern Impoundment* (June 90% RD) for the remaining portion of the Northern Impoundment was submitted to the United States Environmental Protection Agency (EPA) on June 27, 2022 (GHD, 2022c). Below is a summary of correspondence, submissions, and meetings held between the Respondents and the EPA pertaining to the northwest corner and additional information developed regarding conditions in the northwest corner that were not otherwise described in the June 90% RD.

- On June 8, 2022, an in-person meeting between the EPA and International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC; referred to as the Respondents) took place at which the concerns and risks associated with the RD in the northwest corner were discussed. These concerns were further outlined in a letter to the EPA dated June 21, 2022 (IPC & MIMC, 2022b).
- An in-person meeting between Respondents, GHD, and EPA was scheduled for August 4, 2022, to discuss a path forward for the northwest corner design. On the day prior to the meeting, EPA provided to the Respondents a Memorandum to the File dated August 3, 2022, (Memo to File) in which the EPA provided clarification of the phrase "in the dry" used in the Record of Decision (ROD [EPA, 2017b]) in describing the selected remedy for the Northern Impoundment (EPA,2022c).
- During the August 4, 2022, meeting, the Respondents expressed the need to perform an updated hydraulic heave evaluation specifically focused on the northwest corner to confirm the conclusions of the previous investigation and to evaluate the level of water that would need to be maintained to overcome the risk of hydraulic heave in a dredging scenario.
- Following the August 4, 2022, meeting, the Respondents began the focused hydraulic heave evaluation, which resulted in a reduction of the area defined as the "northwest corner" and in a refinement of the assumptions for

the river elevation used in the hydraulic heave calculations. This evaluation is further discussed in Section 5.12.3 and in the attached Appendix B-1.

- Based upon the information provided in the August 3, 2022, EPA Memo to File, and the Respondents' discussions with the EPA during the August 4, 2022, meeting, the Respondents submitted a Request for Schedule Extension Northwest Corner Component to the EPA on August 18, 2022 (GHD, 2022d). The EPA sent a letter to the Respondents dated August 31, 2022 (EPA, 2022d) which extended the deadline for the 90% RD Northwest Corner Component to November 8, 2022.
- The EPA subsequently sent a letter to GHD dated September 14, 2022 (EPA, 2022e) that addressed, among other things, certain aspects of the 90% RD Northwest Corner Component and a second letter to GHD dated September 28, 2022, (EPA, 2022f) regarding options for residuals management in a dredging scenario.
- The Respondents submitted a letter to EPA dated October 7, 2022, (IPC & MIMC, 2022c) with respect to their understanding of the Memo to File and to which EPA responded in a letter dated October 13, 2022 (EPA, 2022g). GHD submitted a letter to EPA dated October 27, 2022, (GHD, 2022e) regarding certain aspects of the September 14, 2022, letter, and Respondents also submitted a letter to EPA on that date regarding the September 14, 2022, letter (IPC & MIMC, 2022d).

The Respondents have prepared this 90% RD - Northwest Corner Component as part of the 90% RD submittal for the Northern Impoundment. To expedite the review process, this submittal is limited to the design components related to the northwest corner, which have been inserted into the existing framework of the June 90% RD. Except as noted below, text, figures, tables, appendices, etc. that are not pertinent to the northwest corner design remain unchanged from the June 90% RD submittal and have not been included herein. It is anticipated that the references in the June 90% RD submittal to the northwest corner will be updated to reflect and include content included in this submittal in the 100% RD submittal. As further discussed in Section 5.12.3, the development of this 90% RD - Northwest Corner Component resulted in a determination that the design river level to be considered in evaluating hydraulic heave risk should be +5 feet North American Vertical Datum of 1988 (ft NAVD88), which is higher than the level of +1.5 ft NAVD88 used in assessing hydraulic heave risk in the remainder of the Northern Impoundment included in the June 90% RD submittal. Due to the limited time for the preparation of this 90% RD - Northwest Corner Component, the potential implications of this change in design river level on the hydraulic heave risk in the remainder of the Northern Impoundment are still being evaluated. Preliminary results indicate that there could be several additional areas in other portions of the Northern Impoundment that are at risk of hydraulic heave.

### 5.12.2 Remedial Evaluation

#### 5.12.2.1 Overview

The northwest corner of the Northern Impoundment excavation area contains approximately 20,000 cubic yards (CY) of impacted material. Following issuance of the ROD, during the remedial design (RD) phase, three design investigations were conducted (as summarized in Section 2) which resulted in a much larger dataset, a clear vertical and horizontal delineation of the Northern Impoundment, and other newly-identified information that significantly changed the characterization and understanding of the Northern Impoundment. Specific impacts of the newly-identified information on conditions in the northwest corner are addressed below in the context of potential remedial options for the northwest corner that have been evaluated (partial excavation in the dry with capping [dry excavation and capping] and removal using mechanical dredging).

#### 5.12.2.2 Northwest Corner Challenges

In the northwest corner, the identified depth and expanse of contamination has increased significantly to an elevation of -28.45 ft NAVD88. This targeted depth of excavation could increase further if confirmation sampling shows that the clean-up target has not been achieved. In evaluating potential RD alternatives to achieve removal of material to this depth in the northwest corner, several issues were identified, the most significant of which is the potential for a catastrophic hydraulic heave condition to occur making excavation in the dry in this area technically impracticable. In a letter to GHD dated September 14, 2022, the EPA requested that issues identified regarding the practicability, safety,

or implementation of the remedy in the northwest corner should be noted and supported as part of this submittal. The challenges and risks specifically associated with the northwest corner are discussed below, building upon the site-wide uncertainties summarized in Section 5.11.

- Risk From Flooding: As summarized in Section 5.3.1, the Respondents conducted an extensive analysis of historical storm events and river levels, which served as the basis for the planned seasonal excavation schedule for the RD. This planned seasonal excavation schedule would limit work to the period from November to April each year to reduce the potential for hurricanes and high-water events involving the risk of flooding of open excavations and overtopping of the cofferdam wall (herein referred to as the best management practice [BMP] wall). While limiting construction activities to this period may reduce this risk, it does not eliminate it. This risk is even more acute in the northwest corner if a dredging alternative is implemented. In a dry excavation or dry excavation with capping scenario, if a storm is approaching and there is a risk that the BMP wall could be overtopped, the open excavations could be backfilled to avoid the risk of a release if uncontrolled overtopping of the BMP wall occurred (assuming adequate warning of a significant storm and sufficient time to backfill the excavation). Water that is required in the northwest corner to reduce the risk of hydraulic heave in a dredging scenario would be released if overtopping of the BMP wall occurred. Under a dredging scenario, there are no controls that could be implemented to prevent a release if uncontrolled overtopping of the BMP wall occurred.
- Increased Excavation Depth and Volume: Based on the results of the pre-design investigations (which provided eight times the data in this area than was available at the time of the ROD), the depth and expanse of the material to be excavated in the northwest corner has significantly increased by at least five feet to -28.45 ft NAVD88. The target excavation depth anticipated in the ROD, which was based on only one boring, has been shown to be deeper and to extend across a larger area than previously understood. Driven by changes required by the deeper depth and increased volume of material to be excavated (both within the northwest corner and in other areas of the Northern Impoundment), the BMP wall and other aspects of the RD involve significantly increased complexity and much greater risk than was assumed in the ROD, as discussed in Section 5.11. This is particularly true for the northwest corner, where the required design of the BMP wall is even more robust to account for the significant excavation depths and in which a specialized, and more challenging remedial technology like dredging would be required to achieve removal beyond what can be achieved using dry excavation.
- Risk of Hydraulic Heave: Because of the need for deeper excavations, a technical analysis was conducted to evaluate the potential for hydraulic heave to occur during excavation. As set forth in Section 5.1 and as described in Appendix B, that technical analysis concluded that significant portions of the Northern Impoundment, including the northwest corner, would be at an unacceptable risk of hydraulic heave in which the bottom of an excavation could suddenly fail, and the excavation would fill with groundwater and flowing sands, putting the health and safety of workers at risk. A further risk associated with hydraulic heave is that once it occurs, no further excavation could take place in that location. Any impacted material greater than 30 nanograms per kilograms (ng/kg) 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (TCDD) Toxicity Equivalent for Mammals (TEQ<sub>DF,M</sub>) in that location or dispersed as a result of the hydraulic heave event could not be excavated and would have to be left in place. If a hydraulic heave event were to take place in a location near or adjoining the BMP wall, the uncontrolled nature of the heave event would also have the potential to impact the stability of the BMP wall. The initial analysis showed that the risk of hydraulic heave in the northwest corner is so significant that even dewatering the area to the elevation of the river bottom could result in a heave scenario. A focused hydraulic heave specifically focused on the northwest corner was performed for purposes of this submission, as further described in Section 5.12.3.3, and further supported the conclusions in the initial analysis.
- Schedule: The additional quantity of waste targeted for remediation, including in the northwest corner, has extended the overall remedial action (RA) schedule to a minimum of seven years for the Northern Impoundment. This extends the period over which extreme events can potentially adversely affect the project. This schedule is also subject to impacts from the proposed Interstate Highway-10 (I-10) bridge replacement project currently under design by the Texas Department of Transportation (TxDOT). As discussed in Section 5.11.1.1, this project could eliminate the only land access to the Northern Impoundment and effectively halt progress on the RA, and/or potentially necessitate major redesign of portions of the BMP wall to accommodate the bridge design. Even if

access to the ROW is made available, the coordination of work with the concurrent bridge construction project (and the associated restrictions on freeway access and traffic delays during the project) will further extend the time needed to complete the work, including in the northwest corner. Schedule delays could have an even greater impact in the northwest corner if a dredging alternative is implemented. In a dry excavation or dry excavation with capping scenario, if unforeseen conditions delay the progress of the seasonal removal, the open excavation could be temporarily capped until work begins the following season. Under a dredging scenario, this option is not available, so the schedule would have to provide ample time to manage the millions of gallons of contact water in the excavation before the completion of the excavation season, which may not allow sufficient time to complete the full excavation of material through the dredging scenario. If sufficient time is not available for water management, there could be the potential for millions of gallons of contact water to be released to the river if there were an overtopping of the BMP wall during a storm event.

- Increased Cost: Given the increase in the volume and depths of the material to be removed and the associated complexities in the design, increased costs significantly above the EPA estimate are anticipated. If dredging is required in the northwest corner, that alternative would have significantly increased costs associated with it due to the use of specialized equipment, the need to treat millions of gallons of impacted water, and the requirement to backfill the dredged area to mitigate hydraulic heave after the excavation is complete, as compared to other options.
- Challenge to Meet ROD Requirements: Removal of deeper material in the northwest corner will require mechanical dredging, which, because it cannot be conducted in the dry, could leave residuals in place above the 30 ng/kg TEQ<sub>DF,M</sub> threshold, even with the adoption of best management practices to minimize residuals. The post-ROD data demonstrates that, even with EPA's clarification in the August 3 Memo to File regarding the requirement for the ROD to be implemented "in the dry," a design cannot be implemented that meets requirements in the ROD for no discharges above the Texas Surface Water Quality Standard (TSWQS) and the removal of all material above 30 ng/kg TEQ<sub>DF,M</sub> and that is consistent with the ROD's emphasis on worker safety.

#### 5.12.2.3 Remedial Approach Selection

Given the constraints identified based on the post-ROD information and analyses, and the identified challenges associated with dry excavation and a full removal in the northwest corner, potential alternatives were identified and evaluated to select one that is both protective of human health and the environment (both in the short- and long-term), can be safely implemented, is cost-effective, and satisfies the Remedial Action Objectives (RAOs) set forth in the ROD. The RAOs are as follows:

- RAO 1: Prevent releases of dioxins and furans above clean-up levels from the former waste impoundments to sediments and surface water of the San Jacinto River.
- **RAO 2**: Reduce human exposure to dioxins and furans from ingestion of fish by remediating sediments to appropriate clean-up levels.
- RAO 3: Reduce human exposure to dioxins and furans from direct contact with or ingestion of paper mill waste, soil, and sediment by remediating affected media to appropriate clean-up levels.
- RAO 4: Reduce exposures of benthic invertebrates, birds, and mammals to paper mill waste derived dioxins and furans by remediating affected media to appropriate clean-up levels.

The limited suite of general response actions for addressing waste material at aquatic sites are typically; No Action, Monitored Natural Recovery, Capping, Removal/Dredging, and Treatment. Of these, the remedy for the northwest corner that can meet the RAOs, can be constructed in the shortest time, and has the lowest potential for catastrophic failures is dry excavation and capping - which combines dry removal of as much material as can safely be excavated followed by capping of the remainder. EPA's September 14, 2022, letter stated that the Respondents were to fully evaluate mechanical dredging as a remedial alternative for the northwest corner. Accordingly, evaluations of dry excavation and capping and mechanical dredging relative to the ability to meet RAOs, short-term effectiveness, and implementability, are provided below.

#### 5.12.2.3.1 Excavation and Capping Alternative

A capping remedy entails the placement of clean material over contaminated waste materials, which remain in place. With the dry excavation and capping approach, the material in the northwest corner above -13 ft NAVD88 would be excavated in the dry (approximately 9,800 CY), and the remaining material that cannot be excavated in the dry due to hydraulic heave concerns, would be capped. The rationale for the dry excavation elevation is further explained in Section 5.12.3. A robust engineered articulating block mat (ABM) cap would be placed over the remaining material that cannot be excavated in the dry (representing approximately 8 percent of the overall excavation surface area and less than 1.5 percent of the total dioxin mass of the Northern Impoundment). The water elevation in the northwest corner would be maintained at or slightly above -13 ft NAVD88 to control the potential for hydraulic heave prior to and during placement of the cap. The cap would be placed atop a geotextile liner and would consist of ABM type fabric-form concrete constructed of a woven, double layer synthetic fabric joined together into a matrix of rectangular compartments. A flowable, high-strength fine aggregate concrete mixture would be pumped into the compartments. The ABM would have interconnected polyester revetment cables embedded between the two layers of fabric to provide longitudinal and lateral binding of the finished articulating block mattress. This cap design would be significantly more robust than the existing time critical removal action (TCRA) armored cap, constructed in 2011 and would be similar to the ABM cap that was constructed on the steep slope of the northwest corner in May 2019 to control erosion, which has performed ideally to date. It would also be over a very small area (half an acre compared to the nearly 15-acre TCRA armored cap) and would be fully submerged year-round (submerged under at least 10 ft of water at all times) minimizing the risk of barge strikes, etc. Additional details on the capping alternative are provided in Section 5.12.4, below.

#### Ability to Meet RAOs

A cap would prevent direct contact between waste material and aquatic biota and human receptors (RAOs 2 to 4). A cap would also prevent resuspension and transport of waste materials away from the site (RAO 1). The initial cover layer of granular material placed would also mix in with surficial waste material, thereby effectively reducing the concentration of any dioxin at the waste material-cap interface. This mixing concept is acknowledged for the bioactive zone in the ROD (pages 18 and 19) for the Lower Passaic River in New Jersey (EPA, 2016). Since dioxin is virtually insoluble in water and typically absorbs to organic materials, the cap would prevent transport of dioxin in waste materials. Therefore, a robust cap, as described above, would meet the RAOs.

A recent example of the use of capping at a dioxin site is provided by the Kanawha River Site in West Virginia (EPA ID: WVSFN0305516). A series of caps placed over four areas and protected by armor stone was constructed at the site in 2020 to address dioxin-impacted sediment (GHD, 2021k). Bathymetric surveys of the caps were performed in 2021 following a 100-year flood (183,000 cubic feet per second [cfs]) and in 2022 as part of routine monitoring. The cap continues to function as intended, underscoring how the advanced state of capping technology has evolved through research and lessons learned over decades that has resulted in improved equipment, materials, techniques, and technologies.

#### Short-Term Effectiveness

In this case, dry excavation and capping would be taking place within the BMP wall and over an excavated surface so there should be no established biota that could be adversely impacted. The impacted area would also be significantly smaller than during the prior TCRA armored cap placement (half an acre compared with nearly 15 acres), and therefore the impact would be over a very limited area and over a short duration. Since the dry excavation and capping work will be conducted behind the BMP wall, there should not be exposure of humans or biota to waste material during the remedial activities in the short-term and the cap will prevent any exposures over the long-term.

#### Implementability

According to EPA (2005), subaqueous capping is a demonstrated technology (EPA, 2005), which has been widely and successfully applied at several aquatic sites across the world for more than two decades. Capping is the major component of the remedies constructed or adopted for a number of Superfund sites, including the Lower Passaic River (EPA, 2016) and the Kanawha River (Matlock, 2017; both with dioxins as the primary chemical of concern),

Portland Harbor (EPA, 2017a), Grasse River (EPA, 2013a), and Gowanus Canal (EPA, 2013b). Guidance for in-situ subaqueous capping has been developed jointly between EPA and the U.S. Army Corps of Engineers (USACE; Palermo, et al., 1998). The technology is well established with specialty equipment developed by several capping contractors. Materials are readily available, and personnel experienced in the design and construction oversight of capping remedies are available and have the necessary expertise. There is also precedence at this site for use of a similar ABM cap. The 6-inch ABM cap constructed along the steep slope of the northwest corner in 2019 has performed as designed and without any issues for more than 3 years. Added benefits of a dry excavation and capping approach include more limited excavation support, less need for dewatering, and less contact water to be managed. The schedule for a dry excavation and capping alternative would also be greatly expedited as compared to dredging. The estimated schedule to remove approximately 9,800 CY of material in the northwest corner in the dry and then install a robust engineered cap over the remaining material is approximately 14, 6-day working weeks. If excavation work was initiated at the beginning of November, work in the northwest corner could be complete by approximately the beginning of March, well before the start of hurricane season, and potentially with enough time to allow the remedial contractor (RC) to move on to other parts of the Northern Impoundment and expedite the overall RA process. This would also avoid the schedule issues associated with mechanical dredging which would require management of all the contact water in the excavation prior to the end of the excavation season.

#### 5.12.2.3.2 Dredging Alternative

Under a dredging scenario, the water elevation in the northwest corner would be maintained above -13 ft NAVD88 to control the potential for hydraulic heave. The waste material above -13 ft NAVD88 would be excavated in the dry, similar to the capping scenario, then the remaining material would be mechanically dredged to the target elevations after the area had been flooded with millions of gallons of water to allow for dredging. The area to be dredged would be surrounded by double turbidity curtains to control migration of suspended sediments. After the target depths are reached, confirmation sampling would be performed, followed by a final clean dredge pass. This would be followed by the placement of a residuals management layer to an elevation of -13 ft NAVD88 while dewatering and treating approximately 4.6 million gallons of contact water. This residuals management layer would be up to 15 feet thick in some places. Additional details on the dredging alternative are provided in Section 5.12.4, below.

#### Ability to Meet RAOs

Excavation and dredging will not result in full removal of all impacted material in the northwest corner. In the *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (2005) EPA notes that all dredging operations leave behind some residual contamination. "All dredging operations resuspend sediment, release contaminants, and generate residuals" (Schroeder, 2009). Palermo, et al. (2008) noted that no removal technology can remove every particle of contaminated sediment, and field results to date for completed environmental dredging pilots and full-scale projects suggest that post-dredging residual contamination levels have often not met desired clean-up levels. Dredging best practices, such as the use of smaller buckets, tighter location controls, reduced dredging rate, thinner and more frequent dredge cuts (e.g., <1 m), an overcut and/or a final clean-up dredge pass, and other operational practices can reduce residuals from mechanical dredging operations, but generated residuals cannot be eliminated (NRC, 2007; Patmont and Palermo, 2007; Gustavson, et al., 2008). It is possible that even after employing best practices to minimize residuals generation and migration, waste material with dioxin concentrations above 30 ng/kg TEQ<sub>DF,M</sub> would remain in the northwest corner following dredging, which would be inconsistent with the ROD.

#### Short-Term Effectiveness

The EPA (Stanislaus, 2017) urges engineers to design remedies to minimize short-term risks while achieving long-term protection. The major risk associated with dredging in the northwest corner is mitigating hydraulic heave and keeping the impacted material and contact water contained during the remediation activities. The breach of a constructed stormwater control berm could result in the transport of dioxin-containing waste material outside the northwest corner and an overtopping of the BMP wall during a major weather event could result in a release outside of the Northern Impoundment. Turbidity curtains and other residuals management methods, along with the BMP wall itself, should reduce the likelihood of a release and exposure to humans or biota during the remedial activities, and the

removal of the waste material and placement of a residuals management layer should minimize the exposures over the long-term.

#### Implementability

Mechanical dredging to remove contaminated submerged waste material is a common remedial practice, so there should not be a shortage of equipment and/or skilled labor. However, due to the potential for hydraulic heave and/or flooding of the impoundment with contact water, there is a limit to the depth to which material can safely be dredged. Furthermore, dredging activities would need to be completed within the tight six-month non-hurricane construction season. The estimated schedule to remove the approximately 20,000 CY of impacted material in the northwest corner (approximately half in the dry and half in the wet) is 24, 6-day working weeks. If dry excavation work was initiated at the beginning of November, work in the northwest corner would not be completed until the very end of April, pushing right to the limit of the non-hurricane working season. This estimated schedule would allow for only one round of confirmation sampling followed by one additional clean dredging pass and does not include any margin for error or delays during the working season for storms, equipment breakdowns, or the like.

In contrast to the dry excavation methodology planned for the rest of the Northern Impoundment, the volume of material that can be removed using dredging during an excavation season is not flexible. In an excavation season in which dry excavation is implemented, if unforeseen conditions cause significant delays that prohibit the target volume for that season from being removed, the area could be "buttoned up" as it is, and the excavation could be resumed the following excavation season. In the northwest corner, under a dredging scenario, as detailed in Section 5.12.5, a certain water level will have to be maintained throughout the dredging process to overcome the potential for hydraulic heave. At the end of removal activities, that now impacted contact water will have to be removed from the northwest corner to avoid having it spread residual contamination to other locations within the BMP wall or resulting in a release of dioxins above the TSWQS if there were an overtopping of the wall. Given the risk of hydraulic heave, the contact water cannot be pumped to the water treatment system (WTS) without replacing it with material to offset the weight of the water. Thus, approximately 11,250 CY of granular material would have to be used to replace the water as it is pumped off, bringing the northwest corner to an elevation of -13 ft NAVD88. The process of water removal and granular material placement will take approximately 46 working days to complete, or almost one-third of the excavation season. Given the lengthy process, it is essential that the entire volume in the northwest corner be removed in one excavation season. Extending the excavation season into the hurricane season is also not an option as that would leave the area at risk of high-water events, overtopping, and releases to the river before it has been properly covered and "buttoned up".

Dredging also requires a large footprint (larger than that needed for a capping scenario) for materials staging, dewatering, solidification, water treatment, etc. which is a challenge given the space constraints of the Northern Impoundment, described in Section 5.2. The limited usable space could be further restricted depending upon the timing and footprint of TxDOT's I-10 bridge replacement project, discussed in Section 5.12.2.2.

#### 5.12.2.4 Evaluation Summary

A combined dry excavation and capping approach will utilize established capping technology that would meet the RAOs and could be designed to withstand extreme weather events. Capping would be performed over a shorter duration than dredging, would have significantly less implementation risk, would take up less space, and would be the less costly alternative while providing a similar level of protection as a dredging program.

Dry excavation and capping would have fewer short-term impacts, including a reduced potential for redistribution of impacted material during construction caused by an extreme weather event. Furthermore, under a dry excavation and capping alternative, there would be no need for confirmation sampling, reduced need for landfill space for disposal of excavated material, reduced need to transport material from the work site to a landfill, and no concern about dioxin being bioavailable after the waste is covered by the cap. The cap would be placed on an area representing approximately 8 percent of the overall excavation area of the Northern Impoundment that represents material containing less than 1.5 percent of the estimated total mass of dioxins in the Northern Impoundment. This means that more than 98.5 percent of the total mass of dioxins in the Northern Impoundment would be removed.

The depth to which dredging can safely occur is limited due to the potential for hydraulic heave. There is the potential that the elevation to which waste material can be safely dredged may preclude further clean passes and therefore result in residuals in excess of the target concentration remaining. Dredging will also take a longer time to implement, during which time the area will be susceptible to extreme weather events, which could be more frequent given climate change. Under a dredging scenario, the area would not be able to be buttoned up in anticipation of a storm event. It will also have the higher production of greenhouse gases and potential for accidents due to required material processing, water treatment, and offsite transport of waste. Dredging would also be more costly than capping and therefore not as cost-effective as the dry excavation with capping alternative.

For all of these reasons, excavation in the dry, followed by capping is proposed as the remedial alternative for the northwest corner. The detailed capping design is included in Section 5.12.4.

To address the EPA requirement to include a mechanical dredging alternative, as stated in the September 14, 2022 EPA letter, a detailed design for mechanical dredging in the northwest corner is included in Section 5.12.5.

### 5.12.3 Update to Basis of Design

As discussed in Section 5.12.1, it was determined that design of excavation in the dry in the northwest corner was technically impractical due the potential for hydraulic heave to occur as the waste is removed. To support a design for the northwest corner that addresses and controls the potential for hydraulic heave, a more focused evaluation of the conditions in the northwest corner was performed as discussed below.

As has been previously discussed, hydraulic heave is a phenomenon that can occur when the downward forces associated with the weight of material (water, waste material, soil, etc.) are not great enough to overcome the upward forces exerted by an aquifer under pressure, as is the case with the Beaumont Sand underlying the Beaumont Clay. Magnifying this risk, in the northwest corner, previous geotechnical evaluations have identified the presence of a sand lens in the Beaumont Clay approximately 50 ft below ground surface (ft bgs). The pressure in the sand lens and potential connectivity to the river were evaluated based on potentiometric data from piezometers and historic river stage data. Safe levels for dry excavation and the required water elevation to be maintained in order to overcome hydraulic heave risk under a dredging scenario were then developed, taking into consideration these upward pressures and the soil conditions in the northwest corner.

#### 5.12.3.1 Piezometric Pressure Evaluation

The sand lens within the Beaumont Clay plays a critical role in evaluating the potential for hydraulic heave in the northwest corner. The sand lens was observed in area borings and, based on potentiometric data from the underlying Beaumont Sand, is assumed to be hydraulically connected to the river. Beginning in August 2020, water level data were collected from on-site transducers placed both in the San Jacinto River and in a piezometer installed in the Beaumont Sand. These data showed that there was a direct correlation between the Beaumont Sand and the water level in the river, with the river elevation being approximately 4.2 ft higher than the piezometer elevation. Assuming that there is a dampening effect that is proportional to the clay thickness, the piezometric head gradient between the river and the Beaumont Sand was calculated to be approximately 0.11 ft per foot of clay. When this factor is applied to the upper sand lens where there are approximately 16 ft of clay, the estimated piezometric head in the sand lens would be 1.7 ft lower than the river elevation. Based on this evaluation, the upward pressure in the sand lens in the northwest corner for the hydraulic heave evaluation was estimated to be the river stage elevation minus the 1.7-ft differential. For example, when the river stage is at +5 ft NAVD88, the piezometric head in the sand lens is estimated to be +3.3 ft NAVD88. The conceptual dampening effect of the piezometric head is shown on Figure 5-L, below.





#### 5.12.3.2 Hydraulic Heave Evaluation

As part of development of the northwest corner design, a focused hydraulic heave evaluation was conducted to better understand the elevation of water that would be necessary to maintain under a dredging scenario. The detailed hydraulic heave evaluation was conducted specifically for this area using inputs specific to the northwest corner. The evaluation is detailed in the Northwest Corner Hydraulic Heave Analysis, included as Appendix B-1, and is summarized below.

A design river level for the Extreme Case was selected as +9 ft NAVD88, which is the design height of the BMP wall that will surround the Northern Impoundment. Unit weights for the subsurface material were determined based on geotechnical data from the northwest corner, specifically the data from boring SJSB057-G. A unit weight of 95 pounds per cubic foot (pcf) was estimated for the sediments above the Beaumont Clay based on the laboratory measured moisture content and specific gravity data and a unit weight of 126 pcf was assumed for the Beaumont Clay based on the laboratory unit weight determinations for the boring. Due to the assumed horizontal connection between the sand lens in the Beaumont Clay and the San Jacinto River discussed above, the piezometric head difference between the sand lens and the river elevation at the northwest corner was assumed to be 1.7 ft. Assuming an Extreme Case design river level of +9 ft NAVD88, this results in a design head pressure of +7.3 ft NAVD88.

Based on this design head pressure, the critical elevation at which hydraulic heave becomes an unacceptable risk (with an insufficient safety factor [SF]) was calculated. This analysis demonstrated that the northwest corner can be excavated in the dry to an elevation of -13 ft NAVD88 while still maintaining an Extreme Case  $SF_{Total}$  of 1.15. The design river stage for the Reasonable Maximum Case and a  $SF_{Total}$  of 1.15 was then calculated considering the safe level of dry excavation calculated for the Extreme Case. The calculated design river stage for the Reasonable Maximum Case.

During dredging, sufficient water levels will need to be maintained in the excavation to offset the weight of the sediments being removed to overcome the heave potential. The safe water elevation to be maintained during dredging to the target removal elevations calculated for the Extreme Case (river stage +9 ft NAVD88) is -10.1 ft NAVD88 and the safe water elevation calculated for the Reasonable Maximum Case (river stage +5 ft NAVD88) is -10.9 ft NAVD88.

Prior to remedial activities in the Northern Impoundment, it is recommended that piezometers be installed in both the Beaumont Sand and the upper sand lens in the vicinity of the excavation to monitor actual piezometric pressure head in the strata before and during remedial activities. The assumptions used in the hydraulic calculations would then be evaluated based on the actual piezometer data. The northwest corner hydraulic heave evaluation is included as Appendix B-1. It should be noted that the calculated hydraulic heave limit of -13 ft NAVD88 is specific to only the northwest corner component of the Northern Impoundment. The change in the assumed design river level and associated piezometric head pressures will likely have implications on the risk of hydraulic heave in other parts of the Northern Impoundment. A more granular hydraulic heave evaluation for the rest of the Northern Impoundment, which incorporates the refined design inputs, is currently underway.

#### 5.12.3.3 River Stage Evaluation

The heave evaluation described above identified the Reasonable Maximum Case for the river stage as +5 ft NAVD88 and the Extreme Case river stage as +9 ft NAVD88, which serve as the basis of the northwest corner RD presented herein. Further evaluation of the historical river stage data in relation to the measured and projected stage at the Northern Impoundment was conducted to determine whether these design assumptions were appropriate.

#### 5.12.3.3.1 River Level Hindcasting

The Northern Impoundment is subject to both tidal fluctuations, as well as increases in river level from rainfall and tropical storm events. To better understand the river level locally, a transducer was installed on-site in July 2019. Prior to this, historical routine water level readings had not been collected at the Northern Impoundment. As discussed previously in Section 5.3.1, a hindcasted model was created to produce a dataset of calculated site-specific historical river levels dating back to 1996. The hindcasted model was developed based on publicly available historical United States Geological Survey (USGS) data from the Sheldon gage upstream of the Northern Impoundment. The hindcasted model utilizes a fixed data set of Sheldon gage inputs compared to site-specific data collected from the transducer at the Northern Impoundment to produce the hindcasted outputs. When new data becomes available, the model can then be re-hindcasted to reflect the additional data available and allow increased confidence in the hindcasted outputs. The original hindcasted data (provided in the 30% RD and the June 90% RD) was based on approximately 6 months worth of site-specific transducer data (July 2019 through December 2019) available at the time of the 30% RD.

As part of the aforementioned hydraulic heave evaluation for the northwest corner, the historical river levels and specific frequencies in which they occurred over the excavation season at the Northern Impoundment were further explored. To ensure that the most accurate data was being utilized, the hindcasted model was updated and rerun with a larger, more recent dataset from both the Sheldon gage and the on-site transducer (July 2019 through December 2021). The updated river level hindcasted data for the full year and the planned excavation season are shown on the attached Figures 5.4 and 5.5, respectively. The pink elevations represent the hindcasted river levels estimated at the Northern Impoundment. These two figures will effectively replace Figure 5.2 and 5.3, which were based on the more limited dataset. This change will be made in the 100% RD submittal.

#### 5.12.3.3.2 Design River Level

Using the outputs from the updated hindcasted model, the number of times that a specific river level was reached or exceeded during the excavation season was quantified, as shown in Table 5-K.

Table 5-K Hindcasted River Levels On-Site During Excavation Season

Hindcasted River Level (feet NAVD88)	Number of Occurrences <sup>1</sup> (Since 1996)
+1.5	3,844
+3	261
+4	21
+5	5
+6	3
+9	1

Note:

<sup>1</sup> An occurrence is defined as an event that occurred a minimum of four days from another event, with the exception of the +1.5 ft river level which is an event that occurred a minimum of one day from another event (due to the frequency of river levels above +1.5 ft).

The +9 ft NAVD88 river stage has only been exceeded one time between the months of November and April since 1996 (in 1998), indicating a river stage of this elevation during these months is extremely rare, further supporting the appropriateness of using this river stage for the Extreme Case. The +5 ft NAVD88 river stage was exceeded five times between the months of November and April since 1996, or approximately on average once every 5 years. This estimated frequency suggests that it would be likely to experience a river stage of +5 ft NAVD88 at least once during the 7+ year RA activities, but it would still be an unlikely event, making it an appropriate elevation for the Reasonable Maximum Case.

#### 5.12.3.4 Remedial Action Sequencing

Another basis of design assumption that is critical to the design and successful implementation of the RA in the northwest corner, regardless of the remedial alternative selected, is that the northwest corner be addressed in the first excavation season of the overall RA. This is necessary due to access issues and bathymetric conditions. If the other areas of the Northern Impoundment were completed first, it would eliminate land access to the Northwest Corner and make it very difficult to complete a remedy in that area. Completing the Northwest Corner first would also be appropriate due to the deep bathymetry in that area and the implications of that deep bathymetry on water management. This is further explained in Section 5.12.4.2.1.

### 5.12.4 Excavation and Capping

As discussed in Section 5.12.3, the water elevation within the northwest corner must be maintained at or above -13 ft NAVD88 to control the potential for hydraulic heave. Under an excavation and capping approach, the water level in the northwest corner will be dropped to -13 ft NAVD88, the impacted material above -13 ft NAVD88 will be excavated in the dry, granular material will be placed in the area below -13 ft NAV88 to provide a stable base for the cap, and an ABM cap will be constructed over the northwest corner. The following sections describe the procedures for dry excavation and capping in the northwest corner.

#### 5.12.4.1 Site Preparation Activities

Prior to disturbing ground in the northwest corner, erosion control structures would be installed in conformance with the Stormwater Pollution Protection Plan (SWPPP) to be developed by the selected RC. A double turbidity curtain would be installed around the boundary of the area to be excavated and then capped to prevent any release of sediments to the open water area inside the BMP wall during the TCRA armored cap removal and dry excavation phases of the project. The site preparation activities would include constructing roads and truck loading area(s) for the dry excavation. A mixing pad would be constructed adjacent to the northwest corner at the loading area to solidify the excavated material, as necessary, prior to its transport off-site. To facilitate access for concrete trucks to pump concrete slurry to the work area and for trucks to place the granular base material during capping operations, access roads would be constructed. The RC would provide a plan that describes the details of the excavation and capping operations and associated roads and support facilities. The work in the northwest corner would have to take place prior to work in other areas so that access for vehicles and a mixing pad is available.

