APPENDIX N

OPERATIONS, MONITORING, AND MAINTENANCE PLAN

9347761

OPERATIONS, MONITORING, AND MAINTENANCE PLAN

TIME CRITICAL REMOVAL ACTION

SAN JACINTO RIVER WASTE PITS SUPERFUND SITE

Prepared for

McGinnes Industrial Maintenance Corporation

International Paper Company

U.S. Environmental Protection Agency, Region 6

Prepared by

Anchor QEA, LLC

614 Magnolia Avenue

Ocean Springs, Mississippi 39564

October 2011

TABLE OF CONTENTS

1 INTRODUCTION 1
1.1 Location 1
1.2 Environmental Setting 2
1.3 Regulatory Background 2
1.3.1 Administrative Order and Basis for the TCRA 2
1.3.2 TCRA Objectives 3
1.3.3 TCRA Design 3
1.3.4 Summary of TCRA Construction 4
2 POST-TCRA MONITORING 5
2.1 Schedule 5
2.2 Inspection Procedures 6
2.2.1 Perimeter Fence and Warning Sign Inspection Procedures 7
2.2.2 Land-Based Armored Cap Survey Procedures 7
2.2.3 Water-Based Armored Cap Survey Procedures 8
2.3 Inspection Results and Interpretation 9
2.3.1 Reporting to USEPA 9
2.3.2 Conditions Requiring Repair Activities 10
3 POST-TCRA REPAIR PROCEDURES 11
3.1 Schedule 11
3.2 Source Materials 11
3.2.1 Armor Cap A and B/C 12
3.2.2 Armor Cap C and D 13
3.2.3 Material Testing 14
3.3 Installation Procedures 14
3.3.1 Land-Based Armored Cap Placement 15
3.3.2 Water-Based Armored Cap Placement 15
3.4 Verification of Repairs (Construction Quality Assurance) 15
3.5 Repair Report to USEPA 16
4 REFERENCES 17

List of Tables

Table 2-1 Armored Cap Inspection Schedule 5
Table 3-1 Cover Material Gradation Requirements..... 12

List of Figures

Figure 1-1 Vicinity Map
Figure 1-2 Location Map
Figure 1-3 Fence and Warning Sign Layout
Figure 1-4 Armored Cap As-Built
Figure 1-5 Geomembrane Location
Figure 3-1 TCRA Repair Timeline

List of Appendices

Appendix A Armored Cap Material Analyte List

LIST OF ACRONYMS AND ABBREVIATIONS

Anchor QEA	Anchor QEA, LLC
AOC	Administrative Order on Consent
cfs	cubic feet per second
I-10	U.S. Interstate Highway 10
IPC	International Paper Company
MIMC	McGinnes Industrial Maintenance Corporation
MSL	mean sea level
OMM	operations, monitoring, and maintenance
QA/QC	Quality Assurance/Quality Control
RACR	Removal Action Completion Report
RAWP	Removal Action Work Plan
RI/FS	Remedial Investigation/Feasibility Study
ROW	right-of-way
Site	San Jacinto River Waste Pits Superfund Site
SJRWP	San Jacinto River Waste Pits
SOW	Statement of Work
TCRA	time critical removal action
TxDOT	Texas Department of Transportation
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

1 INTRODUCTION

This document presents the Operations, Monitoring, and Maintenance (OMM) Plan to address measures to provide for the protective cover, fencing, and signage, installed for the time critical removal action (TCRA) at the San Jacinto River Waste Pits (SJRWP) Superfund Site (Site) in Harris County, Texas (Figure 1-1) to remain in place and function as designed into the future. The TCRA was implemented by International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC) under an Administrative Settlement Agreement and Order on Consent (AOC) with the United States Environmental Protection Agency (USEPA) - Docket No. 06-12-10, May 2010 (USEPA 2010a).

As required by Task 5 of the Statement of Work (SOW) for the AOC, this OMM Plan identifies continuing obligations, including monitoring and maintenance, with respect to the TCRA. The OMM Plan includes the following major sections:

- Section 1 describes physical conditions and operational history of the waste impoundments that were the subject of the TCRA (SJRWP) and previous investigations.
- Section 2 outlines the procedures that will be used to inspect the fencing, signage, and armored cap that were installed as part of the TCRA.
- Section 3 describes the repair process that will be used to repair the fencing, signage, and armored cap, if an inspection identifies a deficiency in those materials.
- Section 4 provides a list of references.