#### 5.12.4.2 Excavation and Capping Procedures

#### 5.12.4.2.1 Cell Dewatering

Following the installation of the BMP wall, river water would be trapped within the Northern Impoundment. Based on historical river stage data, it is assumed that the water elevation will be at approximately +/- 0 ft NAVD88 on both sides of the BMP wall prior to any waste removal. The water located inside the BMP wall would be pumped back into the river to achieve an elevation of -13 ft NAVD88 in the northwest corner. This would expose approximately 0.67 acres of the northwest corner that can be excavated using land-based equipment in relatively dry conditions. Once the water is pumped to -13 ft NAVD88, the existing bathymetry in the northwest corner would effectively form a natural bowl that will contain the water in this low spot and prevent it from flooding out into the surrounding areas of the Northern Impoundment. This is only possible if the northwest corner is addressed prior to the remainder of the Northern Impoundment. Maintaining the water level at -13 ft NAVD88 provides water to offset the heave potential in the remaining 0.33 acres where the mudline is deeper. Figure 5-M, below, shows the water extent within the northwest corner at a water elevation of -13 ft NAVD88 and the area to be excavated in the dry.



Figure 5-M Capping Area Flooded to -13 ft NAVD88

#### 5.12.4.2.2 TCRA Armored Cap Removal Above -13 ft NAVD88

After pumping the water down to -13 ft NAVD88, and prior to dry excavation activities, the TCRA armored cap atop the exposed 0.67 acres would be removed using standard land-based excavation equipment to access the underlying waste material for excavation. The rock suitable for potential reuse would be staged on the Northern Impoundment or at a nearby location. Any geotextile and/or geomembrane barrier of the TCRA armored cap would be removed and disposed of off-site with other waste from the excavation.

#### 5.12.4.2.3 Dry Excavation

Following removal of the TCRA armored cap, excavation of approximately 9,800 CY of waste material to an elevation of -13 ft NAVD88 would take place in the dry using excavation equipment. During the excavation activities, the excavator would be positioned so it can reach into the excavation and swing around to load trucks or place material directly into a mixing pad. Any excavated material that does not contain free liquids and/or does not require solidification would be loaded directly in haul trucks for off-site disposal. Excavated material that is too wet (i.e., would not pass the paint filter test) to be directly loaded into haul trucks would be temporarily staged and allowed to drain by gravity and dry naturally and/or be solidified on the mixing pad prior to loading for off-site disposal. An earthen ramp (in a location adjoining the TxDOT right-of-way) would be constructed over the lip of the BMP wall to allow truck traffic into and out of the work area (see Drawings C-05 and C-45 in Appendix G-1).

SWPPP controls would be installed to control run-on and run-off from the excavation surface, as described in Section 5.9.2. Any water that contacts the excavation surface would be pumped out, as needed to maintain excavation operations, to a WTS where it would be treated and discharged to the river, as described in Section 5.8.

#### 5.12.4.2.4 Capping

Following dry excavation activities, granular material would be placed atop the existing TCRA armored cap in the submerged area to a minimum elevation of -13 ft NAVD88 so that the entire area to be capped is above the water surface. A minimum of 6 inches of granular material would be placed on the excavated surface to provide a stable base for the cap. Granular material would also be placed in a low area located to the northeast of the capped area where there is a risk of hydraulic heave, as shown in green shading on Figure 5-N, below. The heave calculations indicate that, for this area, the heave potential during reasonable maximum conditions (+5 ft NAVD88 river level and a SF of 1.25) is within the level defined as acceptable for purposes of the RD, but there may be a potential for heave during extreme river level conditions near +9 ft NAVD88. Considering that this area may be dewatered for up to seven years during construction across the Northern Impoundment, approximately one foot of granular material would be added to this area during the granular material placement phase to offset this heave potential.

Following the placement of granular material, a nonwoven geotextile would be placed on top of the granular base in the area to be capped and a cap would be placed on top of the geotextile. The cap would consist of ABM type fabric-form concrete constructed of a woven, double layer, synthetic fabric joined together into a matrix of rectangular compartments. A flowable, high-strength fine aggregate concrete mixture consisting of Portland cement, sand, and water will be pumped into the compartments. The ABM would have interconnected polyester revetment cables embedded between the two layers of fabric to provide longitudinal and lateral binding of the finished articulating block mattress.

The ABM would have a nominal block dimension of 20 by 20 inches and a minimum average thickness of 6 inches, which provides a nominal mass per unit area of 68 pounds per square foot when filled with the fine aggregate concrete. The ABM would either be 6-inch ABM as manufactured by Construction Techniques, Inc. or AB600L as manufactured by Synthetex, or an approved equivalent. As mentioned in Section 5.12.2.3.1, this cap design would be sufficiently more robust than the existing TCRA armored cap that was constructed in 2011 and would be similar to the ABM cap that was constructed on the steep slope of the northwest corner in May 2019 to control erosion, which has performed ideally to date.

The ABM panels would be joined in the field by means of sewing using nylon or polyester thread or zippering closures to the dimension of the areas to be protected and secured using anchor trenches at the lateral limits of the northwest corner. Following the placement of the ABM, fine aggregate concrete would be pumped into the compartments of the

fabric form to a thickness of 6 inches. The end-state capped area is shown on Figure 5-N, below. The approximately 1-acre cap will be placed at elevation -13 ft NAVD88 and will be submerged beneath at least 10 ft of water at all times.



Figure 5-N End-State Capped Area

#### 5.12.4.3 Monitoring and Controls

Monitoring and controls would be implemented during the RA for the northwest corner to prevent releases of impacted material to the surrounding land, water, or air as described in Section 5.9. Additional measures specific to the northwest corner capping operation are summarized below. The specific controls would be developed and/or refined in conjunction with the RC and would be included in revisions or modifications to the Site-Wide Monitoring Plan (SWMP; Appendix J; Attachment 5) and Construction Quality Assurance/Quality Control Plan (CQA/QCP; Appendix J; Attachment 6). An updated version of the CQA/QCP for the capping alternative has been included in the attached Appendix J-1, Attachment 5-A.

#### 5.12.4.3.1 Turbidity Curtain

The RC would be required to install a series of two impermeable turbidity curtains on the northern boundary of the northwest corner to prevent any release of sediments to the remaining open water inside the BMP wall and outside the
area to be capped. The weighted impermeable curtain would extend the full length of the water column and be anchored to the bottom. The absence of flow within the BMP wall and the full length of the curtain means that the turbidity curtain should be effective at controlling migration of suspended solids. Visual inspections would be performed outside and between the curtains and adjustments would be made as necessary to contain the sediments.

#### 5.12.4.3.2 Stormwater Pollution Prevention Plan (SWPPP) and Controls

After pumping the water down, and prior to beginning construction activities in the northwest corner, soil erosion and sediment controls would be implemented. When removing waste material for the dry excavation phase, the excavation would need to be maintained to be free of water as much as practicable. Measures that may be taken to keep water out of the open excavation include grading the excavation to drain stormwater away from the excavation and/or berm construction to prevent water from entering the excavation. As was discussed in Section 5.12.3, the effectiveness of these water management procedures depends in large part on the northwest corner being addressed prior to the other portions of the Northern Impoundment. To the extent practicable, measures would be put in place to segregate non-contact water (water that falls on the TCRA armored cap, soil buttress area just inside the BMP wall, and/or areas that have been confirmed clean) from contact water (water that has come into direct contact with waste material) to control the spread of impacted sediments. The RC would be required to develop a SWPPP for the Northern Impoundment prior to the RA.

#### 5.12.4.4 Drawings and Specifications

#### 5.12.4.4.1 Design Drawings

All 90% RD design drawings are listed below. The drawings from the full June 90% RD submittal that included the northwest corner have been updated and are included in Appendix G-1, along with new drawings specific to the dry excavation and capping design for the northwest corner The drawings from the June 90% RD that have been updated to include the northwest corner and the new drawings specific to the dry excavation and capping design are indicated in black font below. The drawings indicated in grey font did not include the northwest corner and have not been included in Appendix G-1.

- Drawing G-01 Cover Sheet.
- Drawing C-01 Overall Plan.
- Drawing C-02 Existing Conditions.
- Drawing C-03 SSA Area and Northern Impoundment Works.
- Drawing C-04 Soil Erosion and Sediment Control Plan Overall.
- Drawing C-05 Soil Erosion and Sediment Control Plan Seasonal.
- Drawing C-06 Soil Erosion and Sediment Control Details.
- Drawing C-07 Project Traffic Control Plan.
- Drawing C-08 Excavation Plan Overall.
- Drawing C-09 Excavation Plan Northwest.
- Drawing C-10 Excavation Plan Northeast.
- Drawing C-11 Excavation Plan Southeast.
- Drawing C-12 Excavation Plan Southwest.
- Drawing C-13 Excavation Section 1 of 6.
- Drawing C-14 Excavation Section 2 of 6.
- Drawing C-15 Excavation Section 3 of 6.
- Drawing C-16 Excavation Section 4 of 6.
- Drawing C-17 Excavation Section 5 of 6.
- Drawing C-18 Excavation Section 6 of 6.

- Drawing C-19 Typical Seasonal Excavation Sequencing.
- Drawing C-20 Typical Excavation Sequencing 1 of 2.
- Drawing C-21 Typical Excavation Sequencing 2 of 2.
- Drawing C-22 Restoration Plan.
- Drawing C-23 Typical Construction Sequencing 1 of 2.
- Drawing C-24 Typical Construction Sequencing 2 of 2.
- Drawing C-25 Typical Details 1 of 3.
- Drawing C-26 Typical Details 2 of 3.
- Drawing C-27 Typical Details 3 of 3.
- Drawing C-28 Pile Wall Layout Plan.
- Drawing C-29 Double Pile Wall Plan and Profile 1 of 4.
- Drawing C-30 Double Pile Wall Plan and Profile 2 of 4.
- Drawing C-31 Double Pile Wall Plan and Profile 3 of 4.
- Drawing C-32 Double Pile Wall Plan and Profile 4 of 4.
- Drawing C-33 South Wall Plan and Profile 1 of 2.
- Drawing C-34 South Wall Plan and Profile 2 of 2.
- Drawing C-35 Double Pile Wall Sections 1 of 7.
- Drawing C-36 Double Pile Wall Sections 2 of 7.
- Drawing C-37 Double Pile Wall Sections 3 of 7.
- Drawing C-38 Double Pile Wall Sections 4 of 7.
- Drawing C-39 Double Pile Wall Sections 5 of 7.
- Drawing C-40 Double Pile Wall Sections 6 of 7.
- Drawing C-41 Double Pile Wall Sections 7 of 7.
- Drawing C-42 South Wall Sections 1 of 3.
- Drawing C-43 South Wall Sections 2 of 3.
- Drawing C-44 South Wall Sections 3 of 3.
- Drawing C-45 Capping Alternative Northwest Corner Works Plan.
- Drawing C-46 Capping Alternative Northwest Corner Capping Controls.
- Drawing C-47 Capping Alternative Northwest Corner Dry Excavation.
- Drawing C-48 Capping Alternative Northwest Corner Fill Grade.
- Drawing C-49 Capping Alternative Northwest Corner Sections 1 of 2.
- Drawing C-50 Capping Alternative Northwest Corner Sections 2 of 2.
- Drawing C-51 Capping Alternative Northwest Corner Sequencing 1 of 2.
- Drawing C-52 Capping Alternative Northwest Corner Sequencing 2 of 2.
- Drawing C-53 Capping Alternative Northwest Corner Final Grade.
- Drwaing C-54 Capping Alternative Northwest Corner Capping Details.
- Drawing S-01 Structural Notes.
- Drawing S-02 Structural Layout Plan.
- Drawing S-03 Structural Sections.
- Drawing S-04 Structural Details 1 of 2.
- Drawing S-05 Structural Details 2 of 2.
- Drawing P-00A Water Treatment System Process Flow Diagram Symbols.

- Drawing P-00B Water Treatment System Process Flow Diagram Schedules.
- Drawing P-01 Water Treatment System Process Flow Diagram/Mass Balance.
- Drawing P-02 Water Treatment System P&ID (1 of 4).
- Drawing P-03 Water Treatment System P&ID (2 of 4).
- Drawing P-04 Water Treatment System P&ID (3 of 4).
- Drawing P-05 Water Treatment System P&ID (4 of 4).
- Drawing P-06 Site Plan Water Treatment System Season 3-6.

As the means and methods for performing the Northern Impoundment remedy are further defined, these drawings, insofar as they reflect use of specific means and methods for carrying out the Northern Impoundment remedy, may be modified.

#### 5.12.4.4.2 Technical Specifications

Technical specifications to address capping in the northwest corner have been added to the 90% RD design in Appendix H-1. The following specification has been added for the northwest corner:

- Section 31 35 26.50 - Articulating Block Fabric Formed Concrete.

#### 5.12.4.5 Supporting Deliverables

#### 5.12.4.5.1 Construction Quality Assurance/Quality Control Plan

The CQA/QCP (Appendix J-1, Attachment 6-A) is an updated version of the CQA/QCP. It describes the planned and systematic activities, including those related to the northwest corner for a dry excavation and capping, to be used during the Northern Impoundment RA to verify compliance with requirements consistent with clean-up goals and performance requirements.

#### 5.12.5 Mechanical Dredging

As discussed in Section 5.12.3, the water elevation within the northwest corner must be maintained at or above -13 ft NAVD88 to control the potential for hydraulic heave. Under this approach, the water level in the northwest corner would be dropped to -13 ft NAVD88, the impacted material above -13 ft NAVD88 would be excavated in the dry, and the remainder of the material to the target removal elevations would be removed via mechanical dredging. The following sections describe the procedures for implementing mechanical dredging in the northwest corner.

#### 5.12.5.1 Site Preparation Activities

Prior to disturbing ground in the northwest corner, erosion control structures would be installed in conformance with the SWPPP. A double turbidity curtain wouls be installed around the boundary of the area to be dredged to prevent any release of sediments to the open water area inside the BMP wall during the TCRA armored cap removal and dry excavation phases of the project. The site preparation activities would include constructing roads and truck loading area(s) for the dry excavation. A mixing pad would be constructed adjacent to the northwest corner at the loading area to solidify the excavated material, as necessary, prior to its transport off-site. For the dredging operation, a staging area would be constructed adjacent to the dredging location to support a crane that would assist with assembling the dredging equipment and placing the dredging equipment into the water. The size of the pad would be determined by the RC and is expected to be constructed of crushed concrete or similar over the top of geotextile fabric spread and rolled to provide a base to support the crane. The RC would provide a plan that describes the details of the excavation and dredging operations and associated roads and support facilities. The work in the northwest corner would have to take place prior to work in other areas so that access for vehicles and a mixing pad is available.

#### 5.12.5.2 Excavation and Dredging Procedures

#### 5.12.5.2.1 Cell Dewatering

Following the installation of the BMP, river water would be trapped within the Northern Impoundment. Based on historical river stage data, it is assumed that the water elevation would be at approximately +/- 0 ft NAVD88 on both sides of the BMP wall prior to any waste removal. Water located inside the BMP wall would be pumped back into the river to achieve an elevation of -13 ft NAVD88 in the northwest corner. This would expose approximately 0.67 acres of the northwest corner that can be excavated using land-based equipment in relatively dry conditions. Once the water is pumped to -13 ft NAVD88, the existing bathymetry in the northwest corner would effectively form a natural bowl that will contain the water in this low spot and prevent it from flooding out into the surrounding areas of the Northern Impoundment. This is only possible if the northwest corner is addressed prior to the remainder of the Northern Impoundment. Maintaining the water level at -13 ft NAVD88 provides water to offset the heave potential in the remaining 0.33 acres where the mudline is deeper. Figure 5-O, below shows the water extent within the northwest corner at a water elevation of -13 ft NAVD88 before and after the dry excavation work.



Figure 5-0 Mechanical Dredging Area Flooded to -13 ft NAVD88 (Before and After Dry Excavation)

#### 5.12.5.2.2 TCRA Armored Cap Removal Above -13 ft NAVD88

After pumping the water down to -13 ft NAVD88, and prior to excavation activities, the TCRA armored cap atop the exposed 0.67 acres would be removed using standard land-based excavation equipment to access the underlying waste material for excavation. The rock suitable for potential reuse would be staged on the Northern Impoundment or at a nearby location. Any geotextile and/or geomembrane barrier of the TCRA armored cap would be removed and disposed of off-site with the excavated material.

#### 5.12.5.2.3 Dry Excavation

After removal of the TCRA armored cap, excavation of approximately 9,800 CY of waste material to an elevation of -13 ft NAVD88 would take place in the dry using excavation equipment. During the excavation activities, the excavator would be positioned so it can reach into the excavation and swing around to load trucks or place material directly into a mixing pad. Any waste material that does not contain free liquids and/or does not require solidification would be loaded directly in haul trucks for off-site disposal. Excavated material that is too wet (i.e., would not pass the paint filter test) to be directly loaded into haul trucks would be temporarily staged and allowed to drain by gravity and dry naturally and/or be solidified on the mixing pad prior to loading for off-site disposal. An earthen ramp would be

constructed over the lip of the BMP wall (in a location adjoining the TxDOT right-of-way) to allow truck traffic into and out of the work area (see Drawings C-05 and C-045 in Appendix G-2).

Within the northwest corner, SWPPP controls would be installed to control run-on and run-off from the excavation surface, as described in Section 5.9.2. Any water that contacts the excavation surface would be pumped out, as needed to maintain excavation operations, to a WTS where it will be treated and discharged, as described in Section 5.8.

#### 5.12.5.2.4 Dredging Procedures

After completion of the dry excavation, the northwest corner would be prepared for mechanical dredging by raising the water to a minimum elevation of -9 ft NAVD88 by pumping water back into the northwest corner from the river. The higher water elevation is necessary to offset the heave potential when removing material to the deeper target depths in this area and to provide sufficient draft to float the dredge. In order to contain the water within the northwest corner once the water level is raised, an earthen berm would be installed in a low area on the eastern boundary of the northwest corner (as shown below in orange). Double impermeable turbidity curtains would be installed around the area to be dredged. The curtains would extend from above the water surface to the mudline. The inner curtain would be anchored approximately 10 ft outside the outer limits of the dredge area. The outer curtain would be positioned just outside the inner curtain. Both curtains would extend to the mudline and be anchored in place.

Figure 5-P, below, shows the limits of the flooded area at elevation -9 ft NAVD88, as contained by the natural bathymetry of the land around the northwest corner. It also shows the approximate locations of the turbidity curtains, and the location of the earthen berm to be installed on the eastern side to contain water.



Figure 5-P Mechanical Dredging Area Flooded to -9 ft NAVD88

#### 5.12.5.2.4.1 Dredging and Processing Equipment

Mobilization for the dredging operation would occur after construction of the staging area and concurrent with the dry excavation activities. Any equipment requiring assembly would likely require the assistance of a crane. It is expected that the dredge platform would be constructed of FlexiFloat sectional barges or similar and spuds would be installed on the platform for positioning purposes. After assembly of the FexiFloat dredge platform, the mechanical dredging excavator would be tracked onto the barge or placed onto the barge with the crane. Material barges would be placed into the water and assembled for the purpose of managing the dredge spoils and transporting the spoils to a location at the edge of the dredge area and within the northwest corner as shown on Drawing C-45 in Appendix G-2 for processing.

An aboveground solidification containment area would be constructed adjacent to the edge of the dredge area and would be sized, subject to space limitations, to manage at least 2 days of dredged materials based on the RC's planned production rate. The containment area would be lined and would contain a sump to remove free liquid. The decanted water would be pumped to the WTS where it would be treated and discharged, as described in Section 5.8 or used as make-up water for the dredging operation. The treated water may be pumped back to the northwest corner to serve as make-up water to maintain the required water elevation of -9 ft NAVD88 as waste material is being removed. The solidification containment area would be designed to manage both the solidification and loading operations. It would be situated within a larger bermed area that would also be lined to contain any spillage from the material management and loading operations.

The barge-mounted excavator would first remove the remaining TCRA armored cap material over the submerged portion of the northwest corner. The TCRA armored cap material would be loaded onto barges and transported to the edge of the dredge area for offloading and transportation off-site.

For the dredging operation, the excavator would be outfitted with an environmental bucket designed to minimize turbidity and resuspension of sediment. Managing resuspension and residuals is discussed further in Section 5.12.5.7.1. The dredged sediment would be removed and placed into sealed hopper barges, which would be moored to the dredge platform while they are being loaded. Once full, the hopper barges would be transported to the edge of the dredge area for offloading at the stabilization containment area.

#### 5.12.5.2.4.2 Dredging and Verification Procedures

A pre-dredge bathymetric survey would be performed to develop the pre-dredge surface. The information from the survey, in combination with the CAD surface of the target remediation limits, would provide the basis for the dredge prisms and target volumes for the dredging production passes. Additional bathymetric surveys would be performed during the dredging to provide project operational data for routine evaluation of dredging operations and to allow for analysis of daily production, measurement of removal accuracy, and process adjustments.

For positioning and accuracy purposes, the dredge excavator would be equipped with real-time kinematic global positioning system (RTK-GPS) that would confirm that the removal activities met the horizontal and vertical requirements of the project. The RTK-GPS signals would be combined with various sensors located on the excavator to incorporate the numerous variables of an excavator's operation, including real-time adjustments for water fluctuations. The excavator includes sensors that would measure the angle of the stick and the boom, and the rotation of the bucket, as well as the pitch and roll of the machine itself. The desired design depths within the dredge prism would be displayed in real-time on a screen located on the dredge to assist the operator in determining target depths while operating the equipment. The information generated from the GPS system and the sensors would be processed in real-time using Hypack, Inc. Dredgepack® software or similar.

The dredging operation would require the addition of makeup water to maintain the -9 ft NAVD88 water elevation. The make-up water would either be pumped into the northwest corner directly from the river and/or pumped to the area from the clean WTS effluent.

#### 5.12.5.3 Solidification and Loading

After loading material into hopper barges and pushing the barges to the staging area with work boats, the material would be allowed to gravity drain. Water that accumulates in the hopper barges would be pumped to a settling tank where the sediments would settle out. The water would then be removed and pumped to the WTS, as described in Section 5.8, or used as makeup water for the dredging operation. The accumulated sediments would be periodically removed from the settling tanks and incorporated in with the dredge spoils for solidification.

After the water is pumped from the hopper barges, a material handler or similar equipment, would be used to offload the dredge spoils from the hopper to the solidification containment area. The material would be mixed with a solidification agent in the stabilization containment area and allowed to cure, as needed, to meet the paint filter test. Section 3.3.5 provides the result of solidification treatability testing performed on the waste material; however, the RC would be required to perform its own treatability testing to define the reagents and mix ratios prior to the RA. After curing, the solidified material would be removed from the solidification containment area, loaded into haul trucks, and transported to the off-site landfill.

#### 5.12.5.4 Post-Dredging Confirmation Sampling

As detailed in the updated Field Sampling Plan (FSP; Appendix J-2, Attachment 3-A), prior to conducting a final pass intended to remove remaining settled residuals, composite sampling across decision units (DUs) in the northwest corner would be used to demonstrate compliance with the cleanup standard. The sampling would also serve to inform the target depth of the final dredge pass, up to a maximum depth limit of two feet beyond the target excavation elevations. Consistent with the format provided herein, only newly added-information pertinent to the northwest corner has been included in the attached FSP.

Prior to confirmation sample collection, chemical additives would be mixed with the water in the northwest corner to promote settling of resuspended sediments from the water column to maximize residuals removal.

Following excavation of the northwest corner to the target elevations, the area would be divided into two approximately <sup>1</sup>/<sub>2</sub>-acre DUs using a methodology similar to that used for the rest of the impoundment, as described in the FSP (Appendix J, Attachment 3). Six to eight (6 to 8) discrete 2-ft core samples would be collected from sample locations evenly spaced across the DU excavation bottom. Each 2-ft core discrete sample would be divided into two depth intervals (6 to 12 inches and 12 to 24 inches) after excluding the top approximately 6-inch layer of settled residuals (to be removed as part of the final pass as described in the sections below). A composite sample of the discrete samples from each depth interval would be prepared for laboratory analysis. The approved analytical laboratory (Approved Laboratory) would analyze the 6 to 12-inch composite first and would hold the 12 to 24-inch sample pending the results of the shallower sample.

Results will be evaluated, as described below:

- If the result of the 6 to 12-inch composite sample is below the clean-up level, a 6-inch overcut would be performed in that DU to serve as a final pass and remove any settled residuals.
- If the result of the 6 to 12-inch composite sample is above the clean-up level, the 12 to 24-inch composite sample that the Approved Laboratory is holding would be analyzed.
- If the result of the 12 to 24-inch composite sample is below the clean-up level, a 12-inch overcut would be
  performed in that DU to remove the remaining inventory and any settled residuals.
- If the result of the 12 to 24-inch composite sample is above the clean-up level, a 24-inch overcut would be
  performed in that DU to remove the remaining inventory and any settled residuals.

As the result of three pre-design investigations, there is an extensive dataset to give confidence in the horizontal and vertical delineation of the impacted area in the Northern Impoundment. Even still, as is the case in the remainder of the impoundment, the BMP wall around the northwest corner has been designed to allow for the removal of up to an additional 2 feet of material. Additionally, in the northwest corner as waste material is removed, make-up water must be added to offset the weight of the removed material. A water elevation of -9 ft NAVD88 is sufficient to compensate for removal of waste material to the target excavation elevations identified based on the existing dataset (that include

a maximum removal of -28.45 ft NAVD88) plus an additional 2-ft overcut, if necessary. If an additional dredging pass is required to remove material, the water level would have to be raised proportionately to offset the deeper removal. However, no more than 2 feet of additional removal are possible without compromising the structural integrity of the BMP wall. Further, due to a very tight schedule for the seasonal dredging in the northwest corner, only one round of sampling, analysis, and over-excavation would likely be possible. Given the deep, challenging conditions in the northwest corner, the time (as much as one-third of a season) required to close an excavation in this location, and the use of specialized dredging equipment which is only planned for use in this limited area of the Northern Impoundment, backfilling the northwest corner area and returning the next excavation season would not be practical. Any remaining residuals following the clean pass would be addressed by the residuals management layer, described in Section 5.12.5.6, which would be as thick as 15 ft in some places.

#### 5.12.5.5 Final Dredging Pass

Based upon the results of the confirmation sampling described above and in the FSP, a final dredging pass would be conducted to remove the generated residuals (to the extent practicable) and any undredged inventory identified by confirmation sampling. A bathymetric survey would be performed to develop an updated bathymetric profile after settling of residuals. The information from the survey in combination with the updated remediation surface from the confirmation sampling would be used to create the dredge prisms for the final dredging pass.

The final dredging pass would use the same procedures for positioning the dredge and verification of removal as described in Section 5.12.5.2.4.1. Modifications may be made to the mechanical dredging bucket type and the dredging procedures for the final pass to optimize removal efficiency based on the thickness and condition of the material to be dredged.

#### 5.12.5.6 Residual Management Layer

After the final dredging pass, chemical additives may be used again to promote a final round of settling of the resuspended sediments. The procedures for the final round of settling of resuspended sediments would be developed by the RC based on the condition of the water and the effectiveness of the additives during the first application described above in Section 5.12.5.4. Granular material would then be placed over the dredged area to achieve the following:

- Provide weight to offset the heave potential as the weight from the water is removed.
- Facilitate complete removal of contact water at the surface.
- Provide a residual management layer.

Similar to the capping alternative described in Section 5.12.4, granular material would also be placed in a low area located to the northeast of the dredging area where there is a risk of hydraulic heave, as shown in green shading on Figure 5-P, below. The heave calculations indicate that, for this area, the heave potential during reasonable maximum conditions (+5 ft NAVD88 river level and a SF of 1.25) is within the level defined as acceptable for purposes of the RD, but there may be a potential for heave during extreme river level conditions near +9 ft NAVD88. Considering that this area may be dewatered for up to 7 years during construction across the Northern Impoundment, approximately 1 foot of granular material would be added to this area during the granular material placement phase to offset this heave potential.

A bathymetric survey would be conducted to define the final dredge surface and periodic surveys would be conducted during material placement to measure progress. The material would first be placed over the low area located to the northeast of the dredged area in the northwest corner to an elevation of -13 ft NAVD88 with standard excavation equipment working from barges.

The residual management layer within the dredging limits would initially be placed using subaqueous capping techniques that distribute the granular material in thin lifts to effectively cover any residuals with minimal disturbance. After a minimum of 2 feet of granular material has been placed over the entire dredged surface, a bathymetric survey would be performed to confirm the granular material thickness. The material above the initial 2-ft layer may be placed

more quickly using methods such as placing the material in from the edge of the excavated area or placing with excavators.

During residual management layer placement, the water would be maintained between elevation -9 ft NAVD88 to -13 ft NAVD88 to continue to offset the heave potential while not allowing the water to flood beyond the -9 ft NAVD88 extent (see Figure 5-O). The water that is displaced by the granular material would be captured and pumped to the WTS for treatment, as described in Section 5.8. The granular cover material would be placed over the dredged area to a final grade of -13 ft NAVD88, constituting a residuals management layer that is up to 15 ft thick in some places.



Figure 5-Q, below, shows the limits of the granular material after placement.

Figure 5-Q Post-Dredging Fill Placement to -13 ft NAVD88

#### 5.12.5.7 Monitoring and Controls

#### 5.12.5.7.1 Resuspension and Residuals Management

Several methods would be employed to control and manage resuspension of sediment and residuals during dredging activities, as listed below.

**Construction of Earthen Berms** - As previously stated, for the most part, the existing bathymetry in the northwest corner effectively forms a natural bowl that would contain the water and prevent it from flooding out into the surrounding areas of the Northern Impoundment. There is one area to the southeast that would require construction of an earthen berm to fill a low area and keep the water contained to the northwest corner. Construction of berms and

other best stormwater management practices would be implemented across the northwest corner where necessary to limit the spread of contact water and potential residuals.

**Turbidity Curtains** - Prior to dredging operations, double turbidity curtains would be installed around the area to be dredged. The turbidity curtains would be made of impermeable fabric to control migration of suspended solids from the dredging area during dredging and material placement. The curtains would extend from the water surface through the full extent of the water column to the mudline and would be weighted and/or anchored to the river bottom. The absence of flow within the BMP wall means that the turbidity curtain should be effective at controlling migration of suspended solids.

**Dredging Procedures** - The RC would be required to perform the mechanical dredging using an environmental dredging bucket that is specifically designed to reduce the release of sediments during closure and retrieval to minimize resuspension. Additional measures required during dredging to minimize resuspension and the generation of residuals include:

- Setting and sequencing production cuts to reduce concentrations in residuals.
- Placing bucket accurately so as not to allow missed sediments between bucket placement.
- Controlling bucket overpenetration and overfilling.

**Use of Polymers, Coagulants and/or Other Additives -** As a method to reduce the resuspended sediments in the water column for the northwest corner, polymers, coagulants and/or other additives to promote settling would be applied and mixed after the completion of production passes. Depending on the condition of the water and the effectiveness of the first application, a second application may also be performed after the final pass, prior to placement of the residuals management layer. A settling test treatability study was performed as part of the 2020 Approach B Water Filtration Testing (see Section 3.6.2). Polymer and coagulant were added to a tank with suspended solids from the Northern Impoundment simulating conditions in a dredging scenario. Using 250 parts per million (ppm) polyaluminum chloride and 25 ppm Nalco polymer 7194, the turbidity in the tank dropped quickly from 4,060 Nephelometric Turbidity Units (NTUs) to below 40 NTU after 30 minutes of settling. Final turbidity values after 3 hours of settling were between 4 and 5 NTUs. These results were compared to a controls test performed without the addition of polymers or coagulants, where the turbidity was above 75 NTUs after 60 hours (with an initial turbidity of 9,190 NTUs). Although results of the laboratory settling tests using polymers and coagulants were favorable (see Section 3.6.2), application of these additives in an area much larger than a laboratory setting could prove difficult to provide consistent application and proper mixing. The RC would evaluate the GHD treatability data and perform its own testing, as necessary to develop a plan for application and mixing of polymers, coagulants and/or other additives.

*Final Pass* - A targeted final pass would be conducted after completion of production passes to reduce or remove the thickness of the contaminated residuals layer and to address any remaining inventory, as informed by the confirmation sampling.

**Residual Management Layer -** To overcome the potential for hydraulic heave in the northwest corner while pumping out the contact water, imported granular material would be placed atop the dredged area to an elevation of -13 ft NAVD88. This fill material would also serve as a residuals management layer to cover the remaining residuals. The initial layers would be placed using subaqueous capping techniques that distribute the material in thin lifts to effectively cover any residuals while minimizing sediment resuspension. The residual management layer would be constructed to -13 ft NAVD88, which would provide as much as 15 ft of cover over the dredged area.

#### 5.12.5.7.2 Stormwater Pollution Prevention Plan and Controls (SWPPP) and Controls

After pumping the water down, and prior to beginning construction activities in the northwest corner, soil erosion and sediment controls would be implemented. When removing waste material during the dry excavation phase, the area would need to be maintained to be free of water, as much as practicable. Measures that may be taken to keep water out of the open excavation include grading the excavation to drain stormwater away from the excavation and/or berm construction to prevent water from entering the excavation. As was discussed in Section 5.12.3, the effectiveness of these water management procedures depends in large part on the northwest corner being addressed prior to the other portions of the Northern Impoundment. To the extent practicable, measures would be put in place to segregate

non-contact water (water that falls on the TCRA armored cap, BMP wall soil buttress area, and/or areas that have been confirmed clean) from contact water (water that has come into direct contact with waste material) to control the spread of impacted sediments. The RC would be required to develop a SWPPP for the Northern Impoundment prior to the start of the RA.

#### 5.12.5.8 Drawings and Specifications

#### 5.12.5.8.1 Design Drawings

All 90% RD design drawings are listed below. The drawings from the full June 90% RD submittal that included the northwest corner have been updated and are included in Appendix G-2, along with new drawings specific to the mechanical dredging design for the northwest corner. The drawings from the June 90% RD that have been updated to include the northwest corner and the new drawings specific to the mechanical dredging design are indicated in black font below. The drawings indicated in grey font did not include the northwest corner and have not been included in Appendix G-2.

- Drawing G-01 Cover Sheet.
- Drawing C-01 Overall Plan.
- Drawing C-02 Existing Conditions.
- Drawing C-03 SSA Area and Northern Impoundment Works.
- Drawing C-04 Soil Erosion and Sediment Control Plan Overall.
- Drawing C-05 Soil Erosion and Sediment Control Plan Seasonal.
- Drawing C-06 Soil Erosion and Sediment Control Details.
- Drawing C-07 Project Traffic Control Plan.
- Drawing C-08 Excavation Plan Overall.
- Drawing C-09 Excavation Plan Northwest.
- Drawing C-10 Excavation Plan Northeast.
- Drawing C-11 Excavation Plan Southeast.
- Drawing C-12 Excavation Plan Southwest.
- Drawing C-13 Excavation Section 1 of 6.
- Drawing C-14 Excavation Section 2 of 6.
- Drawing C-15 Excavation Section 3 of 6.
- Drawing C-16 Excavation Section 4 of 6.
- Drawing C-17 Excavation Section 5 of 6.
- Drawing C-18 Excavation Section 6 of 6.
- Drawing C-19 Typical Seasonal Excavation Sequencing.
- Drawing C-20 Typical Excavation Sequencing 1 of 2.
- Drawing C-21 Typical Excavation Sequencing 2 of 2.
- Drawing C-22 Restoration Plan.
- Drawing C-23 Typical Construction Sequencing 1 of 2.
- Drawing C-24 Typical Construction Sequencing 2 of 2.
- Drawing C-25 Typical Details 1 of 3.
- Drawing C-26 Typical Details 2 of 3.
- Drawing C-27 Typical Details 3 of 3.
- Drawing C-28 Pile Wall Layout Plan.
- Drawing C-29 Double Pile Wall Plan and Profile 1 of 4.