1.1 Location

The SJRWP consists of a set of impoundments approximately 15.7-acres in size, built in the mid-1960s for disposal of paper mill wastes. The impoundments are located on a 20-acre parcel on the western bank of the San Jacinto River, in Harris County, Texas, immediately north of the Interstate Highway 10 (I-10) Bridge over the San Jacinto River (Figure 1-2). The coordinates for the SJRWP are: 29.7944° N (Latitude), 95.0629° W (Longitude).

1.2 Environmental Setting

The SJRWP is within the estuarine portion of the lower San Jacinto River. A detailed analysis of the environmental setting can be found in the Removal Action Completion Report (RACR) (Anchor QEA 2011b). Excerpts of the environmental setting described in the (Anchor QEA 2011b) are provided in this section.

The main channel of the San Jacinto River, downstream from the Lake Houston dam in northeastern Harris County, flows southeast for 28 miles to its mouth on Galveston Bay east of Houston. Flow rates in the San Jacinto River in the vicinity of the SJRWP are partially controlled by the Lake Houston dam. The river in the vicinity of the waste impoundments is affected by diurnal tides, with a typical tidal range of 1 to 2 feet. Tidal range varies over a 14-day cycle, with neap and spring tide conditions corresponding to minimum and maximum tidal ranges, respectively.

The average flow in the San Jacinto River is 2,200 cubic feet per second (cfs). Floods in the river primarily occur during tropical storms (e.g., hurricanes) or intense thunderstorms. Extreme flood events (return intervals of 25-years or more) have flow rates of 200,000 cfs or greater. An October 1994 flood had a peak discharge of 360,000 cfs, which has a return period greater than 100-years. River stage height during the October 1994 flood peaked at 27 feet above mean sea level (MSL).

It is not uncommon to have precipitation events that exceed 2 inches per day, and on a 10-year basis, events that exceed 10 inches per day should be expected. These types of precipitation events produce wide variations in the volume of discharge into and out of the San Jacinto River and have significant implications concerning variations in flow velocities, sediment stability, and suspended sediment loads.

1.3 Regulatory Background

1.3.1 Administrative Order and Basis for the TCRA

MIMC and IPC entered into the AOC to conduct a TCRA in May 2010 (USEPA 2010a). The Action Memorandum for the TCRA (USEPA 2010b) stated that the TCRA was required to stabilize a portion of the Site, to abate the release of polychlorinated dibenzo-p-dioxins and

polychlorinated dibenzofurans into the waterway from the impoundments north of I-10 until the Site is fully characterized and a remedy is selected.

1.3.2 TCRA Objectives

The following removal action objectives for the TCRA were identified by USEPA in the Action Memorandum:

- Stabilize the impoundments to withstand forces sustained by the River.
    - The barrier design and construction must be structurally sufficient to withstand forces sustained by the River including any future erosion and be structurally sound for a number of years until a final remedy is selected and implemented (USEPA 2010b).
    - The technologies used to withstand forces sustained by the River must be structurally sufficient to withstand a storm event with a return period of 100-years until the nature and extent of contamination for the Site is determined and a final remedy is implemented.
- Prevent direct human contact with the waste materials, which according to the Action Memorandum; humans come into contact when accessing the Site by land and water (USEPA 2010b, IV.A.1; Page 9; 1st paragraph).
- Prevent benthic contact with the waste materials (USEPA 2010b, III.B).
- Ensure that the actions taken "are consistent with any long term remediation strategies that may be developed for the Site", which because the action constitutes source control would be consistent with any long term remediation strategies that may be developed for the Site (USEPA 2010b).

1.3.3 TCRA Design

The design of the TCRA is described in the TCRA Removal Action Work Plan (RAWP), as amended (Anchor QEA 2010; Anchor QEA 2011). The RAWP also includes discussion of the required OMM for the TCRA. This report provides a detailed plan for the procedures that will be used for OMM, consistent with the requirements described in the RAWP.