- Drawing C-30 Double Pile Wall Plan and Profile 2 of 4.
- Drawing C-31 Double Pile Wall Plan and Profile 3 of 4.
- Drawing C-32 Double Pile Wall Plan and Profile 4 of 4.
- Drawing C-33 South Wall Plan and Profile 1 of 2.
- Drawing C-34 South Wall Plan and Profile 2 of 2.
- Drawing C-35 Double Pile Wall Sections 1 of 7.
- Drawing C-36 Double Pile Wall Sections 2 of 7.
- Drawing C-37 Double Pile Wall Sections 3 of 7.
- Drawing C-38 Double Pile Wall Sections 4 of 7.
- Drawing C-39 Double Pile Wall Sections 5 of 7.
- Drawing C-40 Double Pile Wall Sections 6 of 7.
- Drawing C-41 Double Pile Wall Sections 7 of 7.
- Drawing C-42 South Wall Sections 1 of 3.
- Drawing C-43 South Wall Sections 2 of 3.
- Drawing C-44 South Wall Sections 3 of 3.
- Drawing C-45 Dredging Alternative Northwest Corner Works Plan.
- Drawing C-46 Dredging Alternative Northwest Corner Dredging Controls.
- Drawing C-47 Dredging Alternative Northwest Corner Dry Excavation.
- Drawing C-48 Dredging Alternative Northwest Corner Wet Excavation.
- Drawing C-49 Dredging Alternative Northwest Corner Sections 1 of 2.
- Drawing C-50 Dredging Alternative Northwest Corner Sections 2 of 2.
- Drawing C-51 Dredging Alternative Northwest Corner Sequencing 1 of 3.
- Drawing C-52 Dredging Alternative Northwest Corner Sequencing 2 of 3.
- Drawing C-53 Dredging Alternative Northwest Corner Sequencing 3 of 3.
- Drawing C-54 Dredging Alternative Northwest Corner Final Grade.
- Drawing C-55 Dredging Alternative Northwest Corner Dredging Details.
- Drawing S-01 Structural Notes.
- Drawing S-02 Structural Layout Plan.
- Drawing S-03 Structural Sections.
- Drawing S-04 Structural Details 1 of 2.
- Drawing S-05 Structural Details 2 of 2.
- Drawing P-00A Water Treatment System Process Flow Diagram Symbols.
- Drawing P-00B Water Treatment System Process Flow Diagram Schedules.
- Drawing P-01 Water Treatment System Process Flow Diagram/Mass Balance.
- Drawing P-02 Water Treatment System P&ID (1 of 4).
- Drawing P-03 Water Treatment System P&ID (2 of 4).
- Drawing P-04 Water Treatment System P&ID (3 of 4).
- Drawing P-05 Water Treatment System P&ID (4 of 4).
- Drawing P-06 Site Plan Water Treatment System Season 3-6.

#### 5.12.5.8.2 Technical Specifications

A technical specification to address mechanical dredging in the northwest corner has been added to the 90% RD design in Appendix H-2. The following specification was added for the northwest corner:

– Section 35 24 00 - Dredging.

#### 5.12.5.9 Supporting Deliverables

#### 5.12.5.9.1 Field Sampling Plan

The FSP (Appendix J-2, Attachment 3-A) is an updated version of the FSP. It has been updated to describe the sampling activities for all media to be sampled during work to implement the Northern Impoundment RA, including northwest corner activities associated with dredging. The FSP provides the rationale for sample collection and describes the protocol for sample handling and analysis.

#### 5.12.5.9.2 Construction Quality Assurance/Quality Control Plan

The CQA/QCP (Appendix J-2, Attachment 6-B) is an updated version of the CQA/QCP that describes the planned and systematic activities to be used during the Northern Impoundment RA, including the northwest corner activities involving mechanical dredging, to verify that requirements consistent with clean-up goals and performance requirements are met.

## 6. Sand Separation Area (SSA)

- 6.1 2019 Sediment Sampling Program
- 6.1.1 SSA Analytical Sampling
- 6.1.2 SSA Isotope Sampling
- 6.1.3 SSA Investigation Results
- 6.1.3.1 SSA Analytical Results
- 6.1.3.2 SSA Isotope Results
- 6.1.4 SSA Conclusions
- 6.2 Monitored Natural Recovery
- 7. Environmental Footprint (Greener Clean-Ups)
- 8. Drawings and Specifications
- 8.1 Design Drawings
- 8.2 **Technical Specifications**
- 9. Supporting Deliverables
- 9.1 Health and Safety Plan
- 9.2 Emergency Response Plan
- 9.3 Field Sampling Plan
- 9.4 Quality Assurance Project Plan

- 9.5 Site-Wide Monitoring Plan
- 9.6 **Construction Quality Assurance/Quality Control Plan**
- 9.7 Institutional Controls Implementation and Assurance Plan
- 9.8 Transportation and Off-Site Disposal Plan
- 9.9 Monitored Natural Recovery Plan (Operations & Maintenance Plan)
- 9.10 Operations & Maintenance Manual

### 10. References

- EPA, 1986. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Updates I to V. SW-846. NTIS Publication No. PB97-156111 or GPO publication No. 955-001-00000 1. Office of Solid Waste. September 1986 (with all subsequent revisions).
- EPA, 1998. Management of Remediation Waste Under RCRA. EPA530-F-98-026. Office of Solid Waste. October 1998.
- EPA, 2002. RCRA Waste Sampling Draft Technical Guidance Planning, Implementation, and Assessment.
   EPA530-D-02-002. Office of Solid Waste. August 2002.
- EPA, 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. EPA-540-R-05-012, OSWER 9355.0-85. United States Environmental Protection Agency.
- EPA, 2009. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. *Principles for Greener Clean-Ups*. August 27, 2009.
- EPA, 2010. Administrative Settlement Agreement and Order on Consent for Removal Action. U.S. Environmental Protection Agency Region 6 CERCLA Docket No. 06-12-10. In the matter of San Jacinto River Waste Pits Superfund Site Pasadena, Harris County, Texas. International Paper Company and McGinnes Industrial Management Corporation, Respondents.
- EPA, 2013a. Record of Decision, Grasse River Superfund Site, Massena, St. Lawrence County, New York. U.S.
   Environmental Protection Agency Region 2, New York, New York, April 2013. Site ID Number: NYD980506232.
- EPA, 2013b. Record of Decision, Gowanus Canal Superfund Site (Operable Unit: 01), Brooklyn, Kings County, New York, U.S. Environmental Protection Agency, Region 2, New York, New York, September 2013. Site ID Number: NYN000206222.
- EPA, 2016. Record of Decision for the Lower 8.3 Miles of the Lower Passaic River, Part of the Diamond Alkali Superfund Site, Essex and Hudson Counties, New Jersey. United States Environmental Protection Agency, Region II, New York, New York, March 3, 2016.
- EPA, 2017a. Record of Decision, Portland Harbor Superfund Site, Portland, Oregon. U.S. Environmental Protection Agency Region 10, Seattle, Washington, January 2017. Site ID Number: ORSFN1002155.

- EPA, 2017b. Record of Decision, San Jacinto River Waste Pits. Harris County, Texas. EPA ID: TXN000606611.
   U.S. Environmental Protection Agency, Region 6. Dallas, Texas. October 2017.
- EPA, 2018a. Administrative Settlement Agreement and Order on Consent for Remedial Design. U.S. EPA Region 6, CERCLA Docket. No. 06-02-18. In the matter of: San Jacinto Waste Pits Superfund Site, Harris County, Texas. International Paper Company and McGinnes Industrial Maintenance Corporation, Respondents. April 2018.
- EPA, 2018b. Letter to C. Patmont, Anchor QEA, regarding approval of First Phase Pre-Design Investigation Work Plan, dated September 12, 2018. U.S. Environmental Protection Agency.
- EPA, 2018c. Letter to C. Munce, GHD Services Inc., regarding approval of Submission Date for Draft Second Phase Pre-Design Investigation Work Plan and Draft Treatability Study Work Plan, dated December 18, 2018. U.S. Environmental Protection Agency.
- EPA, 2019a. Letter to C. Munce, GHD Services Inc., regarding comments on the Draft Second Phase Pre-Design Investigation Work Plan, dated April 18, 2019. U.S. Environmental Protection Agency.
- EPA, 2019b. Letter to C. Munce, GHD Services Inc., regarding comments on the Draft Treatability Study Work Plan, dated April 18, 2019. U.S. Environmental Protection Agency.
- EPA, 2019c. Letter to C. Munce, GHD Services Inc., regarding approval of Final Second Phase Pre-Design Investigation Work Plan, dated August 8, 2019. U.S. Environmental Protection Agency.
- EPA, 2019d. Letter to C. Munce, GHD Services Inc., regarding approval of Final Treatability Study Work Plan, dated August 27, 2019. U.S. Environmental Protection Agency.
- EPA, 2019e. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Second Phase Pre-Design Investigation Work Plan Refinement Notice, dated October 11, 2019. Approval received from G. Baumgarten on October 22, 2019. GHD Services Inc.
- EPA, 2019f. Letter to C. Munce, GHD Services Inc., regarding approval of Force Majeure Event, dated October 30, 2019. U.S. Environmental Protection Agency.
- EPA, 2019g. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Second Phase Pre-Design Investigation Work Plan Additional Refinement Notice, dated November 1, 2019. Approval received from G. Baumgarten on November 8, 2019. GHD Services Inc.
- EPA, 2019h. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Second Phase
   Pre-Design Investigation Work Plan Fourth Refinement Notice, dated December 4, 2019. Approval received from
   G. Baumgarten on December 9, 2019. GHD Services Inc.
- EPA, 2020a. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding *Treatability Study Work Plan Refinement Notice*, dated January 10, 2020. Approval received from G. Baumgarten on January 17, 2020.
   GHD Services Inc.
- EPA, 2020b. Baumgarten, Gary, U.S. Environmental Protection Agency. "Regarding San Jacinto River Waste Pits - Surface Water Quality Standard." Received by Judy Armour, Nicholas Casten, Katie Delbecq, Satya Dwivedula, Anne Foster, Karl Gustavson, Monica Harris, Ashley Howard, John Meyer, Charles Munce, Brent Sasser, Paul Schroeder, Phillip Slowiak, Janie Smith. February 18, 2020. E-Mail.
- EPA, 2020c. Letter to C. Munce, GHD Services Inc. regarding comments on the Additional Treatability Testing Notice, dated May 5, 2020. U.S. Environmental Protection Agency.
- EPA, 2020d. Letter to C. Munce, GHD Services Inc. regarding approval of the June 4, 2020, Revised Additional Treatability Testing Notice, dated June 11, 2020. U.S. Environmental Protection Agency.
- EPA, 2020e. Letter to C. Munce, GHD Services Inc. regarding comments on the Preliminary 30% Remedial Design - Southern Impoundment, dated June 26, 2020. U.S. Environmental Protection Agency.
- EPA, 2020f. Letter to C. Munce, GHD Services Inc. regarding comments on the Preliminary 30% Remedial Design - Northern Impoundment, dated July 16, 2020. U.S. Environmental Protection Agency.
- EPA, 2020g. Letter to C. Munce, GHD Services Inc. regarding approval of the August 21, 2020, Request for Northern Impoundment Schedule Extension, dated September 10, 2020. U.S. Environmental Protection Agency.

- EPA, 2020h. Letter to C. Munce, GHD Services Inc. regarding the Waste Characterization Evaluation, dated November 19, 2020. U.S. Environmental Protection Agency.
- EPA, 2021a. Letter to C. Munce, GHD Services Inc. regarding approval of the February 3, 2021 Request for Northern Impoundment Schedule Extension, dated March 29, 2021. U.S. Environmental Protection Agency.
- EPA, 2021b. Letter to C. Munce, GHD Services Inc. regarding comments on the Supplemental Design Investigation Sampling Plan, dated March 29, 2021. U.S. Environmental Protection Agency.
- EPA, 2021c. Letter to C. Munce, GHD Services Inc. regarding approval of the Supplemental Design Investigation Sampling Plan - Revision 1, dated June 4, 2021. U.S. Environmental Protection Agency.
- EPA, 2021d. Letter to A. Howard, U.S. Environmental Protection Agency, regarding SDI Sampling Plan Refinement Notice - 1, dated June 26, 2021. Approval received from A. Howard on August 4, 2021. GHD Services Inc.
- EPA, 2021e. Letter to C. Munce, GHD Services Inc. regarding approval of the October 6, 2021, *Revised Ambient Turbidity Measurements Plan*, dated October 15, 2021. U.S. Environmental Protection Agency.
- EPA, 2022a. Letter to C. Munce, GHD Services Inc. regarding approval of the October 1, 2021 Request for Northern Impoundment Schedule Extension, dated January 12, 2022. U.S. Environmental Protection Agency.
- EPA, 2022b. Letter to Chris Kotara (International Paper Company [IPC]) and Steve Joyce (McGinnes Industrial Maintenance Corporation [MIMC]) regarding San Jacinto River Waste Pits Superfund Site; Administrative Settlement Agreement and Order on Consent for Remedial Design, Docket No. 06-02-18, dated April 15, 2022. U.S. Environmental Protection Agency.
- EPA, 2022c. Memorandum to Site File Regarding a Non-Significant Post-Record of Decision Clarification and Change, dated August 3, 2022. U.S. Environmental Protection Agency.
- EPA, 2022d. Letter to C. Kotara, IPC, and S. Joyce, MIMC, regarding *Extension Request for Northwest Corner* Component of Pre-Final 90% Remedial Design, dated August 31, 2022. U.S. Environmental Protection Agency.
- EPA, 2022e. Letter to C. Munce, GHD, regarding *Request for Extension Northwest Corner Component*, dated September 14, 2022. U.S. Environmental Protection Agency.
- EPA, 2022f. Letter to C. Munce, GHD, regarding Northwest Corner Component to Pre-Final 90% Remedial Design, dated September 28, 2022. U.S. Environmental Protection Agency.
- EPA, 2022g. Letter to C. Kotara, IPC, and Steve Joyce, MIMC, regarding EPA Response to Respondents' October 7, 2022, Letter, dated October 13, 2022. U.S. Environmental Protection Agency.
- GHD, 2018. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Schedule Extension and Approval of Submission Date - Draft Treatability Study Work Plan and Draft Second Phase Pre-Design Investigation Work Plan, dated December 7, 2018. GHD Services Inc.
- GHD, 2019a. Draft Second Phase Pre-Design Investigation Work Plan, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. February 11, 2019.
- GHD, 2019b. *Draft Treatability Study Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. February 11, 2019.
- GHD, 2019c. *Final Treatability Study Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. May 20, 2019.
- GHD, 2019d. *Final Second Phase Pre-Design Investigation Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. June 3, 2019.
- GHD, 2019e. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Written Notification of Force Majeure Event, dated September 27, 2019. GHD Service Inc.

- GHD, 2019f. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Second Phase Pre-Design Investigation Work Plan Refinement Notice, dated October 11, 2019. GHD Services Inc.
- GHD, 2019g. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Second Phase
   Pre-Design Investigation Additional Work Plan Refinement Notice, dated November 1, 2019. GHD Services Inc.
- GHD, 2019h. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Second Phase
   Pre-Design Investigation Work Plan Fourth Refinement Notice, dated December 4, 2019. GHD Services Inc.
- GHD, 2020a. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Treatability Study Work Plan Refinement Notice, dated January 10, 2020. GHD Services Inc.
- GHD, 2020b. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Additional Treatability Testing Notice, dated April 16, 2020. GHD Services Inc.
- GHD, 2020c. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Revised Additional Treatability Testing Notice, dated June 4, 2020. GHD Services Inc.
- GHD, 2020d. Preliminary 30% Remedial Design Northern Impoundment, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. May 28, 2020.
- GHD, 2020e. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Request for Northern Impoundment Schedule Extension, dated August 21, 2020. GHD Services Inc.
- GHD, 2020f. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Refinement Notice - Revised Additional Treatability Testing Notice, dated October 15, 2020. GHD Services Inc.
- GHD, 2020g. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding the Waste Characterization Evaluation, dated October 20, 2020. GHD Services Inc.
- GHD, 2021a. Letter to A. Howard, U.S. Environmental Protection Agency, regarding Request for Northern Impoundment Schedule Extension, dated February 3, 2021. GHD Services Inc.
- GHD, 2021b. Supplemental Design Investigation Work Plan, San Jacinto River Waste Pits Superfund Site.
   Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company and
   U.S. Environmental Protection Agency, Region 6. February 19, 2021.
- GHD, 2021c. Supplemental Design Investigation Work Plan Revision 1, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. May 21, 2021.
- GHD, 2021d. Letter to A. Howard, U.S. Environmental Protection Agency, regarding SDI Sampling Plan Refinement Notice - 1, dated July 26, 2021. GHD Services Inc.
- GHD, 2021e. Letter to A. Howard, U.S. Environmental Protection Agency, regarding Turbidity Curtain Deployment During the Supplemental Design Investigation, dated September 28, 2021. GHD Services Inc.
- GHD, 2021f. Letter to A. Howard, U.S. Environmental Protection Agency, regarding Request for Northern Impoundment Schedule Extension, dated October 1, 2021. GHD Services Inc.
- GHD, 2021g. *Revised Ambient Turbidity Measurements Plan*, San Jacinto River Waste Pits Superfund Site.
   Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and
   U.S. Environmental Protection Agency, Region 6. October 6, 2021.
- GHD, 2021h. Letter to A. Howard, U.S. Environmental Protection Agency, regarding Request for Northern Impoundment Schedule Extension - Addendum, dated November 9, 2021. GHD Services Inc.
- GHD, 2021i. Hydraulic Heave Analysis, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. December 9, 2021.
- GHD, 2021j. Concerns Regarding Hydraulic Heave, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. December 22, 2021.

- GHD, 2022a. Letter to S. Najda, Harris County Flood Control District, regarding Floodplain Drainage Impact Analysis, dated March 30, 2022. GHD Services Inc.
- GHD, 2022b. Revised Letter to S. Najda, Harris County Flood Control District, regarding Floodplain Drainage Impact Analysis, dated May 6, 2022. GHD Services Inc.
- GHD, 2022c. *Pre-Final 90% Remedial Design Northern Impoundment,* San Jacinto River Waste Pits Superfund Site. Prepared for MIMC, IPC, and USEPA, Region 6. June 27, 2022.
- GHD, 2022d. Letter to A. Howard, USEPA, regarding *Request for Schedule Extension Northwest Corner Component*, dated August 18, 2022. GHD Services Inc.
- GHD, 2022e. Letter to A. Howard, USEPA, regarding Response to Environmental Protection Agency Letter Dated September 14, 2022, dated October 27, 2022. GHD Services Inc.
- Gustavson, K. E., Burton, G. A., Francingues, N. R., Reible, D. D., Vorhees, D. J., Wolfe, J.R., 2008. Evaluating the Effectiveness of Contaminated Sediment Dredging. Environmental Science & Technology, 42 (14), 5042-5047.
- Harris County Flood Control District (HCFCD), 2022. E-Mail to GHD, regarding comments on March 30, 2022, Floodplain Drainage Impact Analysis, e-mail dated April 8, 2022.
- Integral and Anchor QEA, 2013a. Baseline Human Health Risk Assessment, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. May 2013.
- Integral and Anchor QEA, 2013b. *Remedial Investigation Report*, San Jacinto River Waste Pits Superfund Site.
   Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and
   U.S. Environmental Protection Agency, Region 6. May 2013.
- Integral and Anchor QEA, 2018a. Draft First Phase Pre-Design Investigation Work Plan, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. June 2018.
- International Paper Company [IPC] and McGinnes Industrial Maintenance Corporation [MIMC], 2022a. Letter to Earthea Nance and Lisa Price, U.S. Environmental Protection Agency, regarding Request Pursuant to 40 CFR 300.825(c) to Alter Response Action for the Northern Impoundment, San Jacinto River Waste Pits Superfund Site, Harris County, Texas ("Site"), dated March 24, 2022.
- IPC and MIMC, 2022b. Letter to Lisa Price and John Meyer, U.S. Environmental Protection Agency, regarding Extension Request for Northwest Corner Component, dated June 21, 2022.
- IPC and MIMC, 2022c. Letter to Ashley Howard, Lisa Price, John Meyer, and Chris Villarreal, U.S. Environmental Protection Agency, regarding Memo to File Regarding Non-Significant Post-Record of Decision Clarification and Change dated August 3, 2022, dated October 7, 2022.
- IPC and MIMC, 2022d. Letter to Ashley Howard, U.S. Environmental Protection Agency, regarding USEPA Letter dated September 14, 2022, dated October 27, 2022.
- Integral and Anchor QEA, 2018b. *First Phase Pre-Design Investigation Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. August 2018.
- Integral and Anchor QEA, 2018c. *Draft Remedial Design Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. September 2018.
- Integral and Anchor QEA, 2018d. Addendum to the First Phase Pre-Design Investigation Work Plan, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. October 2018.
- Integral and Anchor QEA, 2018e. *Remedial Design Work Plan*, San Jacinto River Waste Pits Superfund Site.
   Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and
   U.S. Environmental Protection Agency, Region 6. December 2018.

- Integral and Anchor QEA, 2019. Northwest Slope Enhancement Completion Report, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. August 2019.
- Matlock D., 2017. Enforcement Action Memorandum for a Removal Action at the Kanawha River Site, Kanawha and Putnam Counties, WV. U.S. Environmental Protection Agency, Region 3, January 9, 2017. USEPA Docket No. CERC-03-2004-0171DC for Administrative Order on Consent.
- NRC (National Research Council), 2007. Sediment Dredging at Superfund Mega Sites: Assessing the Effectiveness. Washington DC, National Academies.
- Palermo, M. R., Maynord, S., Miller, J., Reible, D. D., 1998. Guidance For In-Situ Subaqueous Capping of Contaminated Sediments. Assessment and Remediation Of Contaminated Sediments Program, EPA 905-B96-004, September 1998.
- Palermo, M. R., Schroeder, P. R., Estes, T. J., Francingues, N. R., 2008. Technical Guidelines for Environmental Dredging of Contaminated Sediments. U.S. Army Corps of Engineers, Engineer Research and Development Center, ERDC/EL TR-08-29, September 2008.
- Patmont, C. R., Palermo, M. R., 2007. Case Studies of Environmental Dredging Residuals and Management Implications. In: Proceedings 4<sup>th</sup> International Conference on Remediation of Contaminated Sediments, January 22 through 25, 2007, Savannah, Georgia (Battelle Press, Columbus, Ohio).
- Schroeder, P.S., 2009. USACE Technical Guidelines for Predicting The 3Rs of Environmental Dredging.
   Proceedings of the Western Dredging Association (WEDA XXIX) Technical Conference and Texas A&M
   University (TAMU 40) Dredging Seminar, Tempe, Arizona, June 14 through 17, 2009, 311-330.
- Stanislaus, M., 2017. Memorandum OLEM Directive 9200.1-130. Remediating Contaminated Sediment Sites - Clarification of Several Key Remedial Investigation/Feasibility Study and Risk Management Recommendations, and Updated Contaminated Sediment Technical Advisory Group Operating Procedures. United States Environmental Protection Agency.
- TCEQ, 2010. Texas Commission on Environmental Quality, Water Quality Division. Procedures to Implement the Texas Surface Water Quality Standards. RG-194. June 2010.

#### Table 5-4

#### Northwest Corner Dredge Removal Elevations Pre-Final 90% Remedial Design - Northern Impoundment (Northwest Corner Component) San Jacinto River Waste Pits Site Harris County, Texas

Starting Elevation (Mud-line)	-1.17	-0.61	-8.04	-13.36	-14.36	-18.39	-15.36	-15.64	-12.40	-4.29
(	SJSB070	SJSB099	SJGB013	SJSB100	SJSB098	SJSB057	SJSB103	SJSB097 <sup>1</sup>	SJSB056	SJSB056-C1
ELEVATION (feet NAVD88)										
+5										
+4										
+3										
+2										
+1										
	13000	53000								
-1	43900	53000								
-2	68600	54000								
	68600	54000								0.70
	45600	130								0.79
	45600	130								1 1/
-0	24300	13								1.14
	24300	13	5100							0.26
-0	16700	15	5100							0.20
	16700	15	1740							0.20
-11	1000	210	1740							0.60
-12	1000	210	338						3 35	1.4
-13	609	1.9	338	110					3.35	1.1
-14	609	1.0	104	110	71				1.65	1.33
-15	69	26	104	37	71		22		1.65	1.33
-16	6.9	26	25.2	3.7	1900		2.2	52	0.80	0.60
-17	4 69	14	25.2	9.2	1900		1 1	5.2	0.80	0.60
-18	4 69	14	20.2	9.2	1800	24200	1.1	1.2	0.00	0.60
-19				0.81	1800	24200	14	12	0.78	0.62
-20				0.81	160	37600	14	1.2	3 76	0.96
-21				2.3	160	37600	4.8	1.8	3.76	0.96
-22				2.3	9600	3540	4.8	1.0	0.93	0100
				0.58	9600	3540	3.9	1.4	0.93	
-24				0.58	3900	372	3.9	2.6	2.91	
-25				0.57	3900	372	0.49	2.6	2.91	
-26				0.57	680	7.6	0.49	0.77	4.44	
-27				0.51	680	7.6	0.46	0.77	4.44	
-28				0.51	11	2.93	0.46	1.4	0.46	
-29					11	2.93		1.4	0.46	
-30					0.16	15.9		0.29		
-31					0.16	15.9		0.29		
-32						1.59				
-33						1.59				
-34						1.5				
-35						1.5				
Calculated Excavation Elevatio Calculated Excavation Depth	-15.17 14	-12.61 12	-14.04 6	-13.36 0	-28.36 14	-26.39 8	-16.99 2	-15.64 0	-12.40 0	-19.69 15
Hydraulic Heave Elevation Hydraulic Heave Depth	-22.4 21.23	-22.60 21.99	-17.00 8.96	-15.50 2.14	-13.00 -1.36	-13.00 -5.39	-13.00 -2.36	-16.00 0.36	-16.00 3.60	-15.47 11.18

Notes:

- Bold font indicates dioxins results >30 ng/kg TEQ.

- Yellow shading indicates material >30 ng/kg TEQ being removed.

- Green shading indicates material <30 ng/kg TEQ being removed.

- Red line indicates the elevation in each boring at which there is risk of hydraulic heave (Factor of Safety <1.25).

- Green line indicates the target removal elevation for each boring.

<sup>1</sup> Elevation at which there is risk of hydraulic heave is the same as the target removal elevation.



#### Legend

Northern Impoundment Water Surface (Hindcasted)

Sheldon Gage Water Surface (Measured)

Notes:

San Jacinto River water surface elevations measured at the Sheldon Gage (USGS #08072050)

NAVD88 = North American Vertical Datum of 1988

San Jacinto River water surface data at the Northern Impoundment based upon data obtained from a transducer installed in the river on the west side of the Northern Impoundment in July, 2019

BMP = Best Management Practice (ie: cofferdam or sheetpile wall)"

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Paper Size ANSI B

GHD

UPDATED HINDCASTED WATER **SURFACE ELEVATIONS -**YEAR ROUND

SAN JACINTO RIVER WASTE PITS SITE HARRIS COUNTY, TEXAS

Project No. 11215702 Revision No. -

Date Nov 1, 2022





#### Legend

Northern Impoundment Water Surface (Hindcasted)

Sheldon Gage Water Surface (Measured)

Notes:

San Jacinto River water surface elevations measured at the Sheldon Gage (USGS #08072050)

NAVD88 = North American Vertical Datum of 1988

San Jacinto River water surface data at the Northern Impoundment based upon data obtained from a transducer installed in the river on the west side of the Northern Impoundment in July, 2019

BMP = Best Management Practice (ie: cofferdam or sheetpile wall)"

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Paper Size ANSI B

GHD

UPDATED HINDCASTED WATER **SURFACE ELEVATIONS -**NOVEMBER TO APRIL

Project No. 11215702 Revision No. -

Date Nov 1, 2022

**FIGURE 5-5** 

# Appendices

# Appendix B Geotechnical Engineering Report

# **Appendix B-1**

## Northwest Corner Hydraulic Heave Evaluation

#### GEOTECHNICAL ENGINEERING REPORT ADDENDUM HYDRAULIC HEAVE ANALYSIS – NORTHWEST CORNER SAN JACINTO RIVER WASTE PITS NORTHERN IMPOUNDMENT HARRIS COUNTY, TEXAS



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November 7, 2022 AAI File: 18-2876-004

GHD Services Inc. 5551 Corporate Boulevard, Suite 200 Baton Rouge, Louisiana 70808

- Attention: Mr. Charles W. Munce, P.E. Project Manager
- Re: Geotechnical Engineering Report Addendum Northwest Corner Hydraulic Heave Analysis San Jacinto River Waste Pits Northern Impoundment Harris County, Texas

We have completed our study and analyses based on the existing and available data received to date for the San Jacinto Waste Pits Superfund Site's Northern Impoundment Northwest Corner Hydraulic Heave Analysis. A summary of the methods of analysis and results are provided in the attached Geotechnical Engineering Report Addendum. The analyses were based on the information made available to Ardaman to date and may be subject to change in the future.

Sincerely, ARDAMAN & ASSOCIATES, INC. Texas Firm # 5822

9 hr

CHAD D. ROE, P.E. PROJECT ENGINEER



La. War

MARK L. WOODWARD, P.E. PRINCIPAL GEOTECHNICAL ENGINEER

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#### GEOTECHNICAL ENGINEERING REPORT ADDENDUM NORTHWEST CORNER HYDRAULIC HEAVE ANALYSIS PRE-FINAL 90% REMEDIAL DESIGN SAN JACINTO RIVER WASTE PITS NORTHERN IMPOUNDMENT HARRIS COUNTY, TEXAS

This Geotechnical Engineering Addendum summarizes the results of the hydraulic heave analyses to determine safe water levels within the northwest corner of the Northern Impoundment under a potential dredging alternative. Ardaman & Associates, Inc. (Ardaman) has worked with GHD Services Inc. (GHD), on behalf of the International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC), to develop a Pre-Final 90% Remedial Design (90% RD) for the Northern Impoundment of the San Jacinto River Waste Pits Superfund Site located in Harris County, Texas (Site). The geotechnical analyses were developed based upon data obtained during the 2011 Remedial Investigation (RI), the 2018 First Phase Pre-Design Investigation (PDI-1), the 2019 Second Phase Pre-Design Investigation (PDI-2), and the 2021 Supplemental Design Investigation (SDI). The geotechnical investigation results from the RI and PDI-1 are provided in Attachment A, the geotechnical investigation results from PDI-2 are provided in Attachment B, and the SDI Geotechnical Data Report is provided as Attachment C of the Geotechnical Report dated June 27, 2022.

#### **SECTION 1. GENERAL PROJECT INFORMATION**

#### 1.1 Project Description

This analysis was performed to supplement the previously submitted Geotechnical Report (submitted June 27, 2022 as part of the Pre-Final 90% RD) and to support the potential waste removal activities in the northwest corner of the Northern Impoundment.

#### 1.2 Northern Impoundment Location and Description

The Northern Impoundment is located along the San Jacinto River and near Interstate Highway-10 (I-10).

#### 1.3 Geology

The geology in the vicinity of the northwest corner of the Northern Impoundment is delineated by the geologic profile shown in Figure 1, below, which shows Alluvium deposits to approximately Elevation (EL) -27 ft North American Vertical Datum 1988 (NAVD88) underlain by the Beaumont Clays to EL -50 ft NAVD88. The geological profile indicates that borings SJGB018 and SJGB019 show the upper sand. The top of the upper sand in boring SJGB-19 is shown as EL -50 ft NAVD88 and EL -54 ft NAVD88 in boring SJGB018. CPT SJSCPT-01 shows the top of the upper sand at EL - 50 ft NAVD88. CPT SJSCPT-01 also encountered a gravelly sand below the upper sand as shown in blue. The profile shows the potential that the gravelly sand is connected to the upper sand.



There is also potential for this gravelly sand to be connected to the Beaumont Sands or Pleistocene Lissie and Willis Formations or Chicot Aquifer.



Figure 1: Typical Geologic Profile in the Northwest Corner

#### SECTION 2. HYDRAULIC HEAVE ANALYSIS

2.1.1 Hydraulic Heave Mechanism

When an excavation is dug into a clay deposit underlain by a pervious stratum under artesian pressure, pressure and seepage may result, leading to instability of the excavation.

The above-mentioned conditions are illustrated for the Northern Impoundment case on Figure 2. The hydrostatic head in the deep Beaumont Sand below the impervious Beaumont Clay layer is higher than the bottom of the excavation. If the effective stress at point A approaches zero,



the situation becomes unstable. Therefore, if the pore pressure at point A exceeds the total vertical stress at this point, heave may occur in the bottom of the excavation.



#### Figure 2: Artesian Groundwater Conditions Below Excavation

#### 2.1.2 Methodology

For the total stress approach, the heave assessment is solely based on the ratio of total stresses and uplift pore pressures.

For this approach, the Safety Factor (SF) protective of hydraulic heave is expressed using the following equation:

$$SF_{Total} = (H_s^* \gamma_s + H_c^* \gamma_c) / H_w^* \gamma_w$$
[1]

In this equation,  $H_s$  and  $H_c$  are the thicknesses of the sediments and the clay layers, respectively and  $H_w$  is the water head in the pervious layer.  $\gamma_s$  and  $\gamma_c$  are the total unit weights of the sediments and the clay respectively.  $\gamma_w$  corresponds to the water unit weight.

In order to prevent hydraulic heave with a sufficient security margin, pore pressure at point A should not exceed 80 percent of the total vertical stress at this point, corresponding to a  $SF_{Total}$  of 1.25 for the Reasonable Maximum Case and 87 percent or a  $SF_{Total}$  of 1.15 for the Extreme Case.



#### 2.1.3 Design Parameters

Under a potential dredging scenario, waste material would be removed under a column of water. As the waste is removed, makeup water would be added to replace the weight of the removed material and maintain an adequate downward pressure to overcome hydraulic heave risk. In order to determine a safe water level within the excavation, the design water level and the unit weight of the material need to be established. A design river level for the Extreme Case was selected as EL +9 ft NAVD88, which is the design height of the BMP that will surround the Northern Impoundment during remediation. As mentioned in Section 1.3 there is potential that the sands below EL -50 ft NAVD88 in the northwest corner are connected to the deeper sand layer below the Beaumont Clays. Figure 3, below, compares the Beaumont Sands piezometric head at SJMW016 and the river level measured at the Northern Impoundment. Details of piezometer SJMW016 are presented in Attachment E of the June 27, 2022 Geotechnical Report. The data indicated that the piezometric head in the Beaumont Sand responded to the water level fluctuations in the river and appeared to be dampened by the overlying clay interval.



Figure 3: Piezometric Readings – River and Upper Sand Elevation



Based on these data, it is estimated that the piezometric head in the Beaumont Sands is dampened by approximately 0.11 feet per foot of overlying clay. Therefore, a difference of 1.7 feet between the river stage and the piezometric head at EL -50 ft NAVD88 beneath the northwest corner was conservatively assumed.