1.3.4 Summary of TCRA Construction

To achieve the objectives summarized in the previous section, TCRA construction activities were initiated in December 2010 and completed in July 2011. TCRA construction consisted of installation of approximately 5,700 lineal feet of fencing, placement of approximately 15 warning signs (Figure 1-3), and the installation of approximately 59,000 tons of rock to construct an armored cap ranging in thickness from 12 to 24 inches over a 15.7-acre area (Figure 1-4).

For purposes of the TCRA design and construction, the SJRWP was subdivided into the following areas:

- Eastern Cell
- Western Cell
- Northwestern Area

The location of each of these areas is depicted on Figure 1-4. Prior to the installation of the armored cap, a geotextile was placed in the Eastern Cell portion of the Site (approximately 10-acres), and a cover system consisting of an underlying geotextile, a 40-milliliter thick geomembrane, and an overlying geotextile cushion was installed in the Western Cell portion of the Site (approximately 3.2-acres) (Figure 1-5). The Northwestern Area did not receive a geotextile or geomembrane layer.

Additional details pertaining to the completion of the TCRA construction can be found in the RACR.

2 POST-TCRA MONITORING

This section describes the field activities that will be completed to monitor the effectiveness of the armored cap installed during the TCRA, including the inspection schedule, visual inspections, topographic and bathymetry survey procedures, and manual probing.

2.1 Schedule

As required by USEPA, inspections of the fencing, signage, and the protective armored cap will be performed quarterly for the first two years following completion of the TCRA construction, semiannually from years three to five, and annually starting at year six. In addition, an inspection of the armored cap will be performed following the first 25-year flow event and after each 100-year flow event. Table 2-1 summarizes the schedule for completing inspections of the armored cap.

Table 2-1
Armored Cap Inspection Schedule

Interval	Schedule
Baseline Bathymetry and Topographic Survey	August 2011
Quarterly	January 2012
	April 2012
	July 2012
	October 2012
	January 2013
	April 2013
	July 2013
	December 2013

Interval	Schedule
Semi-Annually	April 2014
	October 2014
	April 2015
	October 2015
	April 2016
	October 2016
Annually	Each July beginning in 2017
25-Year Flow Event	Following first such event
100-Year Flow Event	Following each such event

The criterion used to determine whether a 25-year flow event has occurred will be a measurement greater than 202,000 cfs at United States Geological Survey (USGS) Station 08072000, located at the south end of Lake Houston near Sheldon, Texas (http://waterdata.usgs.gov/nwis/nwisman/?site_no=08072000&agency_cd=USGS). The criterion used to determine whether a 100-year flow event as occurred will be a measurement greater than 372,000 cfs at the USGS-Sheldon Gauge Station.

To determine whether a 25-year or 100-year flow event has occurred, river stage height monitoring will be automated using computer code that polls the real-time stage height data at the Sheldon Lake Houston river stage gauge (gauge number 08072000) on a daily basis. The automated system will evaluate the stage height data and, in the event that the Lake Houston gauge is noted to be rising and approaching a critical elevation, will initiate automated polling of the real-time tide gages at Lynchburg, Battleship, or Morgan's Point. Using the river stage and tide data, the system will calculate the flow conditions at the SJRWP and evaluate whether a design level event is imminent or has already occurred. The automated system will send emails notifying the technical team and the Respondent's project manager of the condition and the results of the flow calculation. If the team verifies that a design-level event has occurred, an inspection will be made as described herein.

If the team verifies that a high-flow event has occurred, as defined in this section, an inspection will be made as described in Section 2.2. The inspection will be initiated within one week following the return of river flows to levels that permit the inspection to be safely completed.

2.2 Inspection Procedures

The following TCRA elements will be inspected as part of each event:

- Visual inspection of the security fence and signage surrounding the Site.
- Visual inspection of the armored cap located above the water surface.
- Visual observation that waste materials are not being actively eroded into the River.

In addition, each inspection event will include:

- Collection of topographic survey data for the portions of the armored cap that are located above the water surface or at a water depth too shallow to access by boat and bathymetry survey data for the portions of the armored cap that are below the water surface and accessible by boat.
- Manual probing of armored cap thickness at areas identified by the topographic or bathymetry surveys as more than 6 inches lower in elevation than during the prior survey.

Chemical monitoring is planned for the San Jacinto River in the vicinity of the SJRWP, however, USEPA is in discussions regarding whether chemical monitoring will be conducted as a Remedial Investigation/Feasibility Study (RI/FS) activity or a TCRA activity. Therefore, this OMM Plan does not include provisions for chemical monitoring.

2.2.1 Perimeter Fence and Warning Sign Inspection Procedures

The perimeter fence surrounding the Site (Figure 1-3) on the west and east sides of the River will be visually inspected for man-made breaches or other signs of damage. The portion of the fence installed at the Big Star property will not be included in the fencing inspection because it is currently an active facility that conducts its own security checks. Fifteen "Danger" and "No Trespassing" signs were installed at the Site on steel posts set in concrete pads; a visual inspection will be completed to verify that these signs remain in place according to the schedule provided in Table 2-1, and during any supplementary armored cap inspections.

2.2.2 Land-Based Armored Cap Survey Procedures

Portions of the armored cap that are located above the water surface, or at a water depth too shallow to access by boat, will be surveyed using conventional land-based topographic survey techniques. The survey contractor will prepare a survey transect plan that will be sufficient to adequately measure the armored cap, but not less than an equivalent 25-foot by 25-foot grid. Horizontal and vertical measurements will be collected at 5-foot intervals and major breaks along these grid lines.

Each topographic survey will be compared with the prior completed survey. As outlined in Section 5 of the RAWP (Anchor QEA 2010; Anchor QEA 2011), elevation changes exceeding 6 inches (either higher or lower than the elevation during the prior survey) will be cause for additional evaluation. The elevations obtained from the survey will be re-checked and the survey benchmarks will be verified. If the most recent survey elevation is 6 inches higher or lower than the elevation during the prior survey for an area larger than 30 feet by 30 feet, manual armored cap probing will be initiated in such areas to measure the cap thickness. These contingency probing observations will be used to evaluate whether the required thickness of the armored cap material is present in the area of interest.

The manual probing will be completed using similar techniques used to confirm the TCRA construction, and will include recording the elevation of the top of the cap, followed by hand-deploying a steel rod to penetrate to the base of the armored cap (identified by refusal at the geotextile base) and recording the elevation of the base of the cap.

Because a large portion of the Site is in an intertidal area that prevents the establishment of a fixed location to transition between bathymetry and topographic survey data collection, a survey plan will be developed for each inspection event that provides for overlapping the bathymetry and topographic portions of the survey to provide complete coverage of the armored cap. The transition area between the two survey types will, by necessity, change for each survey event depending on river stage at the time of survey.

2.2.3 Water-Based Armored Cap Survey Procedures

A bathymetry survey will be performed for the portions of the armored cap that are below the water surface and accessible by boat. Bottom soundings will be made on an equivalent 25 foot trackline interval over the accessible footprint of the armored cap, with techniques designed to have a repeatable accuracy of ± 0.3 feet. Surveys will be performed in accordance with accuracy and quality assurance/quality control (QA/QC) standards established by the United States Army Corps of Engineers Hydrographic Survey Manual (USACE 2002).

Each bathymetry survey will be compared with the prior completed survey. As outlined in Section 5 of the RAWP (Anchor QEA 2010; Anchor QEA 2011), where surveyed elevations are within 6 inches of the previous survey, the results will be considered within the margin of survey accuracy and will not be cause for contingency actions, unless a visual observation indicates that the discrepancy was due to the loss of armored cap material.

Elevation changes of more than 6 inches between surveys will be cause for additional evaluation. The elevations obtained from the survey will be re-checked and the survey benchmarks will be verified. If the most recent survey elevation differs by more than 6 inches when compared to the prior survey for an area larger than 30 feet by 30 feet, manual armored cap probing will be initiated to measure the cap thickness. These contingency

probing observations will be used to evaluate whether the required thickness of armored cap material is present in the area of interest.