A unit weight of 95 pounds per cubic foot (pcf) was assumed for the sediments above EL -27 ft NAVD88. This unit weight was based upon moisture contents from boring SJSB057-G using an assumed Specific Gravity (Gs) at 100% saturation. A unit weight of 126 pcf was conservatively used for the Beaumont Clays between EL -27 ft NAVD88 and EL -50 ft NAVD88 based upon unit weight determinations for boring SJSB057-G. The boring log for boring SJSB057-G was provided in Attachment B of the June 27, 2022 Geotechnical Report. A plot of the unit weights between EL -17 ft NAVD88 and EL -50 ft NAVD88 is shown below in Figure 4.



FIGURE 4: WET DENSITY BORING SJSB057

#### 2.1.4 Heave Analysis

Based upon the design parameters discussed in Section 2.1.3, the design methodology and example are shown in Figure 5 below. The left side of the figure shows methodology for determining safe level that the water can be lowered to for dry excavation prior to dredging considering the EL +9 ft NAVD88 Extreme Case river level and the SF<sub>Total</sub> of 1.15. The right side of the figure shows the methodology to calculate the design river stage for the Reasonable Maximum Case and 1.25 SF<sub>Total</sub> considering the safe level of dry excavation calculated for the



Extreme Case. The calculated design river stage for the Reasonable Maximum case is calculated to be EL +5 ft NAVD88.



**Figure 5: Heave Analysis Summary** 

During dredging, sufficient water will have to be maintained in the excavation to offset the heave potential considering the weight of the sediments that will be removed. The left side of the figure indicates that the safe water elevation required for the Extreme Case (river stage EL +9 ft NAVD88) is EL -10.1 ft NAVD88 and the safe water elevation required for the Reasonable Maximum Case (river stage EL +5 NAVD88) is EL -10.9 ft NAVD88.



#### Safe Water Level At End of Dredging



#### FIGURE 6: SAFE WATER ELEVATION CALCULATIONS FOR DREDGING

#### SECTION 3. ADDITIONAL CONSIDERATIONS.

The potential for hydraulic heave was investigated as presented above. Safe excavation depth limits were established across the northwest corner of the Northern Impoundment to ensure the piezometric head pressure in the sand layers beneath the proposed excavation would not lead to bottom instability. It is recommended that piezometers be installed into the deep sand below the Beaumont Clay as well as in the upper sand below EL -50 ft NAVD88 prior to construction and to continuously monitor the pressure head in those strata during construction.


# Appendix G Design Drawing Package

# **Appendix G-1**

## Design Drawing Package - Northwest Corner Capping



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Plotted By: Matt Wolfer

# SAN JACINTO RIVER WASTE PITS **NORTHERN IMPOUNDMENT** (NORTHWEST CORNER COMPONENT) **PRE-FINAL 90% REMEDIAL DESIGN** HARRIS COUNTY, TEXAS

**NOVEMBER 2022** 11215702



LOCATION MAP

90% NORTHWES

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NORTHERN IMPOUNDMENT



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Drawn

Designer RH

Design

Date Nov 8, 2022

Check

Approved

Date

COMPONENT EPA REVIEW

Issue

# NORTHERN IMPOUNDMENT

## SAN JACINTO RIVER WASTE PITS

CONCRETE

AZ26-700 PILE

AZ40-700 PILE

SOIL TYPE S1

GRAVEL ASPHALT



Client

WELL MATERIAL TO BE EXCAVATED EXISTING BERM TO EXCAVATED EXISTING BERM

MONITORING WELL POWER POLE LIGHT POLE

MATERIAL TO BE ADDRESSED BY CAPPING

PLANNED IMPROVEMENTS FOR NORTHERN IMPOUNDMENT ACCESS

TOE OF SLOPE OVERHEAD ELECTRICAL GUARDRAIL PIPELINE SJSB002 BORING LOCATION

<u>LEGEND</u> ----- ASSUMED TXDOT RIGHT OF WAY ----- TCRA CAP PERIMETER FENCELINE SHORELINE TOP OF BANK

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SAN JACINTO RIVER WASTE PITS

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MATERIAL TO BE ADDRESSED BY CAPPING CONCRETE GRAVEL ASPHALT AZ26-700 PILE AZ40-700 PILE 

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CONCRETE GRAVEL

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SAN JACINTO RIVER WASTE PITS

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YEAR 3



YEAR 5

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Project Coordinator

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HARRIS COUNTY, TEXAS

SAN JACINTO RIVER WASTE PITS

NORTHERN IMPOUNDMENT PRE-FINAL 90% REMEDIAL DESIGN









GUARDRAIL

LIGHT POLE

EXISTING BERM

CONCRETE

GRAVEL

WELL

BORING LOCATION

MONITORING WELL POWER POLE

MATERIAL TO BE EXCAVATED EXISTING BERM TO EXCAVATED

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YEAR 6 - EXCAVATION SEASON 5

SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS, MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019 UPDATED BATHYMETRY DATA PROVIDED BY ANCHOR QEA OCTOBER 2021

NOTES:

- ASSUMED TXDOT RIGHT OF WAY IS BASED ON INFORMATION PROVIDED BY THE HARRIS COUNTY TAX ASSESSOR'S OFFICE.
   SEASONAL EXCAVATION AREAS, VOLUMES, AND SEQUENCING
- ARE APPROXIMATE AND SUBJECT TO CHANGE.

FOR CONSTRUCTION, BIDDING, RECORDATION, CONVEYANCE OR SALES PURPOSES.

## 90% NORTHWEST CORNER COMPONENT EPA REVIEW

![](_page_89_Picture_12.jpeg)

![](_page_89_Picture_13.jpeg)

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![](_page_89_Picture_15.jpeg)

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	LEGEND
	ASSUMED T
	TCRA CAP F
-10	EXISTING CO
X	FENCELINE
	SHORELINE
	TOP OF BAN
	TOE OF SLC
O/H	OVERHEAD
O	GUARDRAIL
\\	PIPEI INE

SJSB002

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ASSUMED TXDOT RIGHT OF WAY TCRA CAP PERIMETER EXISTING CONTOUR INTERVAL FENCELINE SHORELINE TOP OF BANK TOE OF SLOPE OVERHEAD ELECTRICAL GUARDRAIL PIPELINE BORING LOCATION MONITORING WELL POWER POLE LIGHT POLE WELL

MATERIAL TO BE EXCAVATED EXISTING BERM TO EXCAVATED EXISTING BERM

MATERIAL TO BE ADDRESSED BY CAPPING CONCRETE

GRAVEL AZ26-700 PILE

AZ40-700 PILE

PHASE OF EXCAVATION

SAN JACINTO RIVER WASTE PITS

NORTHERN IMPOUNDMENT PRE-FINAL 90% REMEDIAL DESIGN HARRIS COUNTY, TEXAS

3	90% NORTHWEST CORNER	MW	СМ	11/8/2022
	COMPONENT EPA REVIEW			
No.	Issue	Drawn	Approved	Date
Draw	/n <b>MW</b>	Designer	RH	
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Project No. **11215702** 

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TYPICAL CONSTRUCTION SEQUENCING 2 OF 2

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Sheet No.

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JOB NO. 11215702 FILE NO. 001

ghd texas firm registration no. \_\_\_\_276

![](_page_90_Picture_0.jpeg)

ST	CORNER	<b>COMPONENT</b>	<b>EPA REVIEW</b>

Sheet	-	of	-

![](_page_90_Picture_3.jpeg)

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1. ASSUMED TXDOT RIGHT OF WAY IS BASED ON INFORMATION PROVIDED B' THE HARRIS COUNTY TAX ASSESSOR'S OFFICE.

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS, MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019 UPDATED BATHYMETRY DATA PROVIDED BY ANCHOR QEA OCTOBER 2021

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![](_page_91_Figure_0.jpeg)

Plot Date: 8 November 2022 - 9:32 AM

Plotted By: Matt Wolfer

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GHD GHD SERVICES INC.

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Plot Date: 8 November 2022 - 9:36 AM

Plotted By: Matt Wolfer

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SECTION J STA. 6+00.00 SCALE: 1"=10' C-29

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![](_page_93_Picture_5.jpeg)

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1. BOTTOM OF EXCAVATION IS SUBJECT TO CHANGE.

NOTES:

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![](_page_94_Figure_0.jpeg)

			TOP OF AZ26-700 DOUBLE SHEET +9' ELEVATION	PILE WALL COFFERDAM	
SAN JACINTO RIVER	<u>¥</u>		SOIL TYPE S1 FILL		
				MIN. 30'	EXISTING GRADE
					EXISTING ROCK/ OVERBURDEN
			BMP SOIL		EXISTING GEOTEXTILE AND/OR GEOMEMBRANE BARRIER (IF PRESENT)
		30'-			
				TOP OF CLAY	
/////					
			FOR SHEET PILE WALL TIP ELEV. SEE TABLE 1 ON DRAWING S-03		

Plot Date: 8 November 2022 - 9:36 AM

Plotted By: Matt Wolfer

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SECTION L STA.10+00.00 C-30

# 90% NORTHWES

GHD TEXAS FIRM REGISTRATION NO.	_276_	
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![](_page_94_Picture_5.jpeg)

CONVEYANCE OR SALES PURPOSES. GHD GHD SERVICES INC.

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NOTES: 1. BOTTOM OF EXCAVATION IS SUBJECT TO CHANGE.

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Plotted By: Matt Wolfer

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Plotted By: Matt Wolfer

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![](_page_101_Figure_0.jpeg)

1. DEWATER NORTHWEST CORNER TO EXCAVATION LIMIT BASED ON FS = 1.25 FOR HYDRAULIC HEAVE.

![](_page_101_Figure_2.jpeg)

REMOVE ROCK LAYER TO BE STOCKPILED ON SITE. REUSED AS TEMPORARY COVER AT END OF SEASONAL EXCAVATION.
 REMOVE GEOMEMBRANE/ GEOTEXTILE / ACBM (IF PRESENT), EXCAVATE MATERIAL ABOVE LIMIT OF DRY EXCAVATION AND DISPOSE OF OFFSITE.

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Plot Date: 8 November 2022 - 10:53 AM

Plotted By: Matt Wolfer

![](_page_101_Picture_4.jpeg)

— TURBIDITY CURTAIN	EXISTING ROCK/ OVERBURDEN	~	LIMIT OF DRY EXCAVATION		
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**PHASE 2** HORIZ: 1" = 20' VERT: 1" = 10'

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JOB NO. <u>11215702</u> FILE NO. <u>001</u> GHD TEXAS FIRM REGISTRATION NO. <u>276</u> ST CORNER COMPONENT EPA REVIEW	Sheet No. <b>C-51</b> Sheet - of -

![](_page_102_Figure_0.jpeg)

![](_page_102_Figure_1.jpeg)

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ARTICULATING BLOCK FABRIC FORMED CONCRETE PLACED TO CREATE CAP.
 WATER TO BE PUMPED OFF AND TREATED UPON COMPLETION OF GRANULAR FILL PLACEMENT.

Plot Date: 8 November 2022 - 10:48 AM

Plotted By: Matt Wolfer

XISTING GRADE — TURBIDITY CURTAIN		<image/>
	HORE: 1* = 20'         VERT: 1* = 10'	
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![](_page_103_Figure_0.jpeg)

![](_page_104_Figure_0.jpeg)

Plot Date: 8 November 2022 - 10:54 AM

Plotted By: Matt Wolfer

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![](_page_104_Figure_1.jpeg)

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GHD SERVICES INC. JOB NO. <u>11215702</u> FILE NO. <u>001</u> GHD TEXAS FIRM REGISTRATION NO. <u>276</u> ST CORNER COMPONENT EPA REVIEW	Sheet No. C-54 Sheet - of -

# **Appendix G-2**

Design Drawing Package - Northwest Corner Mechanical Dredging

![](_page_106_Picture_0.jpeg)

Plot Date: 8 November 2022 - 8:37 AM

Plotted By: Matt Wolfer

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# SAN JACINTO RIVER WASTE PITS **NORTHERN IMPOUNDMENT** (NORTHWEST CORNER COMPONENT) **PRE-FINAL 90% REMEDIAL DESIGN** HARRIS COUNTY, TEXAS

**NOVEMBER 2022** 11215702

![](_page_106_Picture_3.jpeg)

LOCATION MAP

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![](_page_107_Picture_0.jpeg)

0 50 100 ft GHD 5551 Corporate Boulevard Suite 200 Baton Rouge Louisiana USA T 225 292 9007 F 225 952 2978 W www.ghd.com A CHARLES W. MUNCE 105542 Reuse of Documents This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2022 GHD LEGEND ----- ASSUMED TXDOT RIGHT OF WAY FENCELINE \_\_\_\_\_\_ TOP OF BANK — — — — — — — TOE OF SLOPE OVERHEAD ELECTRICAL \_\_\_\_\_O/H\_\_\_\_\_ ■ SJSB002 BORING LOCATION MONITORING WELL MW ● P.P. POWER POLE ● L.P. LIGHT POLE O WELL WELL MATERIAL TO BE EXCAVATED EXISTING BERM TO EXCAVATED  $\overset{}{\leftarrow}$ EXISTING BERM CONCRETE GRAVEL ASPHALT Client SAN JACINTO RIVER WASTE PITS NORTHERN IMPOUNDMENT PRE-FINAL 90% REMEDIAL DESIGN HARRIS COUNTY, TEXAS 5 90% NORTHWEST CORNER MW CM 11/8/2022 COMPONENT EPA REVIEW Date Issue Drawn Approved Drawn MW Designer RH Drafting Check JC Design Check LL Project **CM** Coordinator Date Nov 8, 2022 This document shall not be used for construction unless signed and sealed for construction. TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS, MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019 UPDATED BATHYMETRY DATA PROVIDED BY ANCHOR QEA OCTOBER 2021 Original Size Bar is one inch on original size drawing Arch D 0 1" ASSUMED TXDOT RIGHT OF WAY IS BASED ON INFORMATION PROVIDED BY THE HARRIS COUNTY TAX ASSESSOR'S OFFICE. Project No. **11215702** THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF **EXISTING CONDITIONS** EPA REVIEW UNDER THE AUTHORITY OF CHARLES W. MUNCE, P.E. 105542 ON 11/8/2022. IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, RECORDATION, CONVEYANCE OR SALES PURPOSES. GHD SERVICES INC. Sheet No. JOB NO. 11215702 FILE NO. 001 **C-02** ghd texas firm registration no. \_\_\_\_276

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1.	ASSUMED TXDOT RIGHT OF WAY IS BASED ON INFORMATION PROVIDED BY
	THE HARRIS COUNTY TAX ASSESSOR'S OFFICE.
2.	LOCATION OF OVERBURDEN STOCKPILE, DECONTAMINATION PAD,
	SOLIDIFICATION PAD, AND DEWATERING FACILITY ARE SUBJECT TO CHANGE
	AND CAN VARY FROM SEASON TO SEASON.

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5	90% NORTHWEST CORNER	MW	СМ	11/8/2022
	COMPONENT EPA REVIEW			
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Project No. **11215702** 

Sheet No.

PF	PRE-FINAL 90% REMEDIAL DESIGN HARRIS COUNTY, TEXAS						
5	90% NORTHWEST CORNER	MW	СМ	11/8/2022			
	COMPONENT EPA REVIEW						
No.	lssue	Drawn	Approved	Date			
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**C-04** 

Sheet - of -

SOIL EROSION AND

SEDIMENT CONTROL PLAN

OVERALL



SOURCE:

NOTES:

190608, JULY 8, 2019 TO AUGUST 2, 2019

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TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS, MORRISON SURVEYING INC.,

ASSUMED TXDOT RIGHT OF WAY IS BASED ON INFORMATION PROVIDED BY THE HARRIS COUNTY TAX ASSESSOR'S OFFICE.
 LOCATION AND TYPE OF SOIL EROSION AND SEDIMENT CONTROLS ARE SUBJECT TO CHANGE AND CAN VARY FROM SEASON TO SEASON.
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TORDIDITY CONTROLS AND GIL BOOM ONLY TO BE IMPLEMENTED DORING BMP INSTALLATION AND REMOVAL.
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UPDATED BATHYMETRY DATA PROVIDED BY ANCHOR QEA OCTOBER 2021



ST CORNER CON	<b>IPONENT</b>	<b>EPA RE</b>	VIEW

SOURCE:

**C-05** 

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GHD GHD SERVICES INC. JOB NO. <u>11215702</u> FILE NO. <u>001</u> GHD TEXAS FIRM REGISTRATION NO. <u>276</u>

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	SHORELINE
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	TOE OF SLOPE
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	NORTHERN IMPOUNDMENT ACCES

Client SAN JACINTO RIVER WASTE PITS

### NORTHERN IMPOUNDMENT PRE-FINAL 90% REMEDIAL DESIGN HARRIS COUNTY, TEXAS

5	5 90% NORTHWEST CORNER		СМ	11/8/2022			
	COMPONENT EPA REVIEW						
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Project No. **11215702** 

## PROJECT TRAFFIC **CONTROL PLAN**

Sheet No.

NOTES: ASSUMED TXDOT RIGHT OF WAY IS BASED ON INFORMATION PROVIDED BY THE HARRIS COUNTY TAX ASSESSOR'S OFFICE.
TRAFFIC ROUTES ARE PRELIMINARY. ASSUME USE OF TXDOT ACCESS ROAD.
ACCESS ROAD IMPROVEMENTS MAY BE NECESSARY AND WILL BE DETERMINED AT A LATER STAGE IN THE REMEDIAL DESIGN.

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO

RIVER WASTE PITS, HARRIS COUNTY, TEXAS, MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019 UPDATED BATHYMETRY DATA PROVIDED BY ANCHOR QEA OCTOBER 2021

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SOURCE:



JOB NO. 11215702 GHD TEXAS FIRM REGISTRATIO



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YEAR 5

#### SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS, MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019 UPDATED BATHYMETRY DATA PROVIDED BY ANCHOR QEA OCTOBER 2021

NOTES:

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- NORTHWEST CORNER IN YEAR 2, AND BMP REMOVAL AND SITE
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## 90% NORTHWEST CORNER COMPONENT EPA REVIEW



**C-19** 

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YEAR 4 - EXCAVATION SEASON 3

#### SOURCE:

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## 90% NORTHWES

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Sheet - of -



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YEAR 6 - EXCAVATION SEASON 5

SOURCE:

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LEGEND ----- ASSUMED TXDOT RIGHT OF WAY - - TCRA CAP PERIMETER

FENCELINE

SHORELINE

TOP OF BANK TOE OF SLOPE

GUARDRAIL

POWER POLE

EXISTING BERM

CONCRETE GRAVEL

AZ26-700 PILE AZ40-700 PILE

SAN JACINTO RIVER

WASTE PITS

NORTHERN IMPOUNDMENT

PRE-FINAL 90% REMEDIAL DESIGN

HARRIS COUNTY, TEXAS

Drawn

Designer RH

Design Check LL

Date Nov 8, 2022

Bar is one inch on original size drawing

0 1"

CM 11/8/2022

Approved

Date

3 90% NORTHWEST CORNER MW

COMPONENT EPA REVIEW

Issue

Drawn MW

Drafting Check JC

Project **CM** Coordinator

Original Size

Arch D

Project No. **11215702** 

PHASE OF EXCAVATION

LIGHT POLE

WELL

PIPELINE

SJSB002 BORING LOCATION

EXISTING CONTOUR INTERVAL

OVERHEAD ELECTRICAL

MATERIAL TO BE EXCAVATED

EXISTING BERM TO EXCAVATED

MONITORING WELL

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Sheet No.

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Sheet - of -

90% NORTHWEST CORNER COMPONENT EPA REVIEW



ST	CORNER	COMPONENT	<b>EPA REVIEW</b>

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Plot Date: 8 November 2022 - 8:54 AM

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5551 Corporate Boulevard Suite 200

Baton Rouge Louisiana USA T 225 292 9007 F 225 952 2978 W www.ghd.com

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CHARLES W. MUNCE

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5	90% NORTHWEST CORNER	MW	СМ	11/8/2022
No.	COMPONENT EPA REVIEW	Drawn	Approved	Date
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Plot Date: 8 November 2022 - 8:53 AM

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EET C-38	6 BEND N: 13857960.44 E: 3217339.09				15 30 ft	GGC         GHD         551 Corporate Boulevard Suite 200         Baton Rouge Louisiana USA         T 225 292 9007 F 225 952 2978 W www.ghd.com
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						LEGEND         ASSUMED TXDOT RIGHT OF WAY         TCRA CAP PERIMETER        10         X         FENCELINE         SHORELINE         TOP OF BANK         TOE OF SLOPE         O/H         OVERHEAD ELECTRICAL         GUARDRAIL         PIPELINE         SJSB002         MW         P.P.         OWELL         WELL         MATERIAL TO BE EXCAVATED         EXISTING BERM         GRAVEL         AZ26-700 PILE         AZ40-700 PILE         RAISED BENCH
EET PILE WALL COFFERDAM		15 10				Client SAN JACINTO RIVER WASTE PITS
		- 5 5				Project NORTHERN IMPOUNDMENT PRE-FINAL 90% REMEDIAL DESIG HARRIS COUNTY, TEXAS
		-10 -15 -20 -25 -30				5     90% NORTHWEST CORNER     MW     CM     11/8/20       COMPONENT EPA REVIEW     Image: Component epa review     Image: Component epa review     Image: Component epa review       No.     Issue     Drawn     Approved     Date       Drawn     MW     Designer     RH
TOP OF CLAY						Drafting Check     JC     Design Check     LL       Project Coordinator     Date     Nov 8, 2022       This document shall not be used for construction unless signed and sealed for construction.     Scale     AS SHOWN       Original Size     Bar is one inch on original size drawing
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-12+000	-12+5	<del>, ,</del>	]			DOUBLE PILE WALL PLAN AND PROFILE 2 OF 4
THIS DOCUME EPA REVIEW U MUNCE, P.E. 10	NT IS RELEASED FOR THE PUR NDER THE AUTHORITY OF CHA 05542 ON 11/8/2022. IT IS NOT 1	POSE OF RLES W. O BE USED	GHD GHD	SERVICES INC	;	DOUBLE PILE WALL PLAN AND PROFILE 2 OF 4



		TOP OF AZ40-700 DC +9' ELEVATION	OUBLE SHEET PILE WALL COFFERDA	AM			
SAN JACINTO RIVER						EXISTING GRADE	
		SOIL TYPE S1 FI	ILL	FOR EROSION AND SCOUR PRO (12" THICK)	DTECTION		G ROCK/ OVERBURDEN
		MIN	V. 30'				- EXISTING GEOTEXTILE AND/OR
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			RAISED BENCH				
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	30'			TOP OF CLAY -			BOTTOM O EXCAVATIO
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Plot Date: 8 November 2022 - 8:21 AM

Plotted By: Matt Wolfer

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SECTION J STA. 6+00.00 C-29

	GHD TEXAS FIRM REGISTRATION NO.	276	
ST CORNER COM		FPA	REVIEW



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JOB NO. 11215702 FILE NO. 001

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SECTION L STA.10+00.00

## 90% NORTHWES

	GHD TEXAS FIRM REGISTRATION NO.	276	
ST CORNER CON		EPA	REVIEW



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Plot Date: 8 November 2022 - 2:29 PM

Plotted By: Matt Wolfer

SECTION HORIZ: 1"=20' VERT: 1"=5' Z WEST/EAST

## 90% NORTHWE

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ES'	T CORNER COM	JOB NO. <u>11215702</u> FILE NO. <u>001</u> GHD TEXAS FIRM REGISTRATION NO. <u>276</u>	REVIEW	Shee	t No. <b>C-</b>	<b>49</b>	t -	of -
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SECTION AA NORTH/ SOUTH HORIZ: 1"=20' VERT: 1"=5'

Plot Date: 8 November 2022 - 2:30 PM

Plotted By: Matt Wolfer

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## 90% NORTHWES

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	Rule       Null
-10 210 -10 -15 26.0 -15 -20 -25	
-30 -35 -40 -45	Client SAN JACINTO RIVER WASTE PITS Project NORTHERN IMPOUNDMENT PRE-FINAL 90% REMEDIAL DESIGN HARRIS COUNTY, TEXAS
450-50	Image: constraint of the second sec
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JOB NO. <u>11215702</u> FILE NO. <u>001</u> GHD TEXAS FIRM REGISTRATION NO. <u>276</u> ST CORNER COMPONENT EPA REVIEW	<b>C-50</b> Sheet - of -



1. DEWATER NORTHWEST CORNER TO EXCAVATION LIMIT BASED ON FS = 1.25 FOR HYDRAULIC HEAVE.



 REMOVE ROCK LAYER TO BE STOCKPILED ON SITE. REUSED AS TEMPORARY COVER AT END OF SEASONAL EXCAVATION.
 REMOVE GEOMEMBRANE/ GEOTEXTILE / ACBM (IF PRESENT) EXCAVATE MATERIAL ABOVE LIMIT OF DRY EXCAVATION AND DISPOSE OF OFFSITE.

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Plot Date: 8 November 2022 - 12:35 PM

Plotted By: Matt Wolfer



	EXISTING ROCK/ OVERBURDEN	~	LIMIT OF DRY EXCAVATION	
TURBIDITY CURTAIN	EXISTING GRADE			
		a a a a a a a a a a a a a a a a a a a		
			EVO	
			BASE FOR HYDE	D ON FS=1.25 AULIC HEAVE
	BEAUMONT CLAY -			
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**PHASE 2** HORIZ: 1" = 20' VERT: 1" = 10'

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	-5 -10 -15 -20 -25 -30 -35 -40 -45	Reuse of Documents This document and the ideas and desig professional service, is the property of GH for any other project without GHD's written	A BEAL 828 NSERVICE 2022 Ins incorporated herein, as a 10 and shall not be reused in a authorization. © 2022 GHD	an instrument of whole or in part
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ST CORNER C	GHD SERVICES INC. JOB NO. <u>11215702</u> FILE NO. <u>001</u> GHD TEXAS FIRM REGISTRATION NO. <u>276</u> OMPONENT EPA REVIEW	Sheet No.	- <b>51</b> Sheet -	of -



1. WATER ADDED TO MITIGATE HYDRAULIC HEAVE AND ALLOW DRAFT OF DREDGE VESSEL.



REMOVE ROCK LAYER TO BE STOCKPILED ON SITE. REUSED AS TEMPORARY COVER AT END OF SEASONAL EXCAVATION.
 REMOVE GEOTEXTILE (IF PRESENT), EXCAVATE MATERIAL THROUGH A COLUMN OF WATER, AND DISPOSE OF OFFSITE.
 WATER LEVEL TO BE MAINTAINED ABOVE EXCAVATION LIMIT BASED ON FS=1.25 FOR HYDRAULIC HEAVE.

Filename: N:\US\Baton Rouge\Projects\562\11215702\Digital\_Design\ACAD 2019\Sheets\11215702-02-DWG-C-039.dwg

Plot Date: 8 November 2022 - 12:35 PM

Plotted By: Matt Wolfer

PHASE 3 HORIZ: 1" = 20' VERT: 1" = 10'

**PHASE 4** HORIZ: 1" = 20' VERT: 1" = 10'

90% NORTHWES

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	Client SAN JACINTO RIVER
-10 -15 -20 -25 -30	Project NORTHERN IMPOUNDMENT PRE-FINAL 90% REMEDIAL DESIGN HARRIS COUNTY, TEXAS
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	Drafting CheckNQDesign CheckWBProject CoordinatorDateNov 8, 2022This document shall not be used for construction unless signed and sealed for construction.ScaleAS SHOWNOriginal SizeBar is one inch on original size drawing 01"
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GHD SERVICES IN JOB NO. 11215702 FILE NO. 001 GHD TEXAS FIRM REGISTRATION NO. 276 ST CORNER COMPONENT EPA	Sheet No. C-52 REVIEW Sheet - of -



1. PLACE GRANULAR MATERIAL AS RESIDUAL MANAGEMENT LAYER UPON COMPLETION OF DREDGING.



Plot Date: 8 November 2022 - 8:34 AM

Plotted By: Matt Wolfer

OPTIONAL REUSE OF ONSITE RIP RAP AND AGGREGATE.
 FILL PLACEMENT TO OVERCOME HYDRAULIC HEAVE.
 WATER TO BE PUMPED OFF AND TREATED. WATER LEVEL TO BE MAINTAINED ABOVE HYDRAULIC HEAVE LIMIT BASED ON FS=1.25.

Filename: N:\US\Baton Rouge\Projects\562\11215702\Digital\_Design\ACAD 2019\Sheets\11215702-02-DWG-C-039.dwg

PHASE 5 HORIZ: 1" = 20' VERT: 1" = 10'

				PLACE STOCKPILED ROCK/OVE	EF
XISTING GRADE					
EXISTING ROCK/ OVERBURDEN					
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			EXC		
· · · · · · · · · · · · · · · · · · ·			BASE FOR HYDE	ED ON FS=1.25 RAULIC HEAVE	•
	BEAUMONT CLAY -				
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**PHASE 6** HORIZ: 1" = 20' VERT: 1" = 10'

	10 5 0	GHD         5551 Corporate Boulevard Suite 200         Baton Rouge Louisiana USA         T 225 292 9007 F 225 952 2978 W www.ghd.com
	-5 -10 -15 -20 -25 -30 -35 -40	Image: Construction of the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2022 GHD         Image: Construction of the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2022 GHD         Image: Construction of the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2022 GHD         Image: Construction of the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2022 GHD         Image: Construction of the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2022 GHD         Image: Construction of the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2022 GHD         Image: Construction of the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2022 GHD
450 RBURDEN	10 5 0	
	-5 -10 -15 -20 -25 -30	Client SAN JACINTO RIVER WASTE PITS Project NORTHERN IMPOUNDMENT PRE-FINAL 90% REMEDIAL DESIGN HARRIS COUNTY, TEXAS
450	-35 -40 -45 -50	1     90% NORTHWEST CORNER     MW     WB     11/8/2022       COMPONENT EPA REVIEW     Image: Composition of the second se
		Draining Check       NQ       Design Check       WB         Project Coordinator       Date       Nov 8, 2022         This document shall not be used for construction unless signed and sealed for construction.       Scale       AS SHOWN         Original Size       Bar is one inch on original size drawing       0       1"
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ST CORNER CO	GHD SERVICES INC. JOB NO. <u>11215702</u> FILE NO. <u>001</u> GHD TEXAS FIRM REGISTRATION NO. <u>276</u> OMPONENT EPA REVIEW	Sheet No. <b>C-53</b> Sheet - of -





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1. TOP WIDTH MAY BE WIDER AND SIDE SLOPES MAY BE FLATTER IF REQUIRED TO FACILITATE CROSSING CONSTRUCTION TRAFFIC.



## 90% NORTHWEST CORNE

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## Appendix H Design Specifications

# **Appendix H-1**

Design Specifications - Northwest Corner Capping

#### SECTION 31 35 26.50

#### ARTICULATING BLOCK FABRIC FORMED CONCRETE

#### PART 1 GENERAL

#### 1.1 SUMMARY

#### A. Section Includes:

- 1. Furnish all materials, equipment, and labor to place granular material over the entire capping surface upon completion of dry excavation.
- 2. Furnish all labor, materials, equipment, and incidentals required to install articulating block fabric formed concrete cover system in accordance with the lines, grades, design, and dimensions shown on Drawings and as specified herein.
- 3. Install the specially woven, double-layer synthetic articulating block forms on the surface of the northwest corner of the Work Site and filling each compartment cavity with a pumpable fine aggregate concrete (structural grout) in such a manner as to form a stable lining to the required thickness, weight and configuration as described in this specification.

#### B. Related Requirements:

- 1. Section 01 10 00 Summary.
- 2. Section 01 33 00 Submittal Procedures.
- 3. Section 01 40 00 Quality Requirements.
- 4. Section 01 50 00 Temporary Facilities and Controls.
- 5. Section 01 57 19 Temporary Environmental Controls.
- 6. Section 01 70 00 Execution and Closeout Requirements.
- 7. Section 02 61 14 Material Handling and Transportation.
- 8. Section 31 05 19.13 Geotextiles for Earthwork.
- 9. Section 31 23 16 Excavation.
- 10. Section 35 49 25 Turbidity Curtain.

#### 1.2 REFERENCES

- A. Definitions:
  - 1. Minimum Average Roll Value: Average value for a specified parameter less two standard deviations.
  - 2. TCEQ: Texas Commission on Environmental Quality.
  - 3. TxDOT: Texas Department of Transportation.
  - 4. USEPA: United States Environmental Protection Agency.
- B. Reference Standards:
  - 1. Section 01 40 00 Quality Requirements: Requirements for references.
  - 2. ASTM International:
    - a. ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field
    - b. ASTM C33 Standard Specification for Concrete Aggregates

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С.	ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
d.	ASTM C150 – Standard Specification for Portland Cement
e.	ASTM D4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc-Type Apparatus.
f.	ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
g.	ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
h.	ASTM D4595 - Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
i.	ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
j.	ASTM D4751 - Standard Test Methods for Determining Apparent Opening Size of a Geotextile.
k.	ASTM D4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
I.	ASTM D4884 - Standard Test Method for Strength of Sewn or Bonded Seams of Geotextiles.
m.	ASTM D5199 - Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.

- n. ASTM D5261 Standard Test Method for Measuring Mass Per Unit Area of Geotextiles.
- o. ASTM D6241 Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.
- p. ASTM D 6449 Standard Method for Flow of Fine Aggregate Concrete for Fabric Formed Concrete.

#### 1.3 COORDINATION

- A. Section 01 30 00 Administrative Requirements: Requirements for coordination.
- B. Coordinate installation of geotextile and fabric form panels after satisfactory surface preparation.

#### 1.4 PRE-INSTALLATION MEETING

- A. Section 01 30 00 Administrative Requirements: Pre-installation meeting.
- B. Convene minimum 1 week prior to commencing work of this Section.
- C. Purpose of Meeting:
  - 1. Define Work Site-specific quality control and monitoring procedures.
  - 2. Discuss pre-installation submittals.
  - 3. Identify daily schedule.

#### 1.5 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

- B. Water Quality Monitoring and Control Plan describing the methods and procedures for controlling water quality within and beyond the capping area (i.e., northwest) during cap placement activities. Include monitoring procedures to demonstrate that the controls are effective.
- C. Fine aggregate concrete supplier's certificates of compliance, mix design, fine aggregate gradation and fineness modulus for the fine aggregate concrete.
- D. Geotextile and fabric form panel manufacturer's certificates of compliance. CONTRACTOR shall also furnish the manufacturer's specifications, literature, and any recommendations, if applicable, that are specifically related to the project, including shop drawings for the layout of the fabric form panels. Provide no later than 14 days prior to installation.
- E. Samples of the geotextile and fabric form panel material proposed.
  - 1. Submit a representative sample of sufficient size for the geotextile and fabric form panel material no later than 10 days prior to ordering.
- F. Manufacturer's Instructions: Submit at least 14 days prior to installation. Include installation, handling, storage, and repair instructions.
- G. Manufacturer's Certificates:
  - 1. Deliver each roll of material to the Work Site accompanied by manufacturer's certificate.
  - 2. Identify each roll by unique manufacturing number.
  - 3. Include results of the tests specified for each respective product specified in PART 2 PRODUCTS.
  - 4. Provide manufacturer's records for storage, handling, and shipping of materials.
  - 5. Quality control certificates signed by manufacturer.
- H. Daily Field Installation Report. Submit no later than 1 day following date covered by report. Include:
  - 1. Total amount and location of material placed.
  - 2. Identifiers of rolls.
  - 3. Changes in layout drawings.
  - 4. Record of defects caused during transportation and handling.
  - 5. Observations of weather conditions, and results.
  - 6. Observations of anchor trench excavation, backfilling, and compaction.
  - 7. Observations of repairs, including locations and name of repairer.
- I. Qualification Statements:
  - 1. Installer: Submit copy of manufacturer's approval letter or license no later than 14 days prior to installation.
  - 2. Manufacturer: Submit no later than 14 days prior to ordering, list of previous projects meeting the qualifications requirement including name of project, description of project, area, client's name and address, contacts, and telephone numbers; engineer's name, address, contact, and telephone number; installer's name, address, contact, and telephone number; and date installed.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for closeout submittals.
- B. Project Record Documents: Record actual locations of all placed material that is to remain in place at the completion of the project.
- C. Warranties: Completed original warranty forms filled out in OWNER's name and registered with manufacturer in accordance with Section 01 70 00.

#### 1.7 QUALITY ASSURANCE

- A. Perform work of this Section according to, and in conformance with, applicable codes and standards of TCEQ, USEPA, and TxDOT.
- B. Certifications: Obtain certificate of compliance from authority having jurisdiction.

#### 1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 10 projects, 5 million sq ft of manufacturing, and 3 years of documented experience.
- B. Installer: Company specializing in performing work of this Section and approved by the manufacturer.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver geotextile and fabric form panels bearing manufacturer's seals and labels intact. Clearly label each roll to show the product identification, date of manufacture, lot number, analysis of contents, and special instructions.
- C. Store and handle geotextile according to manufacturer's recommendations and ASTM D4873, in manufacturer's original covers. Protect from moisture, dust, light, and heat.
- D. Keep the fabric forms panels dry and wrapped such that they are protected from the elements during shipping and storage. If stored outdoors, they shall be elevated and protected with a waterproof cover that is opaque to ultraviolet light. The fabric form panels shall be labeled as per ASTM D4873.
- E. Notify ENGINEER 3 days in advance of delivery to the Work Site. Perform joint inspection with ENGINEER upon delivery. Defects or damage from shipping and handling will be grounds for rejection of the entire shipment at ENGINEER's discretion. Remove rejected material from the Work Site and replace with new material.
### 1.10 AMBIENT CONDITIONS

- A. Install geotextile and fabric form panels according to manufacturer's instructions.
- B. Suspend installation operations whenever climatic conditions, as determined by ENGINEER, are unsatisfactory for placing the material to the requirements of this Section.

### PART 2 PRODUCTS

### 2.1 GEOTEXTILE FILTER FABRIC

A. Non-woven, needle-punched geotextile made of polypropylene that meets or exceeds the following values:

Test	Unit	Test Method	Minimum Average	
			Roll Value	
Unit Weight	ounce/yd <sup>2</sup>	ASTM D5261	8	
Tensile Strength	pound	ASTM D4632	220	
Elongation at Break	percent	ASTM D4632	50	
Static CBR Puncture	pound	ASTM D6241	575	
Trapezoid Tear Strength	pound	ASTM D4533	90	
Apparent Opening Size (AOS)	US Sieve	ASTM D4751	80	
Permittivity	sec <sup>-1</sup>	ASTM D4491	1.26	
Water Flow Rate	gpm/ft <sup>2</sup>	ASTM D4491	95	
Ultra Violet Resistance	percent retained/	ASTM D4355	70	
	500 hours			

### 2.2 FABRIC FORMED CONCRETE MAT

- A. Fabric formed concrete mat shall have a finished nominal block dimensions of 20 inches by 20 inches, a finished average thickness of 6 inches, and a nominal mass per unit area of 68 lb/ft<sup>2</sup>.
- B. Spacer cords shall be used to control the block thickness and shall have minimum tensile strength of at least 600 pounds at each control section.
- C. The fabric form panels shall be composed of synthetic yarns formed into a woven fabric. Yarns used in the manufacture of the fabric shall be composed of nylon or polyester.
- D. The fabric form panels shall also meet or exceed the material properties listed below:
  - 1. Mass per unit area, 13 ounce per square yard, ASTM D5261.
  - 2. Thickness, 30 mils, ASTM D5199.
  - 3. Wide width strip tensile strength, 300 pound per inch (lb/in) machine direction and 275 lb/in cross direction, ASTM D4595.
  - 4. Elongation at break, 15 percent machine direction and 15 percent cross direction, ASTM D4595.
  - 5. Trapezoidal tear strength, 150 pounds machine direction and 170 pounds cross direction, ASTM D4533.

- 6. Flow rate, 55 gallon per minute per square foot, ASTM D4491.
- 7. AOS, between No. 30 and No. 55 U.S. Standard Sieve, ASTM D4751.
- E. Mill widths of fabric form panels shall be a minimum of 72 inches. Each selvage edge of the top and bottom layers of the fabric shall be reinforced for a width of not less than 1.25 inches.
- F. The double-layer fabric shall be separately joined, bottom layer to bottom layer and top layer to top layer, by means of sewing thread, to form multiple mill width panels with sewn seams on approximately 72 inches centers.
- G. All seams sewn in the factory shall have a minimum strength of 90 pound per inch (psi) when tested in accordance with ASTM D 4884. All sewn seams and zipper attachments shall be made using a double line of U.S. Federal Standard Type 401 stitch. All stitches shall be sewn simultaneously and be parallel to each other, spaced between 0.25 inches to 0.75 inches apart. Each row of stitching shall consist of 4 to 7 stitches per inch. Thread used for seaming shall be nylon and/or polyester.
- H. Fabric form compartments shall have sufficient ducts to allow passage of the fine aggregate concrete between adjacent compartments. The cross-sectional area of each duct shall be no more than 10 percent of the maximum filled cross-sectional area of the block lateral to the duct.
- I. Each compartment shall be interconnected with embedded longitudinal revetment cables in such a manner as to provide longitudinal and lateral binding of the finished articulating block mattress.
- J. Revetment cables shall be rated to have a breaking strength of not less than 7,200 pounds. They shall be installed between the two layers of fabric. Two longitudinal cables shall be on approximately 12-inch centers and pass through each compartment to provide longitudinal and lateral binding of the finished articulating block mattress. The cables shall enter and exit the compartments through opposing ducts. All longitudinal cables within each filled concrete compartment shall be completely embedded in the fine aggregate concrete.
- K. Baffles shall be installed to regulate the distance of lateral flow of fine aggregate concrete. The baffle material shall be non-woven filter fabric with a grab tensile strength of at least 90 pounds when tested in accordance with ASTM D 4632.

### 2.3 FINE AGGREGATE CONCRETE

- A. A mixture of Portland cement, fine aggregate (sand) and water, so proportioned and mixed as to provide a pumpable fine aggregate concrete.
  - 1. Sand shall conform to ASTM C33. Grading for the sand shall be reasonably consistent and shall not exceed the maximum size which can be conveniently handled with concrete pumping equipment.
  - 2. Portland cement should conform to ASTM C150, Type I, II or V.
  - 3. Admixtures and/or pozzolan may be used when conforming to ASTM C618, Class C, F or N and with the approval of the ENGINEER.
  - 4. The water/cement ratio of the fine aggregate concrete shall be determined by the ready-mix supplier, but generally should be on the order of 0.65 to 0.70 to allow for excess water to be filtered out through the permeable fabric. The consistency of the

fine aggregate concrete delivered to the concrete pump should be proportioned and mixed as to have a flow time of 9-15 seconds when passed through the <sup>3</sup>/<sub>4</sub>-inch orifice of the standard flow cone that is described in ASTM C6449-99.

- 5. The sand/cement ratio should be determined by the ready-mix supplier and should be on the order of 2.4:1.
- 6. The hardened fine aggregate concrete shall exhibit a compressive strength of 2,500 pound per square inch (psi) at 28 days when specimens are made and tested according to ASTM C-31 and ASTM C-39.
- 7. The average compressive strength of fabric cast test cylinders, shall be at least 20% higher at 7 days than that of companion test cylinders made without fabric in accordance with ASTM C31, and not less than 3,000 psi at 28 days.

### 2.4 TURBIDITY CURTAIN

- A. Impermeable Turbidity Curtains. Two parallel turbidity curtains shall be installed to contain any suspended soils generated during dry excavation activities and installation of the articulating block fabric formed concrete cover system.
- B. Describe curtain material type and deployment procedures in Water Quality Control and Monitoring Plan.

### 2.5 GRANULAR MATERIAL

- A. Supply granular material with the following mixture:
  - 1. 70 to 80 percent sand between No. 30 and No. 200 sieve sizes.
  - 2. 20 to 30 percent fines (passing No. 200 sieve).

### PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 Execution Requirements: Verification of existing conditions before starting work.
- B. Verify that surfaces and Work Site conditions are ready to receive work.

### 3.2 PREPARATION

- A. Prior to material placement, provide necessary equipment and personnel to maintain an acceptable supporting surface during installation.
- B. Examine the material for defects including rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or handling.
- C. Remove defective or damaged material from the Work Site.

### 3.3 TURBIDITY CONTROL

- A. Work in the capping area shall be done to minimize disturbance of existing material within and beyond (i.e., northwest) the active work area.
- B. Deploy turbidity curtain along the boundary of the capping area where the land elevation is below elevation -13 feet NAVD88 prior to commencement of capping operations as shown on Drawings. The bottom of the turbidity curtain shall be installed at the mud line and anchored or weighted in place adjacent to the capping area such that the disturbed material will be contained inside the work area during capping operations.
- C. Follow the approved Water Quality Monitoring and Control Plan to maintain and monitor the water quality outside the work area.

### 3.4 GEOTEXTILE FABRIC PLACEMENT

- A. Prior to geotextile placement, place a minimum 1 foot of granular material to a constant elevation -12 ft NAVD88 over the area requiring capping.
- B. Place granular material to elevation -13 ft NAVD88 in area north of the cap boundary where existing elevation is below -13 ft NAVD88.
- C. Notify ENGINEER at least 24 hours in advance of intention to commence geotextile fabric placement.
- D. Geotextile filter fabric shall be placed directly on the prepared graded surface and be free of folds or wrinkles as an underlayment for the fabric form panel placement in accordance with the installation procedures specified in Section 31 05 19.13.

### 3.5 FABRIC FORM PLACEMENT

- A. Factory assembled fabric form panels shall be placed over the geotextile filter fabric and within the limits shown on Drawings.
- B. Perimeter termination of the fabric form panel material shall be accomplished using anchor trenches, as shown on Drawings.
- C. Allow approximately 10% contraction of the form in each direction which will occur as a result of fine aggregate concrete filling. CONTRACTOR shall gather and fold additional fabric form in the anchor trench to be secured in such a manner as to be gradually released as fabric form panel material contracts during filling.
- D. Adjacent fabric form panels shall be joined in the field by means of sewing or zippering closures. Adjacent panels shall be joined top layers to top layer and bottom layer to bottom. All field seams shall be made using two lines of U.S. Federal Standard Type 101 stitches. All sewn seams shall be downward facing.
- E. When conventional joining of fabric form panels is impractical, adjacent fabric form panels may be overlapped a minimum of 3 ft to form a lap joint, pending approval by ENGINEER. In no case shall a simple butt joint between forms be permitted.

- F. Expansion joints shall be provided or as specified by ENGINEER.
- G. Immediately prior to filling with fine aggregate concrete, the assembled fabric form panels shall be inspected and approved by ENGINEER. At no time shall the unfilled fabric form panels be exposed to ultraviolet light (including direct sunlight) for a period exceeding five (5) days.

### 3.6 FINE AGGREGATE CONCRETE PLACEMENT

- A. Fine aggregate concrete shall be pumped between the top and bottom layers of the fabric form panels through small slits cut in the top layer of the fabric form or through manufacturer supplied valves. The slits shall be sufficient to allow proper insertion of a filling pipe inserted at the end of a 2-inch I.D. concrete pump hose. Fine aggregate concrete shall be pumped to fill the forms to the recommended thickness and configuration.
- B. Holes in the fabric forms left by the removal of the filling pipe shall be temporarily closed by inserting a piece of fabric. The fabric shall be removed when the concrete is no longer fluid and the concrete surface at the hole shall be cleaned and smoothed by hand.
- C. Each cubic yard of fine aggregate concrete shall cover, at a maximum, 50 ft<sup>2</sup> of fabric form material.
- D. Ensure complete filling of the fabric formed panels to the thickness specified by the ENGINEER. Avoid excessive pressure on the fabric form panels during fine aggregate concrete pumping and avoid using cold joints during filling.
- E. Measure the thickness of the current section using a stiff wire at several locations prior to removing the filling pipe and proceed to the adjacent lining section. The average of all thickness measurements shall be not less than the specified average thickness of the concrete lining. Should the measurements not meet the specified average thickness, pumping shall continue until the specified average thickness has been attained.
- F. Do not use high-pressure water hose to remove spilled fine aggregate concrete from the surface of the freshly pumped fabric formed material.
- G. Provide boards if foot traffic on the freshly pumped concrete lining is necessary.
- H. Backfill and compact anchor trenches after the fine aggregate concrete has set. Backfilling and compaction of trenches shall be completed in a timely fashion to protect the completed fabric formed material.

### 3.7 FIELD QUALITY CONTROL

- A. Section 01 40 00 Quality Requirements: Field inspecting and testing.
- B. ENGINEER will inspect geotextile and fabric form panels in-place for tears, overlaps, and consistency after product installation. Damaged sections, as judged by ENGINEER, will be marked and their removal from the work area recorded. Repair minor damage and minor defects as specified in manufacturer's procedures, when approved by ENGINEER, to ENGINEER's satisfaction.

- C. ENGINEER will verify that weather conditions (appropriate air temperature, non-excessive wind, and lack of precipitation) are acceptable for panel placement.
- D. Conformance Testing:
  - 1. Samples of the materials may be removed by ENGINEER and sent to laboratory for testing to ensure conformance with the requirements of this Section.
  - 2. This testing will be carried out prior to field placement.
  - 3. ENGINEER may collect additional samples if initial test results do not comply with requirements of PART 2. The additional testing will be performed at CONTRACTOR's expense.
  - 4. As a minimum, the following conformance tests will be performed on the material sample:
    - a. Mass per unit area.
    - b. Grab tensile strength.
    - c. Tear strength.
    - d. Apparent Opening Size (AOS).
    - e. Permittivity test.

END OF SECTION

# **Appendix H-2**

## Design Specifications - Northwest Corner Mechanical Dredging

### SECTION 35 24 00

### DREDGING

### PART 1 GENERAL

### 1.1 SUMMARY

### A. Section Includes:

- 1. Furnish all material, equipment and labor to complete the mechanical dredging of subsurface material to the target limits and the transport, handling, and placement of the dredged material at a designated on-site area for material solidification.
- 2. Furnish all materials, equipment and labor to apply and mix chemical additives in the water column to increase the settling rate after dredging.
- 3. Furnish all materials, equipment and labor to place a residual management layer and final cover material over the entire surface of removed material (and beyond, where required) upon completion of dredging.

### 1.2 MATERIALS TO BE REMOVED

- A. Materials include subsurface soil within the defined northwest corner of the Work Site, as shown on Drawings. The subsurface soil is described as heterogeneous comprised of highly interbedded alluvial deposits consisting of silty sands, sands, silts, lean clays, fat clays, and sandy clays down to an elevation of approximately -30 feet NAVD88.
- B. Soil boring logs, geotechnical properties and analytical results of the subsurface material at the dredge site can be found in the Final 100% Remedial Design Report, Northern Impoundment, San Jacinto River Waste Pits Site.

### 1.3 PHYSICAL DATA

- A. Vertical datum shown in Drawings is referenced to the North American Vertical Datum of 1988 (NAVD88), measured in feet.
- B. Horizontal coordinates shown in Drawings is referenced to the Texas State Plane Zone 4, TX-South Central.

### 1.4 REFERENCES

- A. Related Sections:
  - 1. Section 01 10 00 Summary
  - 2. Section 01 33 00 Submittal Procedures
  - 3. Section 01 40 00 Quality Requirements.
  - 4. Section 01 50 00 Temporary Facilities and Controls
  - 5. Section 01 57 19 Temporary Environmental Controls
  - 6. Section 02 61 14 Material Handling and Transportation
  - 7. Section 35 49 25 Turbidity Curtain

### 1.5 QUALIFICATIONS

- A. CONTRACTOR shall have completed at least three (3) dredging projects of similar size and scope using mechanical methods.
- B. The dredging supervisor shall have a minimum of five (5) years of experience with dredging projects in the role of dredging supervisor or superintendent.
- C. CONTRACTOR's equipment operators, supervisory engineering staff, and technical staff shall have a minimum of two (2) years of experience with dredging by mechanical methods.

### 1.6 PRE-MOBILIZATION AND PRE-DREDGE MEETINGS

- A. Section 01 30 00 Administrative Requirements: Pre-mobilization and pre-dredge meetings.
- B. Convene 1 week prior to installation of turbidity curtains.
- C. Mandatory attendance includes ENGINEER, CONTRACTOR and Subcontractor.
- D. Purpose of Meeting:
  - 1. Review the Work Site-specific quality assurance/quality control and monitoring procedures.
  - 2. Review time schedules.
  - 3. Review applicable personal protective equipment and regulations.
  - 4. Review safety plan and procedures.

### 1.7 SEQUENCE OF WORK

- A. Mobilize to the Work Site and construct staging area and Solidification Containment Area.
- B. Install turbidity curtains outside the active dredge site, as shown on Drawings.
- C. Perform bathymetric survey to confirm pre-dredge surface and develop dredge prisms.
- D. Conduct mechanical dredging for Production Dredging pass to remove the subsurface material to the lines and grades shown on Drawings and as described in this specification.
- E. Apply chemical additives (e.g., polymers, coagulants) with the specified dosage to facilitate settling of suspended solids. Sufficiently mix within the water column to provide maximum effectiveness of chemical additives.
- F. Perform bathymetric survey after settling of suspended solids. Develop dredge prisms based on surveyed surface and target elevations provided by ENGINEER for final pass.
- G. Conduct mechanical dredging for Final Dredging pass to remove settled material and/or additional subsurface material to limits determined by ENGINEER.
- H. Place granular material within dredge limits while pumping excess water to the Water Treatment System (WTS).

I. Place granular material in area beyond the dredge site (i.e., northwest) as indicated on Drawings.

### 1.8 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Plan for installation of turbidity curtains including equipment to be used and deployment procedures.
- C. Manufacture Data (chemical additives): Include material properties and safety data sheets (SDS) and manufacturer's certified report of test.
- D. Dredge Operation Plan for Approval: Include as a minimum the followings:
  - 1. Description of mobilization/demobilization activities.
  - 2. Schedule of dredging and ancillary works.
  - 3. Method and equipment to accomplish the dredging operation, including ancillary equipment.
  - 4. Description and Shop Drawing of environmental dredging bucket that will be used.
  - 5. Description of dredging procedures to minimize resuspension.
  - 6. Method of verification of pre-dredge and post-dredge site conditions.
  - 7. Site access procedures, including location of staging areas and access to dredging equipment before each shift.
  - 8. Proposed dredging plan and method of verification of dredge positioning and dredging depth.
  - 9. Procedures and equipment layout for solidification procedures.
  - 10. Information to be included in the daily records of operation.
- E. Water Quality Monitoring and Control Plan describing the methods and procedures for controlling water quality outside the work area during dredging operations. Include monitoring procedures to demonstrate that the controls are effective.
- F. Chemical Additives Dosing Plan: include as a minimum the following:
  - 1. Proposed chemical additives Include plan for treatability testing using site water and sediments to determine appropriate additives and dosage.
  - 2. Dosage to be used based on the treatability testing.
  - 3. Plan for placing residual management layer including equipment to be used and placement procedures.
- G. Daily records of operation.

### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Package and label chemical additives bearing manufacturer's markings to clearly identify it with applicable safety data sheet (SDS) submitted to ENGINEER.

- C. When transported to the Work Site, handle chemical additives by appropriate means as recommended by manufacturer.
- D. Store chemical additives as recommended by manufacturer to prevent degradation, theft, and vandalism.

### 1.10 AMBIENT CONDITIONS

A. Suspend operations whenever climatic or water conditions, or equipment proposed for the operation, as determined by ENGINEER, are unsatisfactory for performing the tasks in accordance with the requirements of this Section.

### PART 2 PRODUCTS

### 2.1 CHEMICAL ADDITIVES

- A. CONTRACTOR is required to use chemical additives in the water column after the completion of the Production Dredging pass to settle out the suspended solids.
- B. Chemical additives may also be used to settle suspended solids after the Final Dredging pass at the direction of the ENGINEER.

### 2.2 TURBIDITY CURTAIN

- A. Impermeable Turbidity Curtains. Two parallel turbidity curtains shall be installed to contain the suspended soils from dredging operation within the dredge site.
- B. Describe curtain material type and deployment procedures in Dredging Operation Plan.

### 2.3 GRANULAR MATERIAL

- A. Supply granular material with the following mixture:
  - 1. 70 to 80 percent sand between No. 30 and No. 200 sieve sizes
  - 2. 20 to 30 percent fines (passing No. 200 sieve)

### PART 3 EXECUTION

### 3.1 EQUIPMENT

A. Provide dredging equipment as described in CONTRACTOR's Dredging Operation Plan. Equipment must provide sufficient capacity to satisfactorily complete the Work scope within the scheduled time and in accordance with this specification. Equipment should be selected for implementation that is the most protective of the environment for this project.

- B. Provide environmental bucket that is specifically designed to reduce the release of sediments during closure and retrieval to minimize resuspension.
- C. Provide equipment for transportation of the dredge material to the shore (dry land outside of dredging limits) and offloading to facilitate efficient management and transportation of material.
- D. Material barges must be sealed to prevent leakage.
- E. Provide Solidification Containment Area at location shown on Drawings to meet the following requirements:
  - 1. Sufficient size and capacity to manage a minimum of two days of production.
  - 2. Capable of containing material for off-loading, solidification and loading of dredge spoils.
  - 3. Provide secondary containment to prevent potential spillage from operation.
  - 4. Follow layout and details shown on Drawings.

### 3.2 TURBIDITY CONTROL

- A. Work in the dredge site shall be done to minimize resuspension of material outside of the active work area. Take all precautions to minimize and contain suspended solids from the dredging operation.
- B. Deploy turbidity curtain along the boundary of the dredge site where the land elevation is below -9 feet NAVD88 prior to dredging as shown on Drawings. The bottom of the turbidity curtain shall be installed at the mud line and anchored in place adjacent to the dredge site such that the resuspended sediment will be contained inside the work area during the dredging operation.
- C. Follow the approved Water Quality Monitoring and Control Plan to maintain and monitor the water quality outside the work area.

### 3.3 DREDGING

- A. Perform Dredging Production pass to the target limits shown on Drawings, or as directed by ENGINEER.
  - 1. Begin dredging in the direction and sequence as proposed in the approved Dredging Operation Plan. Attain full grade at each transect prior to moving to the next transect location.
- B. Maintain water level during dredging so that it does not go below -10.9 ft NAVD88.
- C. Dredging tolerances are +0 foot and -0.5 feet from the required final elevation to cover the inaccuracies of the dredging process.
- D. The side slopes shall not be steeper than shown on Drawings. Side slopes shall be dug from top to bottom and to the grades shown on Drawings.

- E. Begin dredging at the highest elevation of material to be removed and work toward the lowest elevation to minimize sloughing of material.
- F. Do not overfill dredge bucket.
- G. Monitor dredge operation throughout the course of work for depth, slopes, location, and tolerances.
- H. CONTRACTOR shall be responsible for damages due to dredging beyond the specified depth or horizontal limits.
- I. Use real-time kinematic (RTK) GPS to accurately position dredge and remove material in dredge prism. Use Hypack, Inc. Dredgepack® software or similar product to monitor and process the data.
- J. Track progress with bathymetric surveys.
- K. Dredge to minimize resuspension of sediments.
- L. Set and sequence production cuts to reduce concentrations in residuals.
  - 1. Place bucket accurately to avoid missing sediments between bucket placements.
  - 2. Control bucket overpenetration and overfilling.
- M. Dredge entire limit to remove all material within the allowable tolerance.
- N. Notify the ENGINEER when all dredging operations are completed. A post-dredge bathymetric survey of the dredge site and confirmation sampling will be completed by the ENGINEER. Assist ENGINEER by providing equipment and labor support.
- O. Apply chemical additives to promote settling of the resuspended sediments after ENGINEER approval the Production Dredging pass.
  - 1. Evaluate the GHD treatability data and perform additional testing as necessary to develop a plan for application and mixing of polymers, coagulants and/or other additives.
  - 2. Sufficiently mix within the water column to provide maximum effectiveness of chemical additives.
- P. ENGINEER to develop requirements for Final Dredging pass to be performed by CONTRACTOR.
- Q. Follow ENGINEER's requirements for Final Dredging pass.

### 3.4 TRANSPORT OF DREDGE MATERIAL

- A. Place dredged material in sealed hopper and transport onshore to the on-site material processing area.
- B. Transfer the dredged material from the hopper barge to the Solidification Containment Area for waste solidification.

C. Keep material barges in good working condition to prevent spillage or overflow of dredged material.

### 3.5 FIELD QUALITY CONTROL

- A. Lay out work area using benchmarks and baselines established by the surveyor. Be responsible for accuracy of work relative to established benchmarks and baseline.
- B. Maintain buoys and markers required to define transects in dredge site.
- C. Use real time kinematics (RTK) positioning GPS to accurately position dredge and remove material in dredge prism. Use Hypack, Inc. Dredgepack® software or similar product to process the data.
- D. Track progress with bathymetric surveys referenced to survey benchmarks.
- E. Provide a daily quality control report to ENGINEER as specified in the approved Dredging Operation Plan.
- F. Provide a final post-dredge survey of the project dredging limits to ENGINEER for final acceptance of dredging work prior to site restoration.

### 3.6 SITE RESTORATION

- A. After completion and approval of Final Dredging pass by ENGINEER, place chemical additives to promote settling of the resuspended sediments, as directed by ENGINEER.
  - 1. Develop the procedures for the final round of settling of resuspended sediments based on the condition of the water and of the water and the effectiveness of the additives during the first application.
  - 2. Sufficiently mix within the water column to provide maximum effectiveness of chemical additives.
- B. Upon acceptance and approval of the dredging operation by ENGINEER, backfill the entire dredge site with granular material.
- C. Initially place minimum of 2 feet of granular material as residual management layer in thin lifts to minimize disturbance of the settled solids
- D. Subsequently place remainder of granular material to elevation -13 ft NAVD88.
- E. Remove water while placing granular material. Maintain water level between elevation -9 ft NAVD88 and -13 ft NAVD88 during granular material placement. Treat water in WTS.
- F. Place granular material to elevation -13 ft NAVD88. As an alternative, there may be a potential to reuse the removed riprap or aggregate material that comprised the existing rock layer that was removed to facilitate dredging
- G. After completion of granular material placement, pump water to elevation between -13 ft NAVD88 to -13.5 ft NAVD88.

- H. Place granular material to lines and grade shown on Drawings to the northwest of the dredging area.
- I. Demobilize Equipment.
- J. Remove rock and liner from Solidification Containment Area and transport off site for disposal at direction of ENGINEER.

END OF SECTION

## Appendix J Supporting Deliverables

# **Appendix J-1**

## Supporting Deliverables - Northwest Corner Capping



## Attachment 6-A -Construction Quality Assurance/Quality Control Plan (CQA/QCP) - Northern Impoundment - Northwest Corner (Capping)

Provided As Part of Pre-Final 90% Remedial Design - Northern Impoundment (Northwest Corner Component) San Jacinto River Waste Pits Site Harris County, Texas

International Paper Company McGinnes Industrial Maintenance Corporation

November 8, 2022

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### Summary of Construction Quality Assurance and Quality Control Inspections Northern Impoundment Remediation

San Jacinto River Waste Pits Site

### Harris County, Texas

Key Work Task Component to be Inspected	Key Items to be Checked During Inspection	Type of Inspection	*Frequency of Inspection	Contractor Submittals to Resident Engineer
A. Temporary Traffic Control				
Traffic Control	<ul> <li>Has a Temporary Traffic Control Plan been provided as specified?</li> </ul>	Check Section 01 35 00	Continuous	Temporary Traffic Control Plan
Traffic Control Devices	<ul> <li>Have signs been inspected for legibility, damage, suitability, and location?</li> </ul>	Check Section 01 35 00	Continuous	• None
	<ul> <li>Are signs clean, repaired, or replaced to maintain clarity and reflectiveness?</li> </ul>			
R Health and Safety			l	
Health and Safety Planning	<ul> <li>Are health and safety procedures in place, including equipment, work area and excavation inspections?</li> </ul>	Check Section 1 35 29	Continuous	Health and Safety Plan
C. Temporary Facilities and Controls		•	•	•
• Utilities	<ul> <li>Have utilities been provided as specified and coordinated with local utility providers?</li> </ul>	<ul><li>Check Section 01 50 00</li><li>Visual</li></ul>	Periodic during installation	• None
Construction Facilities	<ul> <li>Have temporary construction facilities been provided as specified?</li> </ul>	<ul><li>Check Section 01 50 00</li><li>Visual</li></ul>	Periodic during installation	• None
Vehicular Access and Parking	<ul> <li>Has vehicular access and parking been provided as specified?</li> </ul>	<ul><li>Check Section 01 50 00</li><li>Visual</li></ul>	Periodic during installation	• None
Barriers and Enclosures	<ul> <li>Have barriers and enclosures been provided as specified?</li> </ul>	<ul><li>Check Section 01 50 00</li><li>Visual</li></ul>	Periodic during installation	• None
Temporary Controls	<ul> <li>Have temporary controls been provided as specified?</li> </ul>	<ul><li>Check Section 01 50 00</li><li>Visual</li></ul>	Periodic during installation	• None
D. Tomporany Soil Erosion and Sodimont Control				
Erosion Control Items	<ul> <li>Is depth of silt fence embedment in accordance with drawings?</li> </ul>	<ul> <li>Visual &amp; check drawings</li> </ul>	Continuous	<ul> <li>Soil Erosion &amp; Sediment Control Plan</li> </ul>
	Are tears or holes present in silt fence fabric?	• Visual	Continuous	Product Data
	<ul> <li>Is erosion around and under silt fence present?</li> </ul>	• Visual	Continuous	• None
	<ul> <li>Is sagging or collapse evident?</li> </ul>	• Visual	Continuous	• None
	<ul> <li>Has a Soil Erosion and Sediment Control Plan been provided as specified?</li> </ul>	Check permit	Continuous	<ul> <li>Soil Erosion and Sediment Control Plan</li> </ul>
E. Waste Material Solidification				
Waste Material Solidification	<ul> <li>Has waste material been dewatered and solidified as specified?</li> </ul>	Check Section 02 55 13	* Continuous	<ul> <li>Solidification Plan</li> <li>Daily Field Installation Reports</li> <li>Quality Assurance/Quality Control Plan</li> </ul>

### Summary of Construction Quality Assurance and Quality Control Inspections Northern Impoundment Remediation San Jacinto River Waste Pits Site

### Harris County, Texas

Key Work Task Component to be Inspected	Key Items to be Checked During Inspection	Type of Inspection	*Frequency of Inspection	Contractor Submittals to Resident Engineer
F. Material Handling and Transportation				
Material Handling and On-Site Transportation	<ul> <li>Has a Material Handling and On-Site Transportation Plan been provided as specified?</li> </ul>	Check Section 02 61 14	Continuous	Material Handling and On-Site Transportation     Plan
G. Transportation and Disposal				
<ul> <li>Disposal Equipment</li> </ul>	<ul> <li>Is equipment provided as specified?</li> </ul>	Check Section 02 61 16	Upon delivery	<ul> <li>Operating licenses and permits</li> </ul>
	• Is equipment being decontaminated properly?	Check Section 02 61 16	<ul> <li>Prior to leaving Site and changing to lower impacted waste type</li> </ul>	Transportation and Disposal Plan
	Are vehicles maintained properly in accordance with 49 CFR 393?	• Visual	Daily (Periodically)	Transportation and Disposal Plan
	<ul> <li>Do motor vehicle operator(s) perform a safety inspection of each motor vehicle before it is used and at least once a day?</li> </ul>	• Visual	• Continuous	• None
Disposal of Materials	<ul> <li>Has a Transportation and Disposal Plan been provided as specified?</li> </ul>	Check Section 02 61 16	Continuous	<ul> <li>Transportation and Disposal Plan</li> </ul>
	<ul> <li>Has a Transportation Emergency Response Plan been provided as specified?</li> </ul>	Check Section 02 61 16	Continuous	<ul> <li>Transportation and Disposal Plan</li> </ul>
	<ul> <li>Are materials transported and disposed of to satisfy requirements as specified?</li> </ul>	Check Section 02 61 16	• Continuous	<ul> <li>Transportation and Disposal Proposal</li> <li>Shipping and Disposal Documents</li> <li>TSDF Weigh Scale documents</li> </ul>
	<ul> <li>Are trucks inspected prior to leaving the Site to transport for disposal at approved TSDFs?</li> </ul>	• Visual	Continuous	Shipping and Disposal Documents
H. Excavation		•	•	9. 
<ul> <li>Excavation Equipment</li> </ul>	<ul> <li>Is equipment inspected daily by a qualified person?</li> </ul>	• Visual	Continuous	Excavation Plan
• Sediment/Soil	Are excavations being conducted as specified?	<ul> <li>Check Section 31 23 16 and Drawings</li> <li>Visual</li> </ul>	Periodic during excavation	• Excavation Plan
Material Handling and Stockpiling	<ul> <li>Is material being handled and stockpiled as specified?</li> </ul>	<ul> <li>Check Section 31 23 16</li> <li>Visual</li> </ul>	• During excavation and stockpiling	Material Handling and On-Site Transportation     Plan
	• Is load packaged, labelled etc. as specified?	Check Section 31 23 16	After loading and before leaving Site	Material Handling and On-Site Transportation
I. Dewatering				
<ul> <li>Dewatering Equipment</li> </ul>	Does equipment meet specifications?	<ul><li>Check Section 31 23 19</li><li>Visual</li></ul>	Upon delivery	Dewatering Plan
	• Has system been installed as specified?	Check Section 31 23 19 and Drawings	Periodic during installation	Dewatering Plan
	<ul> <li>Has equipment and surplus raw materials been removed?</li> </ul>	• Visual	• Daily as required	Dewatering Plan

### Summary of Construction Quality Assurance and Quality Control Inspections Northern Impoundment Remediation San Jacinto River Waste Pits Site Harris County, Texas