The manual probing will be completed using similar techniques used to confirm the TCRA construction, and will include hand-deploying a steel rod to penetrate the armored cap down to the base of the cap aggregate and recording the water depth. A steel rod or survey rod will then be used to identify the top of the armored cap and the water depth will be recorded. The armored cap aggregate thickness will be calculated as the difference between the water depth measurements collected at the base and at the top of the armored cap.

The manual probing will be completed from a vessel capable of operating in shallow water. Diver-assisted probing may also be used, if any of the areas of interest cannot be manually probed from the vessel.

2.3 Inspection Results and Interpretation

2.3.1 Reporting to USEPA

Following completion of all the inspection elements (visual inspection of the fencing, signage, armored cap, survey data (topographic and bathymetry) of the armored cap, and any manual probing), an inspection report will be prepared documenting the results of the inspection. The inspection report will include representative photographs of TCRA Site conditions and a statement regarding whether or not repairs to the fencing, signage, or armored cap are necessary, using the criteria described in Section 2.3.2. The inspection report will be transmitted to USEPA within three weeks following the completion of the inspection.

In the event that an inspection identifies one or more deficiencies to the armored cap that require repair, the Respondents will transmit a written notice of deficiency to USEPA within one business day of the inspection. Following USEPA's review of the notice of deficiency, a repair plan will be developed by the Respondents, and repairs will commence upon receiving USEPA approval of the proposed repair. Section 3.1 describes the schedule of events that will occur if the inspection indicates that repairs to the armored cap are required.

2.3.2 Conditions Requiring Repair Activities

If the visual inspection identifies a breach in the security fence, the breach will be repaired by a qualified fencing contractor as soon as practicable, but not to exceed two weeks following the inspection. Pending such repairs, cables and locks, wire, and other appropriate means will be used as needed on a short term basis to secure, to the extent practicable, the breach.

If the visual inspection identifies damaged or missing signs, the signage will be repaired or replaced as soon as practicable, but not to exceed two weeks following the inspection, assuming an available inventory of replacement signs. To facilitate timely replacement of signage, an additional ten "Danger" (five large and five small) and ten "No Trespassing" signs have been made and are being stored off-site for future use. If the inventory of a type of sign held in storage is reduced to two or less, additional signs of that type will be ordered to replenish the inventory.

The following criteria will be used to determine whether repair activities are required following an inspection of the armored cap:

- Armored cap thickness which is more than 6 inches less than the thickness specified by the TCRA design over a contiguous area greater than 30 feet by 30 feet in size.
- Complete absence of the armored cap over any area.
- If visual observation indicates that waste materials are being actively eroded into the San Jacinto River over any portion of the armored cap area.

If any of these conditions are observed during an inspection, the deficient portion of the armored cap will be repaired as described in Section 3.

3 POST-TCRA REPAIR PROCEDURES

This section presents an outline of the schedule, source materials, installation procedures, and survey procedures that will be used to complete repairs to the armored cap if an inspection identifies one or more deficiencies to the armored cap that require repair.

3.1 Schedule

The Respondents will initiate an on-call agreement with a local contractor who can respond to the TCRA Site on short notice, as described in this section. This contractor will be available to provide emergency repairs in the event that TCRA elements are damaged.

In the event that an inspection indicates that a portion of the armored cap requires repair, the Respondents will transmit a written notice of deficiency to USEPA within one business day of the inspection. Following USEPA's review of the notice of deficiency, a repair plan will be developed by the Respondents. The proposed repair plan will be submitted to USEPA for review and approval. Mobilization for the repair response will begin within one business day of USEPA approval of the proposed repair plan. Figure 3-1 presents the timeline for this sequence of events.

If material has been scoured, but a substantial flow event has not occurred, the damage will be evaluated to determine whether it was caused by anchor drag, vessel grounding, or some other type of impact force. In this case, the cover will be repaired with similar-sized material, and Site restrictions will be reviewed to determine if additional perimeter barriers or other measures should be implemented to protect the TCRA elements.

If the cover damage is not obviously related to impact forces and there has not been a significant flow event (e.g., greater than a 25-year flow event), additional evaluations will be initiated in order to determine the cause and effect, and an appropriate gradation for the repair material will be selected based on this evaluation.