Key Work Task Component to be Inspected	Key Items to be Checked During Inspection	Type of Inspection	*Frequency of Inspection	Contractor Submittals to Resident Engineer
Dewatering (cont'd)	2 4			
Sediment/Soil Dewatering	<ul> <li>Is dewatering procedure adequate to contain impacted groundwater?</li> </ul>	<ul><li>Check Section 31 23 19</li><li>Visual</li></ul>	Periodic during operation	Dewatering Plan
	<ul> <li>Is material being dewatered as specified?</li> </ul>	<ul> <li>Check Section 31 23 19</li> <li>Visual</li> </ul>	During staging	• Dewatering Plan
<ul> <li>Sediment/Soil Dewatering (cont'd)</li> </ul>	<ul> <li>Is settlement being detected where critical structures or facilities exist immediately adjacent to areas of proposed dewatering.</li> </ul>	Check Section 31 23 19     Visual	Periodic during operation	* None
J. Fill				
Existing Berm Material	Does fill meet specifications?	Check Section 31 23 23 and Drawings	• Each source of fill	Geotechnical testing results
	<ul> <li>Has fill been placed as specified?</li> </ul>	• Visual • Survey	Periodic during installation	<ul> <li>Limits of excavation and thickness measurements</li> </ul>
Fill for Between Sheet Pile Walls	Does fill meet specifications?	Check Section 31 23 23 and Drawings	Each source of fill	<ul> <li>Geotechnical testing results</li> </ul>
	<ul> <li>Has fill been placed as specified?</li> </ul>	<ul><li>Visual</li><li>Survey</li></ul>	Periodic during installation	<ul> <li>Limits of excavation and thickness measurements</li> </ul>
• Structural Fill	Does fill meet specifications?	Check Section 31 23 23 and Drawings	* Each source of fill	<ul> <li>Geotechnical testing results</li> <li>Analytical data</li> <li>Product data</li> </ul>
	<ul> <li>Has fill been placed as specified?</li> </ul>	<ul><li>Visual</li><li>Survey</li></ul>	Periodic during installation	<ul> <li>Limits of excavation and thickness measurements</li> </ul>
Common Fill	<ul> <li>Does fill meet specifications?</li> </ul>	<ul> <li>Check Section 31 23 23 and Drawings</li> </ul>	<ul> <li>Each source of fill</li> </ul>	<ul> <li>Geotechnical testing results</li> <li>Analytical data</li> <li>Product data</li> </ul>
	<ul> <li>Has fill been placed as specified?</li> </ul>	• Visual • Survey	<ul> <li>Periodic during installation</li> </ul>	<ul> <li>Limits of excavation and thickness measurements</li> </ul>
• Sand	<ul> <li>Does sand meet specifications?</li> </ul>	<ul> <li>Check Section 31 23 23 and Drawings</li> </ul>	<ul> <li>Each source of sand</li> </ul>	<ul> <li>Geotechnical testing results</li> <li>Analytical data</li> <li>Product data</li> </ul>
	<ul> <li>Has sand been placed as specified?</li> </ul>	• Visual • Survey	<ul> <li>Periodic during installation</li> </ul>	<ul> <li>Limits of excavation and thickness measurements</li> </ul>
• Topsoil	<ul> <li>Does topsoil meet specifications?</li> </ul>	<ul> <li>Check Section 31 23 23</li> <li>Visual</li> </ul>	<ul> <li>Each source of topsoil</li> </ul>	<ul> <li>Geotechnical testing results</li> <li>Analytical data</li> <li>Product data</li> </ul>
• Coarse Aggregate	<ul> <li>Does aggregate meet specifications?</li> </ul>	Check Section 21 23 23	<ul> <li>Each source of aggregate</li> </ul>	<ul> <li>Source of aggregate</li> <li>Geotechnical data</li> <li>Samples</li> <li>Suppliers' Certificates</li> </ul>
	<ul> <li>Has aggregate been placed as specified?</li> </ul>	<ul> <li>Visual</li> <li>Survey</li> </ul>	Periodic during installation	Limits of excavation and thickness measurements

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### Table 1

### Summary of Construction Quality Assurance and Quality Control Inspections Northern Impoundment Remediation San Jacinto River Waste Pits Site Harris County, Texas

Key Work Task Component	Key Items to be Checked	Type of Inspection	*Frequency of Inspection	Contractor Submittals to Resident Engineer
J. Fill (cont'd)				
Clearstone	Does clearstone meet specifications?	Check Section 31 23 23     Visual	Each source of clearstone	<ul> <li>Geotechnical testing results</li> <li>Analytical data</li> <li>Product data</li> </ul>
Backfilling Excavations	Are excavations being backfilled as specified?	• Check Section 31 23 23 and Drawings	During backfilling	<ul><li>Geotechnical data</li><li>Survey</li></ul>
	<ul> <li>Has horizontal and vertical control been maintained?</li> </ul>	<ul><li>Check Section 31 23 23</li><li>Visual</li></ul>	After placement	<ul> <li>Analytical results</li> <li>Test reports</li> </ul>
K. Synthetic Materials				
• Materials	Do materials provided meet specifications?	Check Section 31 35 26.16	<ul> <li>Each source of geotextile and geomembrane (liner)</li> </ul>	<ul> <li>Product data</li> <li>Manufacture's instructions</li> <li>Samples</li> </ul>
	Are materials being stored properly?	• Visual	Upon delivery to Site	<ul> <li>Manufacturer's instructions</li> </ul>
Installation	Have materials been placed as specified?	• Visual • Survey	Periodic during installation	Manufacturer's instructions
	Are there any visible defects with materials?	• Visual	After installation is completed	• None
L. Riprap				-
• Materials	Do materials provided meet specifications?	Check Section 31 37 00	<ul> <li>prior to delivery</li> </ul>	Source Quality Control testing
Installation	<ul> <li>Have materials been placed to the proper location and depth</li> </ul>	Survey	Continuous during work	• None
M. Articulating Block Fabric Formed Concrete				
Submittals	Has Water Quality Monitoring and Control Plan been provided as specified?	Check Section 31 35 26.50	Continuous	Water Quality Monitoring and Control Plan
• Materials	Do materials provided meet specifications?	Check Section 31 35 26.50	<ul> <li>Each source of fine aggregate</li> <li>Each source of geotextile and fabric form fabric</li> </ul>	<ul> <li>Product data</li> <li>Manufacture's instructions</li> <li>Samples</li> </ul>
	Are materials being stored properly?	• Visual	Upon delivery to Site	Manufacturer's instructions
	<ul> <li>Has Manufacturer's Certificates been provided as specified?</li> </ul>	• Check Section 31 35 26.50	• Continuous	Product data
	<ul> <li>Have Qualification Statements for manufactuer and installer been provided as specified?</li> </ul>	Check Section 31 35 26.50	• Continuous	Product data
	Have Daily Field Installation Reports been provided?	Check Section 31 35 26.50	• Daily	Field Installation Reports
Placement	<ul> <li>Has articulating block fabric fomed concrete been placed as specified?</li> </ul>	• Visual • Survey	Periodic during installation	Limits of placement and thickness measurements

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### Table 1

### Summary of Construction Quality Assurance and Quality Control Inspections Northern Impoundment Remediation San Jacinto River Waste Pits Site Harris County, Texas

Key Work Task Component to be Inspected	Key Items to be Checked During Inspection	Type of Inspection	*Frequency of Inspection	Contractor Submittals to Resident Engineer
N. Sheet Piles				
• Materials	Do materials provided meet specifications?	Check Section 31 41 16	Upon delivery	<ul> <li>Product data</li> <li>Mix Design</li> <li>Test samples in accordance with AI MS-2</li> <li>Records</li> </ul>
Installation	<ul> <li>Have sheet piles been inspected prior to and after installation?</li> </ul>	<ul> <li>Check Section 31 41 16 and Drawings</li> </ul>	After installation	• Records
	Have sheet piles been installed as specified?	• Check Section 31 41 16 and Drawings	After installation	Certifications
O. Chain Link Fences and Gates				
• Materials	Do materials provided meet specifications?	Check Section 32 31 13	• Upon delivery	<ul><li>Product data</li><li>Manufacture's instructions</li></ul>
Installation	<ul> <li>Have chain link fences and gates been installed as specified?</li> </ul>	<ul> <li>Check Section 32 31 13 and s Drawings</li> </ul>	After installation	Certifications
	<ul> <li>Has a final inspection taken place?</li> </ul>	<ul> <li>Check Section 32 31 13 and Drawings</li> </ul>	Upon Substantial Performance	• Records
P. Seeding				
<ul> <li>Topsoil Placement</li> </ul>	Has topsoil been placed as specified?	<ul><li>Check Section 31 23 23</li><li>Visual</li></ul>	<ul> <li>Periodic during placement</li> </ul>	• None
	<ul> <li>Has topsoil been lightly surface compacted following seeding?</li> </ul>	• Visual	Periodic following seeding	• None
	Horizontal and vertical control	• Visual • Survey	<ul> <li>Following placement</li> </ul>	• Survey
Seeding	Are materials stored properly?	• Visual	Periodic during storage	Manufacturer's instructions
	<ul> <li>Does seed, lime, fertilizer, and mulch meet specifications?</li> </ul>	Check Section 32 92 19	Prior to application	<ul><li>Source of materials</li><li>Product data</li></ul>
	<ul> <li>Has hydroseed, fertilizer, and mulch been applied as specified?</li> </ul>	<ul><li>Check Section 32 93 00</li><li>Visual</li></ul>	<ul> <li>Periodic during application</li> </ul>	<ul> <li>Seeding and Erosion Control Plan</li> </ul>
	<ul> <li>Have correct quantities of hydroseed, fertilizer, and mulch been placed?</li> </ul>	<ul><li>Check Section 32 93 00</li><li>Visual</li></ul>	<ul> <li>Periodic during placement</li> </ul>	<ul><li>Seed certificates</li><li>Fertilizer certificates</li></ul>
	Have bare spots been rehydroseeded?	• Visual	Periodic during installation	• None
	• Is height of grass as specified?	Check Section 32 93 00	Periodically during maintenance	• None

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### Table 1

#### Summary of Construction Quality Assurance and Quality Control Inspections Northern Impoundment Remediation San Jacinto River Waste Pits Site Harris County, Texas

Key Work Task Component	Key Items to be Checked	Type of	*Frequency of	Contractor Submittals to Resident Engineer		
Q. Turbidity Curtain	During inspection	inspection	mspection	Resident Engineer		
• Material	Have materials been joint inspected upon delivery?	• Visual	Upon delivery to Work Site	• None		
	<ul> <li>Are materials being stored properly?</li> </ul>	• Visual	Periodic during storage	Manufacturer's instructions		
	Do materials meet specifications?	<ul> <li>Check Section 31 05 19</li> <li>Check material property sheets and quality control certificates</li> </ul>	<ul> <li>Each source of geotextile</li> <li>Upon delivery to Work Site</li> </ul>	<ul> <li>Product data</li> <li>Manufacturer's certificates</li> <li>Samples</li> </ul>		
Placement	• Have materials been placed as specified?	• Visual • Survey	Periodic during installation	<ul> <li>Manufacturer's instructions</li> </ul>		
	<ul> <li>Are there any visible defects, tears or overlaps with materials?</li> </ul>	• Visual	After installation is completed	* None		
R. Process Equipment						
Materials	* Do materials provided meet specifications?	Check Division 40 Sections	* Upon delivery	<ul> <li>Product data</li> <li>Shop drawings</li> <li>Certifications and Reports</li> </ul>		
Installation	* Has process equipment been installed as specified?	<ul> <li>Check Division 40 Sections and Drawings</li> </ul>	After installation	• Records		
	<ul> <li>Has a final inspection taken place?</li> </ul>	<ul> <li>Check Division 40 Sections and Drawings</li> </ul>	Upon Substantial Performance	• Records		
R. Wastewater Treatment System						
Materials	• Do materials provided meet specifications?	Check Section 46 07 01	Upon delivery	<ul> <li>Product data</li> <li>Shop drawings</li> <li>Certifications and Reports</li> </ul>		
Installation	<ul> <li>Has process equipment been installed as specified?</li> </ul>	Check Section 46 07 01     and Drawings	After installation	• Records		
	<ul> <li>Has a final inspection taken place?</li> </ul>	Check Section 46 07 01	Upon Substantial Performance	• Records		

Notes:

\*Frequencies of inspections are considered minimum and will be increased or added to as determined necessary by the Engineer.

1. The quality assurance/quality control inspections included herein are suggested in accordance with the technical specifications.

2. New or updated information is indicated by black font.

#### Summary of Construction Quality Assurance and Quality Control Tests Northern Impoundment San Jacinto River Waste Pits Site Harris County, Texas

Work Task Component to be Tested	Type of Test	Standard	Frequency of Tests per Construction Specifications	Key Acceptance Criteria	Sample Size/Location	Potential Corrective Measures	Test Location	Percentage of Test Frequency by Contractor	Per Tes by	rcentage of t Frequency y Engineer
Reportable Quantities	<ul> <li>Identification of hazardous chemicals</li> </ul>	State accredited method	Throughout the Works	In accordance with State accredited criteria	As determined by Engineer	See Section 01 35 29	On Site	• 50	•	50
Waste Material Sonification (Section     Waste Material Solidification	02 55 13)  In accordance with accepted QA/QC Plan	State accredited method	Throughout the Works	In accordance with State accredited criteria	As determined by Engineer	Locate suitable material and re-test	Analytical Laboratory	• 100	•	0
C. Geotextiles for Earthwork (Section 3	1 05 19.13)									
Geotextile G1	T 1 01 11							100		0
Material	I ensile Strength     Elengation of Brook	ASTM D4632/D4632M     ASTM D4632/D4632M	See standard	• 220	Minimum once every 100,000 sq ft	Removal, reinstallation and re-testing	Analytical Laboratory	• 100 • 100	•	0
	Static CBR Puncture	<ul> <li>ASTM D4032/D4032M</li> <li>ASTM D6241</li> </ul>	See standard	• 50 • 575	As above	<ul> <li>As above</li> <li>As above</li> </ul>	<ul> <li>As above</li> <li>As above</li> </ul>	• 100		0
	Trapezoid Tear Strength	• ASTM D4533	See standard	• 90	As above	As above	As above	• 100		0
	Apparent Opening Size (AOS)	• ASTM D4751	Once per month minimum	• 80	Minimum once every month	As above	As above	• 100		0
	Permittivity	<ul> <li>ASTM D4491</li> </ul>	See standard	• 1.26	<ul> <li>Minimum once every 100,000 sq ft</li> </ul>	<ul> <li>As above</li> </ul>	<ul> <li>As above</li> </ul>	• 100		0
	Permeability	• ASTM D4491	<ul> <li>See standard</li> </ul>	• 0.30	As above	<ul> <li>As above</li> </ul>	<ul> <li>As above</li> </ul>	• 100		0
	Water Flow Rate	• ASTM D4491	See standard	• 95	As above	As above	As above	• 100	•	0
	Ultra Violet Resistance	• ASTM D4355	Once per month minimum	• 70	Minimum once every month	<ul> <li>As above</li> </ul>	<ul> <li>As above</li> </ul>	• 100	•	0
Installation	Conformance Testing	<ul> <li>ASTM D4354</li> </ul>	See standard	<ul> <li>In accordance with State accredited criteria</li> </ul>	As above	As above	As above	• 50		50
meterretretretre	Acceptance Testing	<ul> <li>ASTM D4759</li> </ul>	See standard	<ul> <li>In accordance with State accredited criteria</li> </ul>	As above	As above	As above	• 50		50
<ul> <li>Geotextile G2</li> </ul>										
Material	Tensile Strength	• ASTM D4632/D4632M	See standard	• 320	Minimum once every 100,000 sq ft	<ul> <li>Removal, reinstallation and re-testing</li> </ul>	Analytical Laboratory	• 100	•	0
	Elongation at Break     Static CBP Pupeture	<ul> <li>ASTM D4632/D4632M</li> <li>ASTM D4632/D4632M</li> </ul>	See standard	• 50 • 900	As above	As above	<ul> <li>As above</li> <li>As above</li> </ul>	• 100 • 100	•	0
	Trapezoid Tear Strength	<ul> <li>ASTM D4032/D4032/M</li> <li>ASTM D4533</li> </ul>	See standard	• 125	As above	As above	As above	• 100		0
	Apparent Opening Size (AOS)	<ul> <li>ASTM D4751</li> </ul>	Once per month minimum	• 100	Minimum once every month	As above	As above	• 100		0
	Permittivity	• ASTM D4491	See standard	• 0.80	Minimum once every 100,000 sq ft	• As above	• As above	• 100		0
	Permeability	<ul> <li>ASTM D4491</li> </ul>	<ul> <li>See standard</li> </ul>	• 0.29	As above	<ul> <li>As above</li> </ul>	<ul> <li>As above</li> </ul>	• 100		0
	Water Flow Rate	• ASTM D4491	See standard	• 60	As above	As above	<ul> <li>As above</li> </ul>	• 100		0
	Ultra Violet Resistance	• ASTM D4355	Once per month minimum	• 70	Minimum once every month	<ul> <li>As above</li> </ul>	<ul> <li>As above</li> </ul>	• 100	۰	0
Installation	Conformance Testing	• ASTM D/35/	<ul> <li>See standard</li> </ul>	<ul> <li>In accordance with State accredited criteria</li> </ul>	* As above	• As above	• As above	. 50		50
mstanation	Acceptance Testing	<ul> <li>ASTM D4334</li> <li>ASTM D4759</li> </ul>	See standard	In accordance with State accredited criteria	As above	As above	As above	• 50		50
	, cooptailed Footing				10 00010		, 10 0.5010	00		00
<ul> <li>Geotextile G3</li> </ul>										
Material	<ul> <li>Tensile Strength @ 2% strain (MD)</li> </ul>	• ASTM D4595	See standard	• 720 (typical) 600 MARV	Minimum once every 100,000 sq ft	<ul> <li>Removal, reinstallation and re-testing</li> </ul>	<ul> <li>Analytical Laboratory</li> </ul>	· 100		0
	Tensile Strength @ 2% strain (CD)	• ASTM D4595	See standard	• 1200 (typical) 1020 (MARV)	As above	As above	As above	• 100	•	0
	I ensile Strength @ 5% strain (MD)     Tensile Strength @ 5% strain (CD)	ASTM D4595     ASTM D4595	See standard	<ul> <li>2100 (typical) 1800 (MARV)</li> <li>2580 (typical) 2256 (MARV)</li> </ul>	As above	As above	<ul> <li>As above</li> <li>As above</li> </ul>	• 100 • 100	•	0
	Apparent Opening Size (AOS)	<ul> <li>ASTM D4333</li> <li>ASTM D4751</li> </ul>	Once per month minimum	• 50 (typical) 2250 (MARV)	Minimum once every month	As above	As above	• 100		0
	Permittivity	<ul> <li>ASTM D4491</li> </ul>	See standard	• 1.2 (typical) 0.9 (MARV)	Minimum once every 100.000 sq ft	As above	As above	• 100		0
	Water Flow Rate	• ASTM D4491	See standard	• 85 (typical) 75 (MARV)	As above	• As above	• As above	• 100		0
	<ul> <li>Ultra Violet Resistance</li> </ul>	• ASTM D4355	Once per month minimum	• 70	Minimum once every month	As above	As above	• 100		0
	Pore Size	<ul> <li>ASTM D6767</li> </ul>	<ul> <li>See standard</li> </ul>	<ul> <li>85 (typical) 75 (MARV)</li> </ul>	<ul> <li>Minimum once every 100,000 sq ft</li> </ul>	<ul> <li>As above</li> </ul>	<ul> <li>As above</li> </ul>	• 100	•	0
	Interaction Coefficient	• ASTM D6706	See standard	• 0.89	As above	As above	As above	• 100	•	0
	<ul> <li>Factory Sewn Seam</li> </ul>	• ASTM D4884.D4884M	See standard	• 2700	As above	<ul> <li>As above</li> </ul>	As above	* 100	•	0
Installation	<ul> <li>Conformance Testing</li> </ul>	<ul> <li>ASTM D4354</li> </ul>	<ul> <li>See standard</li> </ul>	<ul> <li>In accordance with State accredited criteria</li> </ul>	As above	<ul> <li>As above</li> </ul>	<ul> <li>As above</li> </ul>	• 50		50
	Acceptance Testing	• ASTM D4759	See standard	<ul> <li>In accordance with State accredited criteria</li> </ul>	As above	As above	As above	• 50	•	50
D. Fill (Section 31 23 23)	Destinte Oine		Nicinum Alextrace 0.500	Des AOTM standard		Least with the west of the test of	Analatical Later	100	-	0
<ul> <li>Existing Berm Material Material</li> </ul>	Particle Size	<ul> <li>ASTM D6913/D6913M</li> <li>and D7928</li> </ul>	• Minimum 1 test per 2,500 cu yd (clay)	Per ASTM standard	Sample size per ASTM     collected at source	<ul> <li>Locate suitable material and re-test</li> </ul>	<ul> <li>Analytical Laboratory</li> </ul>	• 100	•	U
Waleriai	Soil Classification	• ASTM D2487	• Minimum 1 test per 2,500 cu yd (clay)	* Any except poorly graded and except CH, MH, OL, and OH	As above	<ul> <li>As above</li> </ul>	Analytical Laboratory	• 100	•	0
	Chemical Analysis	<ul> <li>(1) EPA SW 846.</li> <li>(2) TCL: Target Compound List.</li> <li>(3) TAL: Target Analyte List</li> </ul>	Minimum 1 test per source	In accordance with State accredited criteria	Sample collected from stockpile at source	• As above	Analytical Laboratory	• 100	٠	0
	Parameter TAL <sup>(3)</sup> Metals Hexavalent Chromium Cyanide TCL <sup>(2)</sup> Volatiles TCL Semi-Volatiles TCL Pesticides	(b) 1142 Methods SW-846 6020A/7471A SW-846 7196A SW-846 9010/9012 SW-846 8260B SW-846 8270D SW-846 8081B								
	Polychlorinated Biphenyls Herbicides	SW-846 8082A SW-846 8151A								

### Summary of Construction Quality Assurance and Quality Control Tests Northern Impoundment San Jacinto River Waste Pits Site Harris County, Texas

Work Task Component to be Tested	Type of Test	Standard	Frequency of Tests per Construction Specifications	Key Acceptance Criteria	Sample Size/Location	Potential Corrective Measures	Test Location	Percentage of Test Frequency by Contractor	Percentage of Test Frequency by Engineer
D. Fill (Section 31 23 23) cont'd     Aggregate Types A1 and A2									
(Course Aggregate									
and Clear Stone) Material	• Grain Size	• ASTM C117, C136/C136M,	• Minimum 1 test per 1,000 cu yd	Per ASTM standard	Sample size per ASTM collected at source	Locate suitable material and re-test	Analytical Laboratory	• 100	• 0
	Chemical Analysis	and D6913/D6913M • (1) EPA SW 846.	Minimum 1 test per source	In accordance with State accredited criteria	<ul> <li>Sample collected from stockpile at source</li> </ul>	As above	Analytical Laboratory	• 100	• 0
	Chonnoal / analyoio	<ul> <li>(2) TCL: Target Compound List.</li> <li>(2) TAL: Target Applied List.</li> </ul>				7.8 db010	, analysiosi Laboratory		
	Parameter	Methods							
	TAL <sup>(3)</sup> Metals Hexavalent Chromium	SW-846 6020A/7471A SW-846 7196A							
	Cyanide	SW-846 9010/9012 SW-846 8260B							
	TCL Semi-Volatiles	SW-846 8270D							
	Polychlorinated Biphenyls	SW-846 8081B SW-846 8082A							
	Herbicides	SW-846 8151A							
Soil Type S1 and S2     (Fill Between Sheet Pile Walls									
and Structural Fill)	Destinte Oise		Minimum 4 hashes a 0 500 minut (class)	Due AOTAL sharehood			An all dis all all and another	100	0
Material	· Particle Size	and D7928	• Minimum Titest per 2,500 cu ya (clay)	• Per ASTM standard	collected at source	Locate suitable material and re-test	Anarytical Laboratory	• 100	• 0
	Soil Classification	• ASTM D2487	Minimum 1 test per 2,500 cu yd (clay)	<ul> <li>Any except poorly graded and except CH, MH, OL, and OH</li> </ul>	<ul> <li>As above</li> </ul>	As above	<ul> <li>Analytical Laboratory</li> </ul>	• 100	• 0
	Chemical Analysis	(1) EPA SW 846.     (2) TCL: Target Compound List	Minimum 1 test per source	In accordance with State accredited criteria	Sample collected from stockpile at source	As above	Analytical Laboratory	• 100	• 0
		(3) TAL: Target Analyte List.							
	TAL <sup>(3)</sup> Metals	Methods SW-846 6020A/7471A							
	Hexavalent Chromium Cyanide	SW-846 7196A SW-846 9010/9012							
	TCL <sup>(2)</sup> Volatiles	SW-846 8260B							
	TCL Pesticides	SW-846 8081B							
	Herbicides	SW-846 8151A							
<ul> <li>Soil Type S3 (Common Fill)</li> </ul>									
and Sand	Chemical Analysis	<ul> <li>(1) EPA SW 846.</li> <li>(2) TCL: Target Compound List.</li> </ul>	Minimum 1 test per source	In accordance with State accredited criteria	Sample collected from stockpile at source	As above	Analytical Laboratory	• 100	• 0
	Poromotor	(3) TAL: Target Analyte List.							
	TAL <sup>(3)</sup> Metals	SW-846 6020A/7471A							
	Hexavalent Chromium Cyanide	SW-846 7196A SW-846 9010/9012							
	TCL <sup>(2)</sup> Volatiles TCL Semi-Volatiles	SW-846 8260B SW-846 8270D							
	TCL Pesticides Polychlorinated Binhenvis	SW-846 8081B SW-846 8082A							
	Herbicides	SW-846 8151A							
Imported Topsoil	Destinte Oise		Minimum 4 hashes a 0 500 minut	Due AOTAL sharehood		Least witchle metarial and a test	An all dis all all and another	100	0
Material	Particle Size	• ASTM D422	• Minimum T test per 2,500 cu ya	• Per ASTIN standard	Sample size per ASTM collected at source	Locale suitable material and re-lest	Anarytical Laboratory	• 100	• 0
	• pH	• ASTM D4972	Minimum 1 test per 2,500 cu yd	Per ASTM standard	Sample size per ASTM	<ul> <li>Locate suitable material and re-test</li> </ul>	<ul> <li>Analytical Laboratory</li> </ul>	• 100	• 0
	Organic Content	• ASTM D2974	Minimum 1 test per 2,500 cu yd	Per ASTM standard					
	<ul> <li>Phosphorus, potassium, calcium, and magnesium</li> </ul>	<ul> <li>In accordance with State accredited criteria</li> </ul>	Minimum 1 test per 2,500 cu yd						
	Chemical Analysis	• (1) EPA SW 846.	Minimum 1 test per source	In accordance with State accredited criteria	Sample collected from stockpile at source	• As above	Analytical Laboratory	• 100	• 0
		(2) TAL: Target Analyte List.							
	Parameter TAL <sup>(3)</sup> Metals	Methods SW-846 6020A/7471A							
	Hexavalent Chromium Cvanide	SW-846 7196A SW-846 9010/9012							
	TCL <sup>(2)</sup> Volatiles	SW-846 8260B							
	TCL Pesticides	SW-846 8081B							
	Herbicides	SW-040 0002A SW-846 8151A							
Imported Common Fill, Topsoil									
and Aggregate	Particle Size Analysis	• ASTM DD6913/D6913M and	Minimum 1 test per source	Per ASTM standard	<ul> <li>Sample size per ASTM</li> </ul>	<ul> <li>Locate suitable material and re-test</li> </ul>	Analytical Laboratory	• 100	• 0
2 Hardennenne		ASTM D7928 or ASTM C117					- mary and Ediboratory	100	
		and ASTIVECTOD							

### Summary of Construction Quality Assurance and Quality Control Tests Northern Impoundment San Jacinto River Waste Pits Site Harris County, Texas

Work Task Component to be Tested	Type of Test	Standard	Frequency of Tests per Construction Specifications	Key Acceptance Criteria	Sample Size/Location	Potential Corrective Measures	Test Location	Percen Test Fr by Co	itage of equency ntractor	Percenta Test Freq by Engi	ge of uency neer
E. Geomembranes (Section 31 05 20)							1				
Material	• Thickness	• ASTM D5199	As above	<ul> <li>nominal 60 mil</li> <li>lowest individual of 10 values (-10% or 54 mil)</li> </ul>	• As per GRI GM 17	Removal, reinstallation and re-testing	Analytical Laboratory	•	0	• 0	
	<ul> <li>Formulated Density</li> </ul>	• ASTM D1505/D792	• As above	• 0.939 g/cu cm MARV *	<ul> <li>As above</li> </ul>	• As above	As above	•	0	• 0	
	Break Strength	• ASTM D6693, Type IV	• As above	152 pounds per inch	<ul> <li>As above</li> </ul>	<ul> <li>As above</li> </ul>	<ul> <li>As above</li> </ul>	•	0	• 0	
	Break Elongation	• ASTM D6693, Type IV	• As above	• 800 pounds per inch	As above	As above	<ul> <li>As above</li> </ul>	•	0	• 0	
	• 2% Modulus (max.)	• ASTM D1004	• As above	2400 pounds per inch	As above	As above	<ul> <li>As above</li> </ul>	•	0	• 0	
	Tear resistance	• ASTM D1004	• As above	• 22 pounds	As above	As above	<ul> <li>As above</li> </ul>	•	0	• 0	
	Puncturing resistance	• ASTM D4833/D4833M	• As above	• 56 pounds	As above	As above	As above	•	0	• 0	
	Carbon Black Content	• ASTM D5596	• As above	• 2 to 3 percent	As above	As above	As above	•	0	• 0	
	Oxidation Induction Time     Standard High Pressure	• ASTM D8117 • ASTM D5885/D5885M	<ul><li>As above</li><li>As above</li></ul>	<ul><li>100 minutes</li><li>400 minutes</li></ul>	<ul><li>As above</li><li>As above</li></ul>	<ul><li>As above</li><li>As above</li></ul>	<ul><li>As above</li><li>As above</li></ul>	•	0 0	• 0 • 0	
	<ul> <li>Oven Aging at 85 degrees Celsius Standard High Pressure</li> </ul>	ASTM D5721 and ASTM D8117     ASTM D5885/D5885M	<ul><li>As above</li><li>As above</li></ul>	<ul><li>35 percent</li><li>60 percent</li></ul>	<ul><li>As above</li><li>As above</li></ul>	<ul><li>As above</li><li>As above</li></ul>	<ul><li>As above</li><li>As above</li></ul>	•	0 0	• 0 • 0	
	UV Resistance	• ASTM D7238 and D5885/D5885M	• As above	• 2 to 3 percent	As above	As above	• As above	۰	0	• 0	
Installation	Seam shear test on test seam	Field tensiometer	Minimum 2 times per day for each seaming equipment. Minimum once per day per seamer.	<ul> <li>1,200 psi minimum strength and seam must not delaminate.</li> <li>Four of 5 replicate samples must pass. *</li> </ul>	<ul> <li>Sample coupons to be 1 inch wide, collected from test seam</li> </ul>	See Section 31 05 20, Article 3.7	On Site	•	100	<ul> <li>Engineer will Contractor Q</li> </ul>	observe C Tests
	<ul> <li>Seam peel test on test seam</li> </ul>	Field tensiometer	Minimum 2 times per day for each seaming equipment. Minimum once per day per seamer.	<ul> <li>1,000 psi minimum strength and seam must not delaminate.</li> <li>Four of 5 replicate samples must pass. *</li> </ul>	• As above.	• See Section 31 05 20	On Site	• •	100	<ul> <li>Engineer will Contractor Q</li> </ul>	observe C Tests
	Destructive seam shear test	Field tensiometer	Minimum 1 test per approximately 500 L.F.     of production seam or at least one per seam	<ul> <li>1,200 psi minimum strength and seam must not delaminate.</li> <li>Four of 5 replicate samples must pass. *</li> </ul>	• As above.	• See Section 31 05 20	<ul> <li>As above</li> </ul>	• •	100	<ul> <li>Engineer will Contractor Q</li> </ul>	observe C Tests
	Destructive seam peel test	Field tensiometer	Minimum 1 test per approximately 500 L.F.     of production seam or at least one per seam	<ul> <li>1,000 psi minimum strength and seam must not delaminate.</li> <li>Four of 5 replicate samples must pass. *</li> </ul>	• As above.	• See Section 31 05 20	As above	•	100	<ul> <li>Engineer will Contractor Q</li> </ul>	observe C Tests
	Non-destructive pressure test	<ul> <li>Pressure test GRI Test Method GM6</li> </ul>	100% of production seams	<ul> <li>Pressurize air channel to between a min. 20 psi and max. 30psi</li> <li>Maintain pressure for a 2 minute stabilization period</li> <li>Maximum allowable pressure drop is 4 psi over 2 minutes</li> </ul>	<ul> <li>100% of production seams</li> </ul>	See Section 31 05 20	• In-place	• 1	100	Engineer will     Contractor Q	observe C Tests
	<ul> <li>Destructive seam shear test (if field test acceptable)</li> </ul>	<ul> <li>ASTM D4437 (Mod.) per NSF Std. 54</li> </ul>	Minimum one test per approximately 500 L.F. of production seam or at least one per seam	<ul> <li>1,200 psi minimum strength and seam must not delaminate.</li> <li>Four of 5 replicate samples must pass. *</li> </ul>	Sample size per ASTM. Sample locations on fixed 500-foot increments; possible intermediate locations	See Section 31 05 20	Geosynthetic laboratory	•	0	• 10	)
	<ul> <li>Destructive seam peel test (if field test acceptable)</li> </ul>	<ul> <li>ASTM D4437 (Mod.) per NSF Std. 54</li> </ul>	Minimum one test per approximately 500 L.F. of production seam or at least one per seam	<ul> <li>1,000 psi minimum strength and seam must not delaminate.</li> <li>Four of 5 replicate samples must pass. *</li> </ul>	<ul> <li>Sample size per ASTM. Sample locations on fixed 500-foot increments; possible</li> </ul>	See Section 31 05 20	Geosynthetic laboratory	٠	0	• 10	C
F. Articulating Block Fabric Formed Co	ncrete (Section 31 35 26.50)							<b></b>			
• Granular Material Material	• Grain Size	<ul> <li>70 to 80 percent sand between No. 30 and No. 200 sieve sizes</li> <li>20 to 30 percent fines (passing No. 200 sieve)</li> </ul>	Minimum 1 test per 1,000 cu yd	Per ASTM standard	Sample size per ASTM collected at source	Locate suitable material and re-test	Analytical Laboratory	•	100	• 0	
	Chemical Analysis	<ul> <li>(1) EPA SW 846.</li> <li>(2) TCL: Target Compound List.</li> <li>(3) TAL: Target Analyte List.</li> </ul>	Minimum 1 test per source	In accordance with State accredited criteria	Sample collected from stockpile at source	• As above	Analytical Laboratory	•	100	• 0	
	Parameter TAL <sup>(3)</sup> Metals Hexavalent Chromium Cyanide TCL <sup>(2)</sup> Volatiles TCL Semi-Volatiles TCL Pesticides Polychlorinated Biphenyls Herbicides	Methods SW-846 6020A/7471A SW-846 7196A SW-846 9010/9012 SW-846 8260B SW-846 8270D SW-846 8081B SW-846 8081B SW-846 8082A SW-846 8151A									
• Geotextile G1 Material	Tensile Strength     Elongation at Break     Static CBR Puncture     Trapezoid Tear Strength     Apparent Opening Size (AOS)     Permittivity     Water Flow Rate     Ultra Violet Resistance	<ul> <li>ASTM D4632/D4632M</li> <li>ASTM D4632/D4632M</li> <li>ASTM D6241</li> <li>ASTM D4533</li> <li>ASTM D4751</li> <li>ASTM D4491</li> <li>ASTM D4491</li> <li>ASTM D4355</li> </ul>	<ul> <li>See standard</li> <li>See standard</li> <li>See standard</li> <li>Once per month minimum</li> <li>See standard</li> <li>See standard</li> <li>See standard</li> <li>Once per month minimum</li> </ul>	• 220 • 50 • 575 • 90 • 80 • 1.26 • 95 • 70	<ul> <li>Minimum once every 100,000 sq ft</li> <li>As above</li> <li>As above</li> <li>As above</li> <li>Minimum once every month</li> <li>Minimum once every 100,000 sq ft</li> <li>As above</li> <li>Minimum once every month</li> </ul>	<ul> <li>Removal, reinstallation and re-testing</li> <li>As above</li> </ul>	<ul> <li>Analytical Laboratory</li> <li>As above</li> </ul>	• • • • • • • • • • • • • • • • • • •	100 100 100 100 100 100 100 100	• 0 • 0 • 0 • 0 • 0 • 0	

### Summary of Construction Quality Assurance and Quality Control Tests Northern Impoundment San Jacinto River Waste Pits Site Harris County, Texas

Work Task Component to be Tested	Type of Test	Standard	Frequency of Tests per Construction Specifications	Key Acceptance Criteria	Sample Size/Location	Potential Corrective Measures	Test Location	Percentage of Test Frequency by Contractor	Percentage of Test Frequency by Engineer
F. Articulating Block Fabric Formed Co	ncrete (Section 31 35 26.50) cont'd				1		1		
Installation	<ul><li>Conformance Testing</li><li>Acceptance Testing</li></ul>	• ASTM D4354 • ASTM D4759	<ul><li>See standard</li><li>See standard</li></ul>	<ul> <li>In accordance with State accredited criteria</li> <li>In accordance with State accredited criteria</li> </ul>	<ul><li>As above</li><li>As above</li></ul>	<ul><li>As above</li><li>As above</li></ul>	<ul><li>As above</li><li>As above</li></ul>	• 50 • 50	• 50 • 50
• Fabric Formed Concrete Mat <i>Material</i>	<ul> <li>Mass per Unit Area</li> <li>Thickness</li> <li>Wide Width Strip Strength</li> <li>Elongation at Break</li> </ul>	<ul> <li>ASTM D5161</li> <li>ASTM D5199</li> <li>ASTM D4595</li> <li>ASTM D4595</li> </ul>	<ul> <li>See standard</li> <li>See standard</li> <li>See standard</li> <li>See standard</li> </ul>	<ul> <li>13</li> <li>30</li> <li>300 (machine direction)</li> <li>275 (cross direction)</li> <li>15 (machine direction)</li> <li>15 (cross direction)</li> </ul>	<ul> <li>Minimum once every 100,000 sq ft</li> <li>As above</li> <li>As above</li> <li>As above</li> </ul>	<ul> <li>Removal, reinstallation and re-testing</li> <li>As above</li> <li>As above</li> <li>As above</li> </ul>	<ul> <li>Analytical Laboratory</li> <li>As above</li> <li>As above</li> <li>As above</li> </ul>	<ul> <li>100</li> <li>100</li> <li>100</li> <li>100</li> </ul>	• 0 • 0 • 0
	Trapezoidal Tear Strength	ASTM D4533     ASTM D4401	See standard	<ul> <li>150 (machine direction)</li> <li>170 (cross direction)</li> </ul>	As above	As above	As above	• 100	• 0
	Apparent Opening Size (AOS)	ASTM D4491     ASTM D4751	Once per month minimum	• 30 to 55	As above	As above     As above	As above     As above	• 100	• 0
Installation	Conformance Testing     Acceptance Testing	ASTM D4354     ASTM D4759	<ul><li>See standard</li><li>See standard</li></ul>	In accordance with State accredited criteria     In accordance with State accredited criteria	As above     As above	<ul><li>As above</li><li>As above</li></ul>	<ul><li>As above</li><li>As above</li></ul>	• 50 • 50	• 50 • 50
<ul> <li>Fine Aggregate Concrete Material</li> </ul>	Sand Grain Size	• ASTM C33	See standard	Per ASTM standard	Sample size per ASTM collected at source	Locate suitable material and re-test	Analytical Laboratory	• 100	• 0
	Portland Cement	ASTM C150, Type I, II, or V	See standard	Per ASTM standard	As above	As above	• As above	• 100	• 0
G. Riprap (Section 31 37 00) Riprap (Section 31 37 00)		1					1		[
Material	<ul> <li>Gradation Testing</li> </ul>	• per spec & OPSS.PROV 1004	<ul> <li>As per specification</li> </ul>	Per ASTM standard	• 1 sample per stone type	See Section 31 05 20	Geosynthetic laboratory	• 0	• 100
	Bulk Specific Gravity	• ASTM C127	As per specification	Per ASTM standard	1 sample per stone type	See Section 31 05 20	Geosynthetic laboratory	• 0	• 100
H. Sheet Piles (Section 31 41 16) • Sheet Piles Material	Material Testing	• ASTM A6/A6M	See standard	Per ASTM standard	Sample size per ASTM	Per ASTM standard	Per ASTM standard	• 100	• 0
I. Seeding (Section 32 92 19)		Ι			1				
• Seed Material									
	• Nitrogen	• per spec	As per specification	Per ASTM standard	1 sample per source	As per specification	<ul> <li>Per ASTM standard</li> </ul>	• 100	• 0
	Phosphorus	• per spec	As per specification	Per ASTM standard	1 sample per source	<ul> <li>As per specification</li> </ul>	<ul> <li>Per ASTM standard</li> </ul>	• 100	• 0
	• Potash	• per spec	As per specification	Per ASTM standard	1 sample per source	As per specification	Per ASTM standard	• 100	• 0
	<ul> <li>Soluble Salt Content</li> </ul>	• per spec	As per specification	Per ASTM standard	1 sample per source	As per specification	<ul> <li>Per ASTM standard</li> </ul>	• 100	• 0
	Organic Matter Content	• ASTM D2974	As per specification	Per ASTM standard	1 sample per source	• 2% to 10%	Per ASTM standard	• 100	• 0
	<ul> <li>Acidity Range (pH)</li> </ul>	• ASTM D4972	As per specification	Per ASTM standard	1 sample per source	• 5.5 to 7.5	Per ASTM standard	• 100	• 0
	• Clay	• ASTM D2487	As per specification	Per ASTM standard	1 sample per source	• 10% to 15%	Per ASTM standard	• 100	• 0
	• Lime	ASTM DC602	As per specification	Per ASTM standard	<ul> <li>1 sample per source</li> </ul>	• 80% calcium carbonate (min.)	Per ASTM standard	• 100	• 0
J. Turbidity Curtain (Section 35 49 25)		1					1		
Material									
	Tensile Strength     Elongation at Break	<ul> <li>ASTM D4632/D4632M</li> <li>ASTM D4632/D4632M</li> </ul>	<ul> <li>See standard</li> <li>See standard</li> </ul>	• (Wrap) 350, (Fill) 250 • 34	Minimum once every 100,000 sq ft     As above	<ul> <li>Removal, reinstallation and re-testing</li> <li>As above</li> </ul>	<ul> <li>Analytical Laboratory</li> <li>As above</li> </ul>	• 100 • 100	• 0 • 0
	Mullen Burst Strength	• ASTM D3786/D3786M	See standard	• 510	As above	• As above	As above	• 100	• 0
	<ul> <li>Trapezoid Tear Strength</li> <li>Puncture Strength</li> </ul>	<ul> <li>ASTM D4533</li> <li>ASTM D4833/D4833M</li> </ul>	<ul> <li>See standard</li> <li>See standard</li> </ul>	• 65 • 140	<ul> <li>As above</li> <li>As above</li> </ul>	<ul> <li>As above</li> <li>As above</li> </ul>	<ul> <li>As above</li> <li>As above</li> </ul>	<ul> <li>100</li> <li>100</li> </ul>	• 0 • 0
	Permittivity	• ASTM D4491	See standard	• 0.04	As above	• As above	As above	• 100	• 0
	<ul><li>Permeability</li><li>Water Flow Rate</li></ul>	<ul> <li>AS fM D4491</li> <li>ASTM D4491</li> </ul>	<ul> <li>See standard</li> <li>See standard</li> </ul>	* 0.01 * 5	<ul><li>As above</li><li>As above</li></ul>	<ul> <li>As above</li> <li>As above</li> </ul>	<ul><li>As above</li><li>As above</li></ul>	<ul><li>100</li><li>100</li></ul>	• 0 • 0
	Apparent Opening Size (AOS)	• ASTM D4751	Once per month minimum	• 70	Minimum once every month	• As above	As above	• 100	• 0
	Ultra Violet Resistance	• ASTM D4355	Once per month minimum	* 80/500	<ul> <li>As above</li> </ul>	As above	<ul> <li>As above</li> </ul>	• 100	• 0
Installation	<ul><li>Conformance Testing</li><li>Acceptance Testing</li></ul>	<ul><li>ASTM D4354</li><li>ASTM D4759</li></ul>	<ul> <li>See standard</li> <li>See standard</li> </ul>	In accordance with State accredited criteria     In accordance with State accredited criteria	<ul> <li>Minimum once every 100,000 sq ft</li> <li>As above</li> </ul>	<ul><li>As above</li><li>As above</li></ul>	<ul><li>As above</li><li>As above</li></ul>	• 50 • 50	• 50 • 50
		I	1	1	1	1			

Notes: \* Minimum criteria, unless identified otherwise. 1. The quality assurance/quality control tests included herein are suggested in accordance with the technical specifications. 2. New or updated information is indicated by black font. MARV = Minimum Average Roll Value AI = Asphalt Institute ASTM = ASTM International



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# **Appendix J-2**

Supporting Deliverables - Northwest Corner Mechanical Dredging



## Attachment 3-A - Field Sampling Plan - Northern Impoundment (Northwest Corner Component) -Dredging

Provided As Part of Pre-Final 90% Remedial Design - Northern Impoundment (Northwest Corner Component) San Jacinto River Waste Pits Site Harris County, Texas

International Paper Company McGinnes Industrial Maintenance Corporation

November 8, 2022

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- Figure 2.5 Conceptual Northwest Corner Post-Dredging Confirmation Sampling Locations
- Figure 2.6 Post-Dredging Confirmation Sampling Decision Flow Chart

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## 1. Introduction

## 1.1 Relationship to Supporting Plans

## 2. Post-Excavation Confirmation Soil Sampling

### 2.1 Establishing Decision Units

- 2.1.1 Sampling Locations within a DU
- 2.2 Sampling Procedures
- 2.2.1 Sample Collection and Compositing Procedures
- 2.2.2 Sample Analysis
- 2.3 Data Analysis
- 2.4 Areas Sensitive to Hydraulic Heave

## 2.5 Northwest Corner Post-Dredging Confirmation Sampling

As detailed in the Pre-Final (90%) Remedial Design - Northern Impoundment - Northwest Corner Component (90% RD - Northwest Corner Component), under a mechanical dredging approach, the impacted material in the northwest corner will be removed to the target elevations exceeding the cleanup standard, based upon the data from past sampling events and utilizing barge-mounted mechanical dredging equipment. Prior to conducting a final pass to remove remaining settled residuals, confirmation sampling will be conducted to demonstrate compliance with the cleanup standard. The sampling will also serve to inform the target depth of the final dredge pass to a depth limit of 2 feet (ft) beyond the target removal elevations (further explained in Section 2.6.2).

Prior to confirmation sample collection, and to maximize residuals removal, chemical additives will be mixed with the water in the northwest corner to promote settling of resuspended sediments from the water column.

This section describes the use of composite sampling across decision units (DU) within the northwest corner to demonstrate compliance with the clean-up level under a mechanical dredging approach. This process is consistent with the confirmation sampling approach for the remainder of the Northern Impoundment, as described in Sections 2.1 to 2.4. This section includes procedures for collection of samples and preparation of composites. It also describes the analysis of the data and course of action based upon the results.

## 2.6 Sampling in Decision Units

As detailed in Section 2.1, the confirmation sampling plan for the other portions of the Northern Impoundment includes dividing the seasonal excavation cell into approximately  $\frac{1}{2}$  DUs for post-excavation confirmation sampling. Due to the

1
specialized remediation planned for the northwest corner, this area will be addressed in the first excavation season of the Northern Impoundment RA. The area to be addressed in the northwest corner is approximately 1 acre. In keeping with the previously established confirmation sampling methodology, following removal of the waste material in the area to the target elevations, the northwest corner will be divided into two DUs, approximately ½ acre in size.

Within each ½-acre DU, six to eight (6 to 8) discrete 2-ft core samples will be collected from sample locations evenly spaced across the DU. Prior to sampling, the locations may be located using Global Positioning System (GPS) and marked using a polyvinyl chloride (PVC) marker. One discrete sample will be collected from each sample location, as further described in Section 2.6.1. The top approximately 6 inches of each core may be comprised of excavated sediment residuals that have settled out of suspension following dredging. This layer will be addressed during the subsequent clean pass, so it will not be sampled during the confirmation sampling process. The remainder of the cores will be divided into two samples (6 to 12 inches and 12 to 24 inches) and composite samples will be prepared for each layer composed of the sample from that depth layer from each of the six to eight discrete samples to form one composite sample from 6 to 12 inches for each DU and one composite sample from 12 to 24 inches for each DU. The samples will be homogenized, composited, packed, and labeled in the field and then sent to the approved analytical laboratory (Approved Laboratory) for analysis. Figure 2.5, below, illustrates a conceptual approach for collection of six discrete samples across each ½-acre DU in the northwest corner. This figure is purely conceptual, as the boundaries of the DUs and/or confirmation sampling locations will not be predefined.



Figure 2.5 Conceptual Northwest Corner Post-Dredging Confirmation Sampling Locations

### 2.6.1 Sampling Procedures

### 2.6.1.1 Sample Collection and Compositing Procedures

At the completion of dredging activities to the target removal elevations across the northwest corner, the bottom 2 ft of the dredged area would be sampled.

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To initiate the sampling, the sampling craft would be navigated to the approximate sampling location using GPS technology. The remedial contractor (RC) may decide to pre-mark the sampling locations with PVC markers. The sampling would likely be conducted from a standard support boat or airboat. Once positioned in the general area, the craft would be anchored or stabilized with spuds at the sample location, and samples would be collected. After sampling, the craft would be navigated using GPS technology to the next location. Sample location coordinates (longitude and latitude) would be recorded along with other pertinent information including water depth and time.

A 3-inch diameter aluminium or PVC sample sleeve would be used for collection of samples. The sample craft would be positioned over the sampling location and the sample core would then be pushed by hand through the sediment/soil to a depth of 24 inches or until refusal is met. The core sample would then be hoisted to the surface and the sediment/soil samples would be collected for analyses. An alternate collection method may be implemented for collection of soil samples depending on-site conditions at the time of sample collection. Any modification of field sample collection methods would be documented in the field logbook. The sampling cores would be transported to the shore where RC samplers would open the sample cores and identify the depth intervals within the core. The top 0 to 6 inches of each sample core would be excluded (as the settled residuals in this layer would be removed as part of the final pass). An approximately 6-ounce sample from the 6 to 12-inch interval from each discrete core sample would be placed into its own decontaminated stainless-steel bowl. Each 6-ounce discrete sample would then be thoroughly homogenized in that bowl using a clean trowel. Following homogenization, approximately 2 ounces from each of the six to eight discrete samples would then all be combined into one clean bowl for preparation of the composite sample. The combined soil would be thoroughly homogenized using a clean trowel. Following homogenization, approximately 4-ounce of the homogenized mixture would be placed into a laboratory-supplied sampling container, sealed, and labeled. Alternately, the RC may opt to have the Approved Laboratory (as defined in the Quality Assurance Project Plan [QAPP]) prepare the composite samples in the laboratory. In that case, all 6 ounces of the material from each discrete sample would be homogenized in the field and sent to the Approved Laboratory where a portion will be utilized for the composite sample. This process would be repeated to prepare a composite sample from the 12 to 24-inch depth interval in each DU. The sampling event would result in four composite samples - one composite sample from 6 to 12 inches and one composite sample from 12 to 24 inches from DU-1, and one composite sample from 6 to 12 inches and one composite sample from 12 to 24 inches from DU-2. Sample equipment would be decontaminated between samples, per Section 7.1.

Any remaining material not placed in sample containers would be added to the excavated material for off-site disposal. Samples are to be labeled, packed, and shipped as outlined in the procedures in Section 7.

### 2.6.1.2 Sample Analysis

Once at the Approved Laboratory, the composite samples would be tested iteratively. The Approved Laboratory would first analyze the 6 to 12-inch composite samples, and pending the results of that analysis, the Approved Laboratory may analyze the 12 to 24-inch sample, as described in Section 2.6.2, below. The samples would be analyzed for the analytical parameters listed in Table 2.2, pursuant to the United States Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste: Physical/Chemical Methods (SW-846). Analytical test methods and quality assurance/quality control procedures (QA/QC) are outlined in the QAPP.

 Table 2.2
 Analytical Testing Method for Post-Dredging Confirmation Sampling

Analytical Parameters	Analytical Method <sup>1</sup>
Dioxins and Furans	SW-846 1613B
Note: <sup>1</sup> EPA SW-846.	

### 2.6.2 Data Analysis

Following laboratory analysis of the 6 to 12-inch composite sample, the result would be compared to the clean-up level. Results are to be evaluated, as described below. A flow-chart below (Figure 2.3) provides a summary of the evaluation procedures.

- If the result of the 6 to 12-inch composite sample is below the clean-up level, a 6-inch overcut will be performed in that DU to serve as a final pass and remove any settled residuals.
- If the result of the 6 to 12-inch composite sample is above the clean-up level, the 12 to 24-inch composite sample that the Approved Laboratory is holding will be analyzed.
- If the result of the 12 to 24-inch composite sample is below the clean-up level, a 12-inch overcut will be performed in that DU to remove the remaining inventory and any settled residuals.
- If the result of the 12 to 24-inch composite sample is above the clean-up level, a 24-inch overcut will be performed in that DU to remove the remaining inventory and any settled residuals.

As the result of three pre-design investigations, there is an extensive dataset to give confidence in the horizontal and vertical delineation of impacted area in the Northern Impoundment. Even still, as is the case in the remainder of the impoundment, the BMP around the northwest corner has been designed to allow for the removal of up to an additional 2-ft of material. In addition, in the northwest corner, as waste material is removed, makeup water must be added to offset the weight of the removed material. A water elevation of -9 feet North American Vertical Datum of 1988 (ft NAVD88) is sufficient to compensate for removal of waste material to the identified target excavation elevations based on the existing dataset that include a maximum excavation of -28 ft NAVD88 plus an additional 2-ft overcut if necessary. If additional dredging passes are required to remove deeper material, the water level would have to be raised proportionately to offset the deeper removal. If more than 2 ft of additional removal were to be required, a larger area of the Northern Impoundment would become flooded, increasing the potential spread of impacted residuals and/or contact water. Further, due to a very tight schedule for the seasonal dredging in the northwest corner, only one round of sampling, analysis, and over-excavation would likely be possible.





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# 3. Historic Berm Material Sampling

- 3.1 Sampling Rationale
- 3.2 Sampling Procedures
- 3.2.1 Sample Collection Procedures
- 3.3 Sample Analysis
- 3.4 Data Analysis

## 4. Off-Site Fill Characterization Sampling

- 4.1 Sampling Rationale
- 4.2 Sample Collection Objective
- 4.3 Sample Analysis
- 4.4 Sampling Procedures
- 5. Water Sampling
- 5.1 Sample Collection Objective
- 5.2 Sample Type, Location, and Frequency of Compliance Sampling
- 5.3 Sampling Procedures
- 5.3.1 Equipment Calibration
- 5.3.2 Sampling Procedure

- 6. Investigation Derived Wastes
- 7. Equipment, Decontamination, Sample Labeling, Packing, and Shipping
- 7.1 List of Equipment Needed
- 7.1.1 Confirmatory and Source Material Sampling Equipment
- 7.1.2 Water Sampling Equipment
- 7.2 Decontamination of Sampling Equipment
- 7.3 Sample Labeling
- 7.4 Sample Packing and Shipping

## 8. References

 GHD, 2021. *Hydraulic Heave Analysis*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. December 10, 2021



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# Attachment 6-B -Construction Quality Assurance/Quality Control Plan (CQA/QCP) - Northern Impoundment - Northwest Corner (Dredging)

Provided As Part of Pre-Final 90% Remedial Design - Northern Impoundment (Northwest Corner Component) San Jacinto River Waste Pits Site Harris County, Texas

International Paper Company McGinnes Industrial Maintenance Corporation

November 8, 2022

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- 4.2 Photographic Documentation
- 4.3 CQA Instrument Calibration
- 4.4 Inspection and Test Log Book
- 5. **Problem/Corrective Action Reports**
- 6. **Project Meetings**
- 7. QA/QC Documentation and Storage of Records
- 8. References

#### Summary of Construction Quality Assurance and Quality Control Inspections Northern Impoundment Remediation

San Jacinto River Waste Pits Site

#### Harris County, Texas

Key Work Task Component to be Inspected	Key Items to be Checked During Inspection	Type of Inspection	*Frequency of Inspection	Contractor Submittals to Resident Engineer
A. Temporary Traffic Control				
Traffic Control	<ul> <li>Has a Temporary Traffic Control Plan been provided as specified?</li> </ul>	Check Section 01 35 00	Continuous	Temporary Traffic Control Plan
Traffic Control Devices	<ul> <li>Have signs been inspected for legibility, damage, suitability, and location?</li> </ul>	Check Section 01 35 00	Continuous	• None
	<ul> <li>Are signs clean, repaired, or replaced to maintain clarity and reflectiveness?</li> </ul>			
R Health and Safety			l	
Health and Safety Planning	<ul> <li>Are health and safety procedures in place, including equipment, work area and excavation inspections?</li> </ul>	Check Section 1 35 29	Continuous	Health and Safety Plan
C. Temporary Facilities and Controls		•	•	•
• Utilities	<ul> <li>Have utilities been provided as specified and coordinated with local utility providers?</li> </ul>	<ul><li>Check Section 01 50 00</li><li>Visual</li></ul>	Periodic during installation	• None
Construction Facilities	<ul> <li>Have temporary construction facilities been provided as specified?</li> </ul>	<ul><li>Check Section 01 50 00</li><li>Visual</li></ul>	Periodic during installation	• None
Vehicular Access and Parking	<ul> <li>Has vehicular access and parking been provided as specified?</li> </ul>	<ul><li>Check Section 01 50 00</li><li>Visual</li></ul>	Periodic during installation	• None
Barriers and Enclosures	<ul> <li>Have barriers and enclosures been provided as specified?</li> </ul>	<ul><li>Check Section 01 50 00</li><li>Visual</li></ul>	Periodic during installation	• None
Temporary Controls	<ul> <li>Have temporary controls been provided as specified?</li> </ul>	<ul><li>Check Section 01 50 00</li><li>Visual</li></ul>	Periodic during installation	• None
D. Tomporany Soil Erosion and Sodimont Control				
Erosion Control Items	<ul> <li>Is depth of silt fence embedment in accordance with drawings?</li> </ul>	<ul> <li>Visual &amp; check drawings</li> </ul>	Continuous	<ul> <li>Soil Erosion &amp; Sediment Control Plan</li> </ul>
	Are tears or holes present in silt fence fabric?	• Visual	Continuous	Product Data
	<ul> <li>Is erosion around and under silt fence present?</li> </ul>	• Visual	Continuous	• None
	<ul> <li>Is sagging or collapse evident?</li> </ul>	• Visual	Continuous	• None
	<ul> <li>Has a Soil Erosion and Sediment Control Plan been provided as specified?</li> </ul>	Check permit	Continuous	<ul> <li>Soil Erosion and Sediment Control Plan</li> </ul>
E. Waste Material Solidification				
Waste Material Solidification	<ul> <li>Has waste material been dewatered and solidified as specified?</li> </ul>	Check Section 02 55 13	* Continuous	<ul> <li>Solidification Plan</li> <li>Daily Field Installation Reports</li> <li>Quality Assurance/Quality Control Plan</li> </ul>

#### Summary of Construction Quality Assurance and Quality Control Inspections Northern Impoundment Remediation San Jacinto River Waste Pits Site

#### Harris County, Texas

Key Work Task Component to be Inspected	Key Items to be Checked During Inspection	Type of Inspection	*Frequency of Inspection	Contractor Submittals to Resident Engineer
F. Material Handling and Transportation				
Material Handling and On-Site Transportation	<ul> <li>Has a Material Handling and On-Site Transportation Plan been provided as specified?</li> </ul>	Check Section 02 61 14	Continuous	Material Handling and On-Site Transportation     Plan
G. Transportation and Disposal				
<ul> <li>Disposal Equipment</li> </ul>	<ul> <li>Is equipment provided as specified?</li> </ul>	Check Section 02 61 16	Upon delivery	<ul> <li>Operating licenses and permits</li> </ul>
	• Is equipment being decontaminated properly?	Check Section 02 61 16	<ul> <li>Prior to leaving Site and changing to lower impacted waste type</li> </ul>	Transportation and Disposal Plan
	Are vehicles maintained properly in accordance with 49 CFR 393?	• Visual	Daily (Periodically)	Transportation and Disposal Plan
	<ul> <li>Do motor vehicle operator(s) perform a safety inspection of each motor vehicle before it is used and at least once a day?</li> </ul>	• Visual	• Continuous	• None
Disposal of Materials	<ul> <li>Has a Transportation and Disposal Plan been provided as specified?</li> </ul>	Check Section 02 61 16	Continuous	<ul> <li>Transportation and Disposal Plan</li> </ul>
	<ul> <li>Has a Transportation Emergency Response Plan been provided as specified?</li> </ul>	Check Section 02 61 16	Continuous	<ul> <li>Transportation and Disposal Plan</li> </ul>
	<ul> <li>Are materials transported and disposed of to satisfy requirements as specified?</li> </ul>	Check Section 02 61 16	• Continuous	<ul> <li>Transportation and Disposal Proposal</li> <li>Shipping and Disposal Documents</li> <li>TSDF Weigh Scale documents</li> </ul>
	<ul> <li>Are trucks inspected prior to leaving the Site to transport for disposal at approved TSDFs?</li> </ul>	• Visual	Continuous	Shipping and Disposal Documents
H. Excavation		•	•	9. 
<ul> <li>Excavation Equipment</li> </ul>	<ul> <li>Is equipment inspected daily by a qualified person?</li> </ul>	• Visual	Continuous	Excavation Plan
• Sediment/Soil	Are excavations being conducted as specified?	<ul> <li>Check Section 31 23 16 and Drawings</li> <li>Visual</li> </ul>	Periodic during excavation	• Excavation Plan
Material Handling and Stockpiling	<ul> <li>Is material being handled and stockpiled as specified?</li> </ul>	<ul> <li>Check Section 31 23 16</li> <li>Visual</li> </ul>	• During excavation and stockpiling	Material Handling and On-Site Transportation     Plan
	• Is load packaged, labelled etc. as specified?	Check Section 31 23 16	After loading and before leaving Site	Material Handling and On-Site Transportation
I. Dewatering				
<ul> <li>Dewatering Equipment</li> </ul>	Does equipment meet specifications?	<ul><li>Check Section 31 23 19</li><li>Visual</li></ul>	Upon delivery	Dewatering Plan
	• Has system been installed as specified?	Check Section 31 23 19 and Drawings	Periodic during installation	Dewatering Plan
	<ul> <li>Has equipment and surplus raw materials been removed?</li> </ul>	• Visual	• Daily as required	Dewatering Plan

#### Summary of Construction Quality Assurance and Quality Control Inspections Northern Impoundment Remediation San Jacinto River Waste Pits Site Harris County, Texas

Key Work Task Component to be Inspected	Key Items to be Checked During Inspection	Type of Inspection	*Frequency of Inspection	Contractor Submittals to Resident Engineer
I. Dewatering (cont'd)				
Sediment/Soil Dewatering	<ul> <li>Is dewatering procedure adequate to contain impacted groundwater?</li> </ul>	<ul><li>Check Section 31 23 19</li><li>Visual</li></ul>	<ul> <li>Periodic during operation</li> </ul>	Dewatering Plan
	Is material being dewatered as specified?	• Check Section 31 23 19 • Visual	During staging	Dewatering Plan
<ul> <li>Sediment/Soil Dewatering (cont'd)</li> </ul>	<ul> <li>Is settlement being detected where critical structures or facilities exist immediately adjacent to areas of proposed dewatering.</li> </ul>	Check Section 31 23 19     Visual	<ul> <li>Periodic during operation</li> </ul>	• None
J. Fill	-		-	
Existing Berm Material	Does fill meet specifications?	Check Section 31 23 23 and Drawings	• Each source of fill	Geotechnical testing results
	* Has fill been placed as specified?	• Visual • Survey	Periodic during installation	<ul> <li>Limits of excavation and thickness measurements</li> </ul>
• Fill for Between Sheet Pile Walls	Does fill meet specifications?	Check Section 31 23 23 and Drawings	• Each source of fill	Geotechnical testing results
	• Has fill been placed as specified?	<ul><li>Visual</li><li>Survey</li></ul>	Periodic during installation	<ul> <li>Limits of excavation and thickness measurements</li> </ul>
• Structural Fill	Does fill meet specifications?	Check Section 31 23 23 and Drawings	Each source of fill	<ul> <li>Geotechnical testing results</li> <li>Analytical data</li> <li>Product data</li> </ul>
	* Has fill been placed as specified?	• Visual • Survey	Periodic during installation	<ul> <li>Limits of excavation and thickness measurements</li> </ul>
• Common Fill	Does fill meet specifications?	Check Section 31 23 23 and Drawings	• Each source of fill	<ul><li>Geotechnical testing results</li><li>Analytical data</li><li>Product data</li></ul>
	Has fill been placed as specified?	• Visual • Survey	Periodic during installation	<ul> <li>Limits of excavation and thickness measurements</li> </ul>
• Sand	Does sand meet specifications?	Check Section 31 23 23 and Drawings	• Each source of sand	<ul> <li>Geotechnical testing results</li> <li>Analytical data</li> <li>Product data</li> </ul>
	• Has sand been placed as specified?	• Visual • Survey	Periodic during installation	<ul> <li>Limits of excavation and thickness measurements</li> </ul>
• Topsoil	Does topsoil meet specifications?	<ul> <li>Check Section 31 23 23</li> <li>Visual</li> </ul>	<ul> <li>Each source of topsoil</li> </ul>	<ul> <li>Geotechnical testing results</li> <li>Analytical data</li> <li>Product data</li> </ul>

#### Summary of Construction Quality Assurance and Quality Control Inspections Northern Impoundment Remediation San Jacinto River Waste Pits Site

Harris County, Texas

Key Work Task Component	Key Items to be Checked	Type of	*Frequency of	Contractor Submittals to
J. Fill (cont'd)	During inspection	Inspection	Inspection	Resident Engineer
• Coarse Aggregate	<ul> <li>Does aggregate meet specifications?</li> </ul>	Check Section 21 23 23	<ul> <li>Each source of aggregate</li> </ul>	<ul> <li>Source of aggregate</li> <li>Geotechnical data</li> <li>Samples</li> <li>Suppliers' Certificates</li> </ul>
	<ul> <li>Has aggregate been placed as specified?</li> </ul>	• Visual • Survey	Periodic during installation	<ul> <li>Limits of excavation and thickness measurements</li> </ul>
Clearstone	Does clearstone meet specifications?	Check Section 31 23 23     Visual	Each source of clearstone	<ul> <li>Geotechnical testing results</li> <li>Analytical data</li> <li>Product data</li> </ul>
Backfilling Excavations	<ul> <li>Are excavations being backfilled as specified?</li> </ul>	• Check Section 31 23 23 and Drawings	During backfilling	<ul><li>Geotechnical data</li><li>Survey</li></ul>
	<ul> <li>Has horizontal and vertical control been maintained?</li> </ul>	<ul><li>Check Section 31 23 23</li><li>Visual</li></ul>	After placement	<ul> <li>Analytical results</li> <li>Test reports</li> </ul>
K. Synthetic Materials			1	
• Materials	* Do materials provided meet specifications?	Check Section 31 35 26.16	<ul> <li>Each source of geotextile and geomembrane (liner)</li> </ul>	<ul> <li>Product data</li> <li>Manufacture's instructions</li> <li>Samples</li> </ul>
	Are materials being stored properly?	• Visual	Upon delivery to Site	Manufacturer's instructions
Installation	<ul> <li>Have materials been placed as specified?</li> </ul>	• Visual • Survey	Periodic during installation	Manufacturer's instructions
	Are there any visible defects with materials?	• Visual	After installation is completed	• None
L. Riprap				
Materials	<ul> <li>Do materials provided meet specifications?</li> </ul>	Check Section 31 37 00	<ul> <li>prior to delivery</li> </ul>	<ul> <li>Source Quality Control testing</li> </ul>
Installation	<ul> <li>Have materials been placed to the proper location and depth</li> </ul>	• Survey	Continuous during work	* None
M. Sheet Piles	•		•	
• Materials	Do materials provided meet specifications?	Check Section 31 41 16	<ul> <li>Upon delivery</li> </ul>	<ul> <li>Product data</li> <li>Mix Design</li> <li>Test samples in accordance with AI MS-2</li> <li>Records</li> </ul>
Installation	<ul> <li>Have sheet piles been inspected prior to and after installation?</li> </ul>	Check Section 31 41 16 and Drawings	After installation	• Records
	<ul> <li>Have sheet piles been installed as specified?</li> </ul>	Check Section 31 41 16 and Drawings	After installation	Certifications

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#### Table 1

#### Summary of Construction Quality Assurance and Quality Control Inspections Northern Impoundment Remediation San Jacinto River Waste Pits Site Harris County, Texas

Key Work Task Component to be Inspected	Key Items to be Checked During Inspection	Type of Inspection	*Frequency of Inspection	Contractor Submittals to Resident Engineer
N. Chain Link Fences and Gates	· · · · · · · · · · · · · · · · · · ·	• •	• •	· · · · ·
• Materials	Do materials provided meet specifications?	Check Section 32 31 13	Upon delivery	<ul><li>Product data</li><li>Manufacture's instructions</li></ul>
Installation	<ul> <li>Have chain link fences and gates been installed as specified?</li> </ul>	• Check Section 32 31 13 and s Drawings	After installation	Certifications
	Has a final inspection taken place?	Check Section 32 31 13 and Drawings	Upon Substantial Performance	• Records
O. Seeding				
Topsoil Placement	Has topsoil been placed as specified?	<ul><li>Check Section 31 23 23</li><li>Visual</li></ul>	Periodic during placement	• None
	<ul> <li>Has topsoil been lightly surface compacted following seeding?</li> </ul>	• Visual	Periodic following seeding	• None
	Horizontal and vertical control	• Visual • Survey	Following placement	• Survey
• Seeding	Are materials stored properly?	• Visual	Periodic during storage	Manufacturer's instructions
	<ul> <li>Does seed, lime, fertilizer, and mulch meet specifications?</li> </ul>	Check Section 32 92 19	Prior to application	<ul><li>Source of materials</li><li>Product data</li></ul>
	<ul> <li>Has hydroseed, fertilizer, and mulch been applied as specified?</li> </ul>	<ul><li>Check Section 32 93 00</li><li>Visual</li></ul>	Periodic during application	Seeding and Erosion Control Plan
	<ul> <li>Have correct quantities of hydroseed, fertilizer, and mulch been placed?</li> </ul>	<ul><li>Check Section 32 93 00</li><li>Visual</li></ul>	Periodic during placement	<ul><li>Seed certificates</li><li>Fertilizer certificates</li></ul>
	• Have bare spots been rehydroseeded?	• Visual	Periodic during installation	• None
	<ul> <li>Is height of grass as specified?</li> </ul>	Check Section 32 93 00	Periodically during maintenance	• None
P. Dredging				
Submittals	Has Dredge Operation Plan been provided     as specified?	Check Section 35 25 00	Continuous	Dredge Operation Plan
	<ul> <li>Has Water Quality Monitoring and Control Plan been provided as specified?</li> </ul>	Check Section 35 25 00	• Continuous	Water Quality Monitoring and Control Plan
	<ul> <li>Has Chemical Additives Dosing Plan been provided as specified?</li> </ul>	Check Section 35 25 00	• Continuous	Chemical Additives Dosing Plan
Granular Material	Does granular material meet specifications?	Check Section 31 23 23 and Drawings	Each source of fill	Geotechnical testing results
Placement	Has granular material been placed as specified?	• Visual • Survey	Periodic during installation	Limits of placement and thickness measurements

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#### Table 1

#### Summary of Construction Quality Assurance and Quality Control Inspections Northern Impoundment Remediation San Jacinto River Waste Pits Site Harris County, Texas

Key Work Task Component	Key Items to be Checked	Type of	*Frequency of	Contractor Submittals to
Q. Turbidity Curtain	During inspection	inspection	mspection	Resident Engineer
• Material	Have materials been joint inspected upon delivery?	• Visual	Upon delivery to Work Site	• None
	<ul> <li>Are materials being stored properly?</li> </ul>	• Visual	Periodic during storage	Manufacturer's instructions
	Do materials meet specifications?	<ul> <li>Check Section 31 05 19</li> <li>Check material property sheets and quality control certificates</li> </ul>	<ul> <li>Each source of geotextile</li> <li>Upon delivery to Work Site</li> </ul>	<ul> <li>Product data</li> <li>Manufacturer's certificates</li> <li>Samples</li> </ul>
Placement	• Have materials been placed as specified?	• Visual • Survey	Periodic during installation	<ul> <li>Manufacturer's instructions</li> </ul>
	<ul> <li>Are there any visible defects, tears or overlaps with materials?</li> </ul>	• Visual	After installation is completed	* None
R. Process Equipment				
Materials	* Do materials provided meet specifications?	Check Division 40 Sections	* Upon delivery	<ul> <li>Product data</li> <li>Shop drawings</li> <li>Certifications and Reports</li> </ul>
Installation	* Has process equipment been installed as specified?	<ul> <li>Check Division 40 Sections and Drawings</li> </ul>	After installation	• Records
	<ul> <li>Has a final inspection taken place?</li> </ul>	<ul> <li>Check Division 40 Sections and Drawings</li> </ul>	Upon Substantial Performance	• Records
R. Wastewater Treatment System				
Materials	• Do materials provided meet specifications?	Check Section 46 07 01	Upon delivery	<ul> <li>Product data</li> <li>Shop drawings</li> <li>Certifications and Reports</li> </ul>
Installation	<ul> <li>Has process equipment been installed as specified?</li> </ul>	Check Section 46 07 01     and Drawings	After installation	• Records
	<ul> <li>Has a final inspection taken place?</li> </ul>	Check Section 46 07 01	Upon Substantial Performance	• Records

Notes:

\*Frequencies of inspections are considered minimum and will be increased or added to as determined necessary by the Engineer.