3.2 Source Materials

The source materials that will be utilized for repairs to the armored cap will meet the same or more stringent requirements than source materials used to complete the TCRA

construction, unless changes to the required grain size are determined to be necessary as described previously. Depending on the portion of the cap requiring repair (Figure 1-4); the required grain sizes listed in Table 3-1 will be used to complete repairs.

Table 3-1
Cover Material Gradation Requirements

Material Designation	Material Type	d_{50} (inches)	Minimum Cover Thickness (inches)[1]
Armor Cap A	recycled concrete	3	12
Armor Cap B/C	recycled concrete	6	12
Armor Cap C	natural stone	6	12
Armor Cap D	natural stone	8	18
Armor Cap D(24)	natural stone	8	24

[1] Note that the actual thickness shown on the construction drawings may be greater than this minimum thickness, depending on other design and constructability considerations.

In the event the hydrodynamic model is recalibrated as part of the response to cover damage, the cover materials and capping plan are subject to change. The contractor performing repairs will follow any new specifications for material gradation and capping thickness in the areas in which the modeling indicates a change in the cap is required for a stable configuration.

3.2.1 Armor Cap A and B/C

Armor Cap A and B/C are processed concrete materials. These materials can be obtained from several local vendors in the Houston area. The materials will have the following gradation requirements:

- Armor Cap A:
  - 80 percent by weight of well graded recycled concrete with the following gradation requirements:
    - 100% passing 6 inches
    - No more than 50% passing 3 inches
    - No more than 4% passing the #200 sieve
  - 20 percent by weight of gravelly sand with the following gradation

requirements:

- 100% passing 3/8-inch sieve
- 50% to 90% passing the #4 sieve
- 10% to 40% passing the #10 sieve
- No more than 4% passing the #200 sieve

- Armor Cap B/C: Well graded recycled concrete with the following gradation requirements:
  - 100% passing 12 inches
  - No more than 50% passing 6 inches
  - No more than 4% passing the #200 sieve

3.2.2 Armor Cap C and D

Armor Cap C and D are natural rock materials. The materials will have the following gradation requirements:

- Armor Cap C: Well graded crushed natural rock with the following gradation requirements:
  - 100% passing 12 inches
  - No more than 50% passing 6 inches
  - No more than 4% passing the #200 sieve

- Armor Cap D and D(24): Well graded crushed natural rock with the following gradation requirements:
  - 100% passing 18 inches
  - No more than 50% passing 8 inches
  - No more than 4% passing the #200 sieve

These materials were obtained from a quarry in Marble Falls, Texas for the TCRA. Because the lead time to manufacture and transport the natural rock materials can take several weeks, additional Armor Cap C and D was manufactured during the TCRA to be available for immediate use in any future repair activities. Currently, 970 tons of Armor Cap C and 1,720 tons of Armor Cap D are stockpiled at an off-site facility located approximately 10 miles from

the Site and are available for use in any future repair activities. Analytical testing for these materials was completed during the TCRA, prior to delivery.

If more than 970 tons of Armor Cap C or 1,720 tons of Armor Cap D are necessary to complete repairs to the armored cap, and if the lead time for receipt of additional Armor Cap C or D will cause significant delay, processed concrete may be used to complete temporary repairs until the additional Armor Cap C or D is available for use. The gradation for the processed concrete used for this purpose would be equivalent to the gradation of the Armor Cap C or D, as appropriate. After the Armor Cap C or D becomes available, it would be placed atop the processed concrete used to complete the temporary repairs.

3.2.3 Material Testing

Materials used for repair of the armored cap will be clean, granular material that is generally free of roots, organic material, contaminants, and other deleterious and objectionable material. Prior to their use at the TCRA Site, a sample of each of the materials will be analyzed for the list of analytes in Appendix A. The concentration of all analytes must be below the applicable Required Chemical Fill Concentration listed in Appendix A and approved for use by USEPA before the material can be used to complete armored cap repairs.

3.3 Installation Procedures

Repair procedures can follow two courses for the installation of armored cap material: 1) land-based armored cap placement and 2) water-based armored cap placement. The repair plan will need to consider the feasibility of attempting either land or water-based operations based on current or anticipated environmental conditions at the Site (e.g., water levels, flow conditions).