1. The quality assurance/quality control inspections included herein are suggested in accordance with the technical specifications.

2. New or updated information is indicated by black font.

#### Summary of Construction Quality Assurance and Quality Control Tests Northern Impoundment San Jacinto River Waste Pits Site Harris County, Texas

Work Task Component to be Tested	Type of Test	Standard	Frequency of Tests per Construction Specifications	Key Acceptance Criteria	Sample Size/Location	Potential Corrective Measures	Test Location	Percentage of Test Frequency by Contractor	Percentage of Test Frequency by Engineer
Reportable Quantities	Identification of hazardous chemicals	State accredited method	Throughout the Works	* In accordance with State accredited criteria	As determined by Engineer	See Section 01 35 29	• On Site	• 50	• 50
B. Waste Material Sonification (Section     Waste Material Solidification	02 55 13)  • In accordance with accepted QA/QC Plan	State accredited method	Throughout the Works	In accordance with State accredited criteria	As determined by Engineer	Locate suitable material and re-test	Analytical Laboratory	• 100	• 0
C. Geotextiles for Earthwork (Section 3	1 05 19.13)								
Geotextile G1	Tanaila Otranath		One standard		Minimum	Description follotion and as to the r	An ab dia al Labarrata ma	400	0
Material	I ensile Strength     Elegation at Brook	ASTM D4632/D4632M     ASTM D4622/D4632M	See standard	• 220 • 50	<ul> <li>Minimum once every 100,000 sq π</li> <li>As above</li> </ul>	Removal, reinstallation and re-testing	Analytical Laboratory	• 100	• 0
	Static CBR Puncture	<ul> <li>ASTM D4632/D4632M</li> <li>ASTM D4632/D4632M</li> </ul>	See standard	• 575	As above	As above	<ul> <li>As above</li> </ul>	• 100	• 0
	Trapezoid Tear Strength	<ul> <li>ASTM D4533</li> </ul>	See standard	• 90	As above	As above	As above	• 100	• 0
	Apparent Opening Size (AOS)	• ASTM D4751	Once per month minimum	• 80	Minimum once every month	As above	<ul> <li>As above</li> </ul>	• 100	• 0
	Permittivity	<ul> <li>ASTM D4491</li> </ul>	<ul> <li>See standard</li> </ul>	• 1.26	<ul> <li>Minimum once every 100,000 sq ft</li> </ul>	<ul> <li>As above</li> </ul>	<ul> <li>As above</li> </ul>	• 100	• 0
	Permeability	• ASTM D4491	See standard	• 0.30	As above	As above	As above	• 100	• 0
	Water Flow Rate	• ASTM D4491	See standard	• 95	As above     Minimum apage over / menth	As above	<ul> <li>As above</li> </ul>	• 100	• 0
	· Oltra violet Resistance	• ASTM D4355	Once per monar minimum	* 70	• Minimum once every monum	<ul> <li>As above</li> </ul>	* As above	* 100	* 0
Installation	Conformance Testing	<ul> <li>ASTM D4354</li> </ul>	See standard	<ul> <li>In accordance with State accredited criteria</li> </ul>	As above	As above	As above	• 50	• 50
	Acceptance Testing	• ASTM D4759	See standard	• In accordance with State accredited criteria	As above	As above	As above	• 50	• 50
Geotextile G2	<b>T 1 0 1</b>				1/1 · · · · · · · · · · · · · · · · · ·			100	0
Material	I ensile Strength     Elegation at Brook	<ul> <li>ASTM D4632/D4632M</li> <li>ASTM D4632/D4632M</li> </ul>	See standard	• 320	<ul> <li>Minimum once every 100,000 sq π</li> <li>As shows</li> </ul>	Removal, reinstallation and re-testing	Analytical Laboratory	• 100	• 0
	Static CBR Puncture	<ul> <li>ASTM D4032/D4032M</li> <li>ASTM D4632/D4632M</li> </ul>	See standard	• 900	<ul> <li>As above</li> <li>As above</li> </ul>	As above	<ul> <li>As above</li> </ul>	• 100	• 0
	Trapezoid Tear Strength	<ul> <li>ASTM D4533</li> </ul>	See standard	• 125	As above	As above	As above	• 100	• 0
	Apparent Opening Size (AOS)	• ASTM D4751	Once per month minimum	• 100	Minimum once every month	As above	<ul> <li>As above</li> </ul>	• 100	• 0
	Permittivity	• ASTM D4491	See standard	• 0.80	<ul> <li>Minimum once every 100,000 sq ft</li> </ul>	<ul> <li>As above</li> </ul>	<ul> <li>As above</li> </ul>	• 100	• 0
	Permeability	• ASTM D4491	See standard	• 0.29	As above	As above	<ul> <li>As above</li> </ul>	• 100	• 0
	Water Flow Rate	• ASTM D4491	See standard	* 60	As above	As above	As above	• 100	• 0
	Utra violet Resistance	• ASTM D4355	Once per month minimum	• 70	<ul> <li>Minimum once every month</li> </ul>	As above	<ul> <li>As above</li> </ul>	• 100	* 0
Installation	Conformance Testing	<ul> <li>ASTM D4354</li> </ul>	See standard	<ul> <li>In accordance with State accredited criteria</li> </ul>	As above	As above	As above	• 50	• 50
	Acceptance Testing	• ASTM D4759	See standard	<ul> <li>In accordance with State accredited criteria</li> </ul>	• As above	As above	<ul> <li>As above</li> </ul>	• 50	• 50
Geotextile G3			O e e stew dawd	700 (h	Minimum	Description follotion and as tooling	An ab dia al Labamatana	400	0
Material	Tensile Strength @ 2% strain (MD)     Tensile Strength @ 2% strain (CD)	• ASTM D4595	See standard	<ul> <li>720 (typical) 600 MARV</li> <li>1200 (typical) 1020 (MARV)</li> </ul>	Minimum once every 100,000 sq ft	Removal, reinstallation and re-testing	<ul> <li>Analytical Laboratory</li> <li>Analytical Laboratory</li> </ul>	• 100	• 0
	Tensile Strength @ 5% strain (CD)     Tensile Strength @ 5% strain (MD)	<ul> <li>ASTM D4595</li> <li>ASTM D4595</li> </ul>	See standard	<ul> <li>200 (typical) 1020 (IMARV)</li> <li>2100 (typical) 1800 (MARV)</li> </ul>	<ul> <li>As above</li> <li>As above</li> </ul>	As above	<ul> <li>As above</li> </ul>	• 100	• 0
	Tensile Strength @ 5% strain (MD)	<ul> <li>ASTM D4535</li> <li>ASTM D4595</li> </ul>	See standard	<ul> <li>2580 (typical) 2256 (MARV)</li> </ul>	As above	As above	As above	• 100	• 0
	Apparent Opening Size (AOS)	• ASTM D4751	Once per month minimum	• 50 (typical) 40 (MARV)	Minimum once every month	As above	<ul> <li>As above</li> </ul>	• 100	• 0
	Permittivity	<ul> <li>ASTM D4491</li> </ul>	<ul> <li>See standard</li> </ul>	<ul> <li>1.2 (typical) 0.9 (MARV)</li> </ul>	<ul> <li>Minimum once every 100,000 sq ft</li> </ul>	<ul> <li>As above</li> </ul>	<ul> <li>As above</li> </ul>	• 100	• 0
	Water Flow Rate	• ASTM D4491	See standard	• 85 (typical) 75 (MARV)	As above	As above	As above	• 100	• 0
	Ultra Violet Resistance	• ASTM D4355	Once per month minimum	• 70	Minimum once every month	As above	As above	• 100	• 0
	Pore Size     Interaction Coofficient	• ASTM D6767	See standard	85 (typical) 75 (MARV)     . 0.80	<ul> <li>Minimum once every 100,000 sq π</li> <li>As above</li> </ul>	As above	As above	• 100	• 0
	Factory Sewn Seam	<ul> <li>ASTM D0700</li> <li>ASTM D4884.D4884M</li> </ul>	See standard	• 2700	As above	As above	As above	• 100	• 0
									-
Installation	Conformance Testing	• ASTM D4354	See standard	· In accordance with State accredited criteria	As above	<ul> <li>As above</li> </ul>	<ul> <li>As above</li> </ul>	• 50	• 50
	Acceptance Testing	• ASTM D4759	See standard	<ul> <li>In accordance with State accredited criteria</li> </ul>	<ul> <li>As above</li> </ul>	<ul> <li>As above</li> </ul>	<ul> <li>As above</li> </ul>	• 50	• 50
D Fill (Section 31 23 23)	ł		ļ						
Existing Berm Material	Particle Size	• ASTM D6913/D6913M	Minimum 1 test per 2,500 cu yd (clay)	Per ASTM standard	Sample size per ASTM	Locate suitable material and re-test	Analytical Laboratory	• 100	• 0
Material		and D7928			collected at source		5		
	Soil Classification	• ASTM D2487	• Minimum 1 test per 2,500 cu yd (clay)	* Any except poorly graded and except CH, MH, OL, and OH	As above	<ul> <li>As above</li> </ul>	Analytical Laboratory	• 100	• 0
	Chemical Analysis	<ul><li>(1) EPA SW 846.</li><li>(2) TCL: Target Compound List.</li></ul>	Minimum 1 test per source	In accordance with State accredited criteria	Sample collected from stockpile at source	• As above	<ul> <li>Analytical Laboratory</li> </ul>	• 100	• 0
	Devenuetor	(3) TAL: Target Analyte List.							
	Parameter	Methods							
	IAL <sup>17</sup> Metals Hexavalent Chromium	SW-846 7196A							
	Cvanide	SW-846 9010/9012							
	TCL <sup>(2)</sup> Volatiles	SW-846 8260B							
	TCL Semi-Volatiles	SW-846 8270D							
	TCL Pesticides	SW-846 8081B							
	Polychlorinated Biphenyls	SW-846 8082A							
	Heibicides	SVV-040 0101A							
	l	- I		1			1		

#### Summary of Construction Quality Assurance and Quality Control Tests Northern Impoundment San Jacinto River Waste Pits Site Harris County, Texas

Work Task Component to be Tested	Type of Test	Standard	Frequency of Tests per Construction Specifications	Key Acceptance Criteria	Sample Size/Location	Potential Corrective Measures	Test Location	Percentage of Test Frequency by Contractor	Percentage of Test Frequency by Engineer
D. Fill (Section 31 23 23) cont'd • Aggregate Types A1 and A2	1								
(Course Aggregate									
and Clear Stone) Material	• Grain Size	• ASTM C117, C136/C136M,	• Minimum 1 test per 1,000 cu yd	Per ASTM standard	Sample size per ASTM collected at source	Locate suitable material and re-test	Analytical Laboratory	• 100	• 0
	Chemical Analysis	and D6913/D6913M • (1) EPA SW 846.	Minimum 1 test per source	<ul> <li>In accordance with State accredited criteria</li> </ul>	<ul> <li>Sample collected from stockpile at source</li> </ul>	• As above	<ul> <li>Analytical Laboratory</li> </ul>	• 100	• 0
		<ul> <li>(2) TCL: Target Compound List.</li> <li>(3) TAL: Target Analyte List</li> </ul>							
	Parameter	Methods							
	TAL <sup>19</sup> Metals Hexavalent Chromium	SW-846 6020A/7471A SW-846 7196A							
	Cyanide TCL <sup>(2)</sup> Volatiles	SW-846 9010/9012 SW-846 8260B							
	TCL Semi-Volatiles	SW-846 8270D SW-846 8081B							
	Polychlorinated Biphenyls	SW-846 8082A							
	Herbicides	SVV-040 0151A							
<ul> <li>Soil Type S1 and S2 (Fill Between Sheet Pile Walls</li> </ul>									
and Structural Fill) <i>Material</i>	Particle Size	• ASTM D6913/D6913M	• Minimum 1 test per 2,500 cu yd (clay)	Per ASTM standard	Sample size per ASTM	<ul> <li>Locate suitable material and re-test</li> </ul>	<ul> <li>Analytical Laboratory</li> </ul>	• 100	• 0
	Soil Classification	and D7928 • ASTM D2487	Minimum 1 test per 2 500 cu vd (clav)	Any except poorly graded and except CH_MH_OL_and OH	collected at source	• As above	Analytical Laboratory	• 100	• 0
		(4) EDA OW 040	Minimum Field per 2,000 eu ya (elay)	have been with Out a second the distribution of the		As above	Analytical Laboratory	100	
	Cnemical Analysis	(1) EPA SW 846. (2) TCL: Target Compound List.	• Minimum 1 test per source	In accordance with State accredited criteria	<ul> <li>Sample collected from stockpile at source</li> </ul>	<ul> <li>As above</li> </ul>	Analytical Laboratory	• 100	• 0
	Parameter	(3) TAL: Target Analyte List. Methods							
	TAL <sup>(3)</sup> Metals Hexavalent Chromium	SW-846 6020A/7471A SW-846 7196A							
	Cyanide	SW-846 9010/9012							
	TCL Semi-Volatiles	SW-846 8270D							
	Polychlorinated Biphenyls	SW-846 8082A							
	Herbicides	SW-846 8151A							
<ul> <li>Soil Type S3 (Common Fill) and Sand</li> </ul>	Chemical Analysis	• (1) EPA SW 846.	Minimum 1 test per source	<ul> <li>In accordance with State accredited criteria</li> </ul>	Sample collected from stockpile at source	<ul> <li>As above</li> </ul>	<ul> <li>Analytical Laboratory</li> </ul>	• 100	• 0
		<ul><li>(2) TCL: Target Compound List.</li><li>(3) TAL: Target Analyte List.</li></ul>							
	Parameter	Methods							
	Hexavalent Chromium	SW-040 00204/14/14 SW-846 7196A							
	TCL <sup>(2)</sup> Volatiles	SW-846 9010/9012 SW-846 8260B							
	TCL Semi-Volatiles TCL Pesticides	SW-846 8270D SW-846 8081B							
	Polychlorinated Biphenyls Herbicides	SW-846 8082A SW-846 8151A							
<ul> <li>Imported Topsoil</li> </ul>									
Material	Particle Size	• ASTM D422	• Minimum 1 test per 2,500 cu yd	Per ASTM standard	Sample size per ASTM collected at source	Locate suitable material and re-test	Analytical Laboratory	• 100	• 0
	• pH	• ASTM D4972	• Minimum 1 test per 2,500 cu yd	Per ASTM standard	• Sample size per ASTM	Locate suitable material and re-test	Analytical Laboratory	• 100	• 0
	Organic Content	• ASTM D2974	• Minimum 1 test per 2,500 cu yd	Per ASTM standard					
	<ul> <li>Phosphorus, potassium, calcium, and magnesium</li> </ul>	In accordance with State accredited criteria	• Minimum 1 test per 2,500 cu yd						
	Chemical Analysis	<ul> <li>(1) EPA SW 846.</li> <li>(2) TCL: Target Compound List.</li> <li>(3) TAL: Target Analyte List</li> </ul>	Minimum 1 test per source	In accordance with State accredited criteria	Sample collected from stockpile at source	• As above	Analytical Laboratory	• 100	• 0
	Parameter	Methods							
	Hexavalent Chromium	SW-846 7196A							
	Cyanide TCL <sup>(2)</sup> Volatiles	SW-846 9010/9012 SW-846 8260B							
	TCL Semi-Volatiles TCL Pesticides	SW-846 8270D SW-846 8081B							
	Polychlorinated Biphenyls Herbicides	SW-846 8082A SW-846 8151A							
	10.00000	5.1. 040 010 M							

#### Summary of Construction Quality Assurance and Quality Control Tests Northern Impoundment San Jacinto River Waste Pits Site Harris County, Texas

Instrument	Work Task Component to be Tested	Type of Test	Standard	Frequency of Tests per Construction Specifications	Key Acceptance Criteria	Sample Size/Location	Potential Corrective Measures	Test Location	Percentage of Test Frequency by Contractor	Percentage of Test Frequency by Engineer
	D. Fill (Section 31 23 23) cont'd     Imported Common Fill, Topsoil     and Aggregate     Placement	Particle Size Analysis	ASTM DD6913/D6913M and ASTM D7928 or ASTM C117 and ASTM C136	Minimum 1 test per source	* Per ASTM standard	• Sample size per ASTM	Locate suitable material and re-test	Analytical Laboratory	• 100	• 0
*****       *****       ******       *******       ************************************	E. Geomembranes (Section 31 05 20)	1		1						
Prime signed s	LLDPE Liner     Material	• Thickness	• ASTM D5199	• As above	<ul> <li>nominal 60 mil</li> <li>lowest individual of 10 values (-10% or 54 mil)</li> </ul>	• As per GRI GM 17	Removal, reinstallation and re-testing	Analytical Laboratory	• 0	• 0
Image:         Margin:         Margin: <thmargin:< th=""> <thmargin:< th=""> <thma< td=""><td></td><td>Formulated Density</td><td>• ASTM D1505/D792</td><td>As above</td><td>• 0.939 g/cu cm MARV *</td><td>As above</td><td>• As above</td><td>• As above</td><td>• 0</td><td>• 0</td></thma<></thmargin:<></thmargin:<>		Formulated Density	• ASTM D1505/D792	As above	• 0.939 g/cu cm MARV *	As above	• As above	• As above	• 0	• 0
Image:		Break Strength	• ASTM D6693, Type IV	• As above	<ul> <li>152 pounds per inch</li> </ul>	* As above	• As above	• As above	• 0	• 0
Participant		Break Elongation	• ASTM D6693, Type IV	As above	• 800 pounds per inch	• As above	• As above	As above	• 0	• 0
- Randam       - Randam <td< td=""><td></td><td>• 2% Modulus (max.)</td><td>• ASTM D1004</td><td>• As above</td><td>• 2400 pounds per inch</td><td>• As above</td><td>• As above</td><td>• As above</td><td>• 0</td><td>• 0</td></td<>		• 2% Modulus (max.)	• ASTM D1004	• As above	• 2400 pounds per inch	• As above	• As above	• As above	• 0	• 0
Product maxme         Product		Tear resistance	• ASTM D1004	• As above	• 22 pounds	• As above	• As above	As above	• 0	• 0
<ul> <li></li></ul>		Puncturing resistance	• ASTM D4833/D4833M	As above	* 56 pounds	* As above	• As above	• As above	• 0	• 0
<ul> <li></li></ul>		Carbon Black Content	• ASTM D5596	• As above	2 to 3 percent	• As above	• As above	• As above	• 0	• 0
<ul> <li></li></ul>		Oxidation Induction Time     Standard High Pressure	• ASTM D8117 • ASTM D5885/D5885M	<ul><li>As above</li><li>As above</li></ul>	<ul><li> 100 minutes</li><li> 400 minutes</li></ul>	<ul><li>As above</li><li>As above</li></ul>	<ul><li>As above</li><li>As above</li></ul>	<ul><li>As above</li><li>As above</li></ul>	• 0 • 0	• 0 • 0
No. Mexicon         ADM 2023 and 00000000000000000000000000000000000		Oven Aging at 85 degrees Celsius Standard High Pressure	• ASTM D5721 and ASTM D8117 • ASTM D5885/D5885M	• As above • As above	<ul><li>35 percent</li><li>60 percent</li></ul>	<ul><li>As above</li><li>As above</li></ul>	<ul><li>As above</li><li>As above</li></ul>	<ul><li>As above</li><li>As above</li></ul>	• 0 • 0	• 0 • 0
Installation         Performance		UV Resistance	• ASTM D7238 and D5885/D5885M	• As above	• 2 to 3 percent	• As above	• As above	As above	• 0	• 0
9. Same per last on stationary       - Section 19.200       - Online	Installation	Seam shear test on test seam	Field tensiometer	Minimum 2 times per day for each seaming equipment. Minimum once per day per seamer.	<ul> <li>1,200 psi minimum strength and seam must not delaminate.</li> <li>Four of 5 replicate samples must pass. *</li> </ul>	<ul> <li>Sample coupons to be 1 inch wide, collected from test seam</li> </ul>	• See Section 31 05 20, Article 3.7	• On Site	• 100	Engineer will observe     Contractor QC Tests
<ul> <li></li></ul>		Seam peel test on test seam	Field tensiometer	Minimum 2 times per day for each seaming equipment. Minimum once per day per seamer.	<ul> <li>1,000 psi minimum strength and seam must not delaminate.</li> <li>Four of 5 replicate samples must pass. *</li> </ul>	• As above.	• See Section 31 05 20	• On Site	• 100	Engineer will observe     Contractor QC Tests
Pesture lase angenetiest       Pesture besture free angenetiest       Perture free an		Destructive seam shear test	Field tensiometer	Minimum 1 test per approximately 500 L.F. of production seam or at least one per seam	<ul> <li>1,200 psi minimum strength and seam must not delaminate.</li> <li>Four of 5 replicate samples must pass. *</li> </ul>	• As above.	• See Section 31 05 20	• As above	• 100	Engineer will observe Contractor QC Tests
- Nn destructive pressure test       - Pressure test GR1 Test       - Only of poduction seams       - Pressure test car 2 minute stabilization predd       - Non of poduction seams       - Inplace		Destructive seam peel test	• Field tensiometer	Minimum 1 test per approximately 500 L.F. of production seam or at least one per seam	<ul> <li>1,000 psi minimum strength and seam must not delaminate.</li> <li>Four of 5 replicate samples must pass. *</li> </ul>	• As above.	• See Section 31 05 20	• As above	• 100	Engineer will observe Contractor QC Tests
Image: Destructive seam shear test (If field tast acceptable)       NSTM D437 (Mod.) per NSF Sid. 54       Ninimum one test per approximately 500 LF. of production seam or at least one per seam       1.200 pis iminimum strength and seam nux tot delaminate. Four of Srepicates samples must pass.*       Sample size per ASTM. Sample locations intermediationations       See Section 31 05 20       See Section 31 05		Non-destructive pressure test	Pressure test GRI Test     Method GM6	<ul> <li>100% of production seams</li> </ul>	<ul> <li>Pressurize air channel to between a min. 20 psi and max. 30psi</li> <li>Maintain pressure for a 2 minute stabilization period</li> <li>Maximum allowable pressure drop is 4 psi over 2 minutes</li> </ul>	• 100% of production seams	See Section 31 05 20	* In-place	• 100	<ul> <li>Engineer will observe Contractor QC Tests</li> </ul>
l Destructive seam peel test (if field et sa coeptable)       ASTM D4437 (Mod.) per NSF Sid. 54       Minimu on etest per approximately 500 L.F. of production seam or at least one per seam       1.000 pi minimum strength and seam must not delaminate. Four of 5 replicate samples must pass.*       Sample size per ASTM. Sample locations on fixed 500-doi norments; possible       See Section 310 5.00       See Sect		Destructive seam shear test     (if field test acceptable)	ASTM D4437 (Mod.) per NSF Std. 54	<ul> <li>Minimum one test per approximately 500 L.F. of production seam or at least one per seam</li> </ul>	<ul> <li>1,200 psi minimum strength and seam must not delaminate.</li> <li>Four of 5 replicate samples must pass. *</li> </ul>	<ul> <li>Sample size per ASTM. Sample locations on fixed 500-foot increments; possible intermediate locations</li> </ul>	See Section 31 05 20	Geosynthetic laboratory	• 0	• 100
Intrary (Saction 31 37 00)         Material       • per spec & OPSS.PROV 1004       • As per specification       • Per ASTM standard       • Per ASTM standard       • See Section 31 05 20       • Geosynthetic laboratory       • 0       • 100         • Sheet Piles       • AstM C127       • AstM Ac/A6M       • See standard       • See Section 31 05 20       • Geosynthetic laboratory       • 0       • 100         • Sheet Piles       • Material       • Material       • Material       • Per ASTM standard       • Per ASTM standard       • Per ASTM standard       • 0 </td <td></td> <td>Destructive seam peel test     (if field test acceptable)</td> <td><ul> <li>ASTM D4437 (Mod.) per NSF Std. 54</li> </ul></td> <td>Minimum one test per approximately 500 L.F. of production seam or at least one per seam</td> <td><ul> <li>1,000 psi minimum strength and seam must not delaminate.</li> <li>Four of 5 replicate samples must pass. *</li> </ul></td> <td>Sample size per ASTM. Sample locations on fixed 500-foot increments; possible</td> <td>• See Section 31 05 20</td> <td>Geosynthetic laboratory</td> <td>• 0</td> <td>• 100</td>		Destructive seam peel test     (if field test acceptable)	<ul> <li>ASTM D4437 (Mod.) per NSF Std. 54</li> </ul>	Minimum one test per approximately 500 L.F. of production seam or at least one per seam	<ul> <li>1,000 psi minimum strength and seam must not delaminate.</li> <li>Four of 5 replicate samples must pass. *</li> </ul>	Sample size per ASTM. Sample locations on fixed 500-foot increments; possible	• See Section 31 05 20	Geosynthetic laboratory	• 0	• 100
b. Highing (Section 31 57 00)       b. expected on 255 000	F. Riprap (Section 31 37 00)									
Arror         Arror <th< td=""><td>o. Riprap (Section 31 37 00) Material</td><td>Gradation Testing</td><td>• per spec &amp; OPSS.PROV 1004</td><td><ul> <li>As per specification</li> </ul></td><td>Per ASTM standard</td><td><ul> <li>1 sample per stone type</li> </ul></td><td><ul> <li>See Section 31 05 20</li> </ul></td><td>Geosynthetic laboratory</td><td>• 0</td><td>• 100</td></th<>	o. Riprap (Section 31 37 00) Material	Gradation Testing	• per spec & OPSS.PROV 1004	<ul> <li>As per specification</li> </ul>	Per ASTM standard	<ul> <li>1 sample per stone type</li> </ul>	<ul> <li>See Section 31 05 20</li> </ul>	Geosynthetic laboratory	• 0	• 100
G. Sheet Piles MaterialASTM A6/A6MSee standardFer ASTM standardFer ASTM standardFer ASTM standardFer ASTM standardImage: Control of the c		Bulk Specific Gravity	• ASTM C127	As per specification	Per ASTM standard	1 sample per stone type	• See Section 31 05 20	Geosynthetic laboratory	• 0	• 100
* Sheet Piles Material Testing • ASTM A6/A6M • See standard • Per ASTM standard • Per ASTM standard • Per ASTM standard • 100 • 0	G Sheet Piles (Section 31.41.16)									I
	Sheet Piles     Material	Material Testing	• ASTM A6/A6M	See standard	Per ASTM standard	Sample size per ASTM	Per ASTM standard	Per ASTM standard	• 100	• 0

# Summary of Construction Quality Assurance and Quality Control Tests Northern Impoundment San Jacinto River Waste Pits Site Harris County, Texas

Work Task Component to be Tested	Type of Test	Standard	Frequency of Tests per Construction Specifications	Key Acceptance Criteria	Sample Size/Location	Potential Corrective Measures	Test Location	Percentage of Test Frequency by Contractor	Percentage of Test Frequency by Engineer
H. Seeding (Section 32 92 19)	1								
Seed     Material									
	• Nitrogen	<ul> <li>per spec</li> </ul>	As per specification	Per ASTM standard	1 sample per source	As per specification	Per ASTM standard	• 100	• 0
	Phosphorus	• per spec	As per specification	Per ASTM standard	1 sample per source	As per specification	Per ASTM standard	• 100	• 0
	• Potash	• per spec	As per specification	Per ASTM standard	1 sample per source	As per specification	Per ASTM standard	• 100	• 0
	Soluble Salt Content	• per spec	As per specification	Per ASTM standard	1 sample per source	As per specification	Per ASTM standard	• 100	• 0
	Organic Matter Content	• ASTM D2974	As per specification	Per ASTM standard	1 sample per source	• 2% to 10%	Per ASTM standard	• 100	• 0
	Acidity Range (pH)	• ASTM D4972	As per specification	Per ASTM standard	* 1 sample per source	• 5.5 to 7.5	Per ASTM standard	• 100	• 0
	• Clay	• ASTM D2487	As per specification	Per ASTM standard	* 1 sample per source	• 10% to 15%	Per ASTM standard	• 100	• 0
	• Lime	ASTM DC602	As per specification	* Per ASTM standard	1 sample per source	• 80% calcium carbonate (min.)	Per ASTM standard	• 100	• 0
I. Turbidity Curtain (Section 35 49 2	5)								
<ul> <li>Geosynthetics Material</li> </ul>									
	Tensile Strength	• ASTM D4632/D4632M	See standard	• (Wrap) 350, (Fill) 250	• Minimum once every 100,000 sq ft	Removal, reinstallation and re-testing	Analytical Laboratory	• 100	• 0
	<ul> <li>Elongation at Break</li> <li>Mullen Burst Strength</li> </ul>	<ul> <li>ASTM D4632/D4632M</li> <li>ASTM D3786/D3786M</li> </ul>	<ul> <li>See standard</li> <li>See standard</li> </ul>	• 34 • 510	<ul> <li>As above</li> <li>As above</li> </ul>	<ul> <li>As above</li> <li>As above</li> </ul>	<ul> <li>As above</li> <li>As above</li> </ul>	• 100 • 100	• 0
	Trapezoid Tear Strength	<ul> <li>ASTM D4533</li> </ul>	See standard	• 65	As above	As above	As above	• 100	• 0
	Puncture Strength	<ul> <li>ASTM D4833/D4833M</li> </ul>	See standard	• 140	As above	• As above	As above	• 100	• 0
	Permittivity	• ASTM D4491	See standard	• 0.04	As above	• As above	As above	• 100	• 0
	Permeability	<ul> <li>ASTM D4491</li> </ul>	See standard	• 0.01	<ul> <li>As above</li> </ul>	As above	As above	• 100	• 0
	Water Flow Rate	• ASTM D4491	See standard	• 5	As above	As above	As above	• 100	• 0
	<ul> <li>Apparent Opening Size (AOS)</li> </ul>	• ASTM D4751	Once per month minimum	• 70	Minimum once every month	As above	As above	• 100	• 0
	Ultra Violet Resistance	• ASTM D4355	Once per month minimum	* 80/500	As above	<ul> <li>As above</li> </ul>	• As above	• 100	• 0
Installation	Conformance Testing     Acceptance Testing	<ul> <li>ASTM D4354</li> <li>ASTM D4759</li> </ul>	See standard     See standard	<ul> <li>In accordance with State accredited criteria</li> <li>In accordance with State accredited criteria</li> </ul>	<ul> <li>Minimum once every 100,000 sq ft</li> <li>As above</li> </ul>	<ul><li>As above</li><li>As above</li></ul>	<ul> <li>As above</li> <li>As above</li> </ul>	• 50 • 50	• 50 • 50
J. Dredging (Section 35 25 00)     • Residual Management Laver									
(Granular Material) <i>Material</i>	• Grain Size	<ul> <li>70 to 80 percent sand between No. 30 and No. 200 sieve sizes</li> <li>20 to 30 percent fines (passing No. 200 sieve)</li> </ul>	• Minimum 1 test per 1,000 cu yd	Per ASTM standard	Sample size per ASTM collected at source	Locate suitable material and re-test	Analytical Laboratory	• 100	• 0
	Chemical Analysis	(1) EPA SW 846.     (2) TCL: Target Compound List.     (3) TAL: Target Analyte List.	Minimum 1 test per source	In accordance with State accredited criteria	Sample collected from stockpile at source	• As above	Analytical Laboratory	• 100	• 0
	Parameter TAL <sup>(3)</sup> Metals Hexavalent Chromium Cyanide TCL <sup>(2)</sup> Volatiles TCL Semi-Volatiles TCL Semi-Volatiles TCL Pesticides Polychlorinated Biphenyls Herbicides	Methods SW-846 6020A/7471A SW-846 7196A SW-846 60109012 SW-846 8260B SW-846 8270D SW-846 8081B SW-846 8081B SW-846 8082A SW-846 8151A							

Notes: \* Minimum criteria, unless identified otherwise. 1. The quality assurance/quality control tests included herein are suggested in accordance with the technical specifications. 2. New or updated information is indicated by black font. MARV = Minimum Average Roll Value AI = Asphalt Institute ASTM = ASTM International



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