Based on the current understanding of TCRA Site conditions and water depths, it is anticipated that land-based armored cap placement would be used for the Western Cell and those portions of the Eastern Cell that cannot be accessed from the water because, with the completion of the TCRA, water depths in the surrounding water are too shallow to accommodate water-based construction. Water-based armored cap placement would be used for any area in which water depths can accommodate water-based construction, including

the Northwestern Area and the north and east portions of the Eastern Cell. The contractor completing the repairs will determine whether the repair work will be completed using land-based equipment, water-based equipment, or a combination of the two.

3.3.1 Land-Based Armored Cap Placement

Repairs completed using land-based equipment would be completed using conventional earth-moving equipment similar to that used to complete the TCRA, including but not limited to: long-reach excavators, dozers, front-end loaders, and low-ground pressure trucks. Armored cap materials used for repairs would be delivered to the Site by trucks along the Texas Department of Transportation (TxDOT) right-of-way (ROW) that runs parallel to the north side of the I-10 Bridge. An access agreement is currently in place to allow use of the ROW for this purpose. If the access agreement expires prior to such time as repair to the armored cap is necessary, the Respondents will use their best efforts to negotiate an extension of the existing agreement or secure a new access agreement with TxDOT to allow continued use of the ROW for transporting equipment and materials to the repair area.

3.3.2 Water-Based Armored Cap Placement

Repairs completed using water-based equipment would be completed using barge-based equipment similar to that used to complete the TCRA, including but not limited to: material transport barges, barge-mounted long-reach excavators, and support boats. Water-based armored cap placement activities will require an off-site load/dock facility and marine transport to deliver the armored cap materials to the Site, dependent on existing and forecast river conditions.

3.4 Verification of Repairs (Construction Quality Assurance)

Following completion of repair work to the armored cap, the repair areas will be re-surveyed and probed until the repair work effectively re-establishes the minimum cap thickness. This information will also be used to re-establish a new baseline survey for the affected area. The survey will be completed using topographic or bathymetry techniques as appropriate.

3.5 Repair Report to USEPA

A report summarizing the repairs to the armored cap will be submitted to USEPA within three weeks following the completion of repairs. This report will be a quality assurance document verifying repairs were completed in accordance with the original construction specifications or the new approved specifications modified to address the damage to the cap under the flow conditions that caused the damage. The report will contain the following items:

- The quantity and type of armored cap materials used to complete the repairs.
- Steps taken to procure the armored cap materials used in the repairs (e.g., used existing stockpile or ordered additional armored cap materials).
- Analytical results for additional armored cap materials used for repairs (as applicable).
- Description of the methods used to install the armored cap materials used for repairs.
- Summary of quality assurance procedures and results.
- As-built survey of the repaired cap.

4 REFERENCES

Anchor QEA, LLC (Anchor QEA), 2010 & 2011. *Removal Action Work Plan,* San Jacinto River Waste Pits Superfund Site. Prepared for U.S. Environmental Protection Agency (USEPA) Region 6 on behalf of McGinnes Industrial Maintenance Corporation and International Paper Company. November 2010, revised February 2011.

Anchor QEA, 2011b. *Draft Removal Action Construction Report,* San Jacinto River Waste Pits Superfund Site. Prepared for U.S. Environmental Protection Agency (USEPA) Region 6, on behalf of McGinnes Industrial Maintenance Corporation, and International Paper Company. September 2011.

USACE, 2002. *Hydrographic Surveying.* Engineering Manual 1110-2-1003. Department of the Army, U.S. Army Corps of Engineers, January 1, 2002.

USEPA, 2009. *Unilateral Administrative Order for Remedial Investigation/Feasibility Study.* U.S. EPA Region 6 CERCLA Docket No. 06-03-10. In the matter of: San Jacinto River Waste Pits Superfund Site Pasadena, Texas. International Paper Company & McGinnes Industrial Management Corporation, Respondents.

USEPA, 2010a. *Administrative Settlement Agreement and Order on Consent for Removal Action*. U.S. EPA Region 6 CERCLA Docket No. 06-03-10. In the matter of: San Jacinto River Waste Pits Superfund Site Pasadena, Harris County, Texas. International Paper Company & McGinnes Industrial Management Corporation, Respondents.

USEPA, 2010b. *Action Memorandum for the Time Critical Removal Action at the San Jacinto River Waste Pits Site, Harris County, Texas.* USEPA Region 6. April 2, 2010.

FIGURES

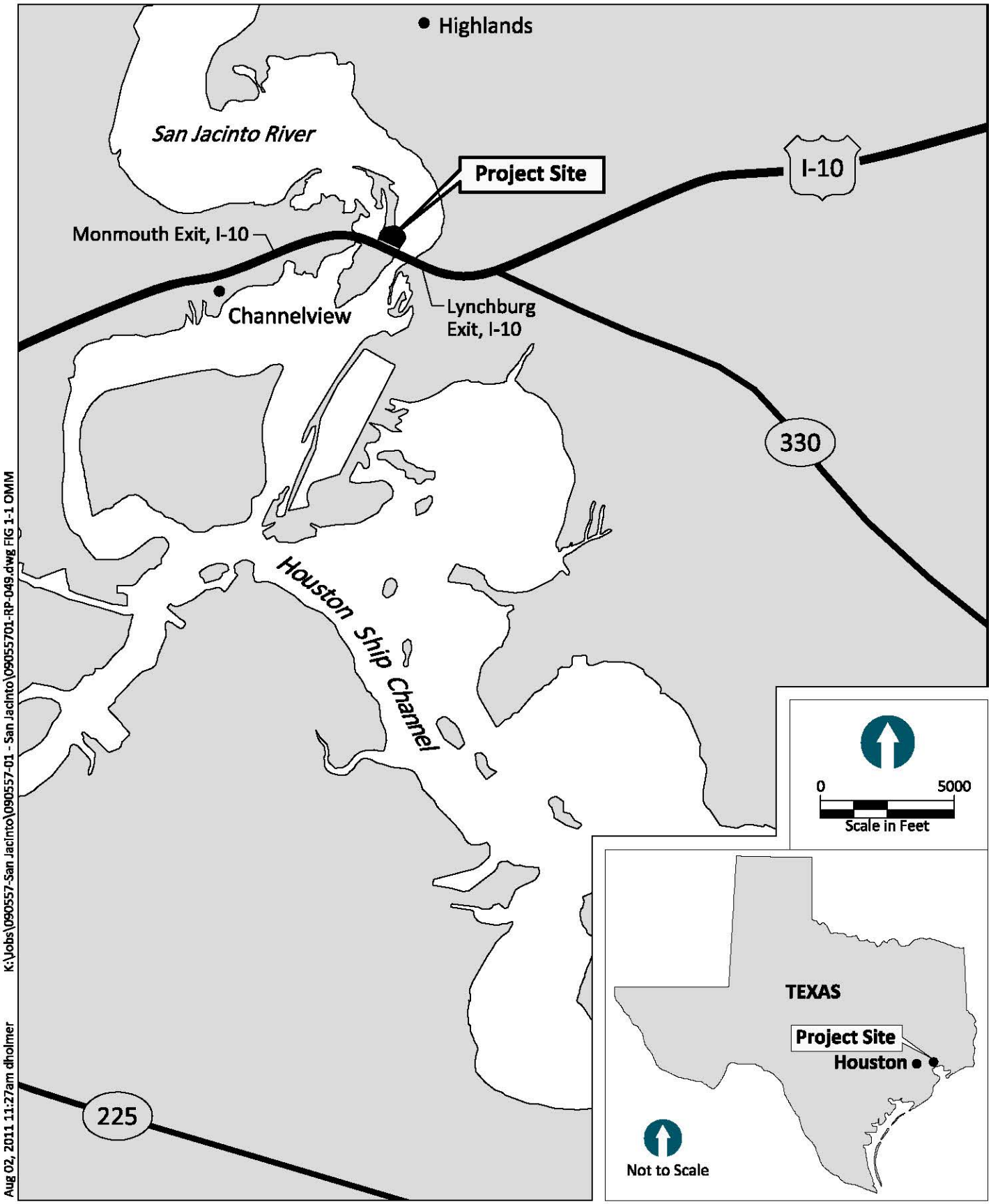
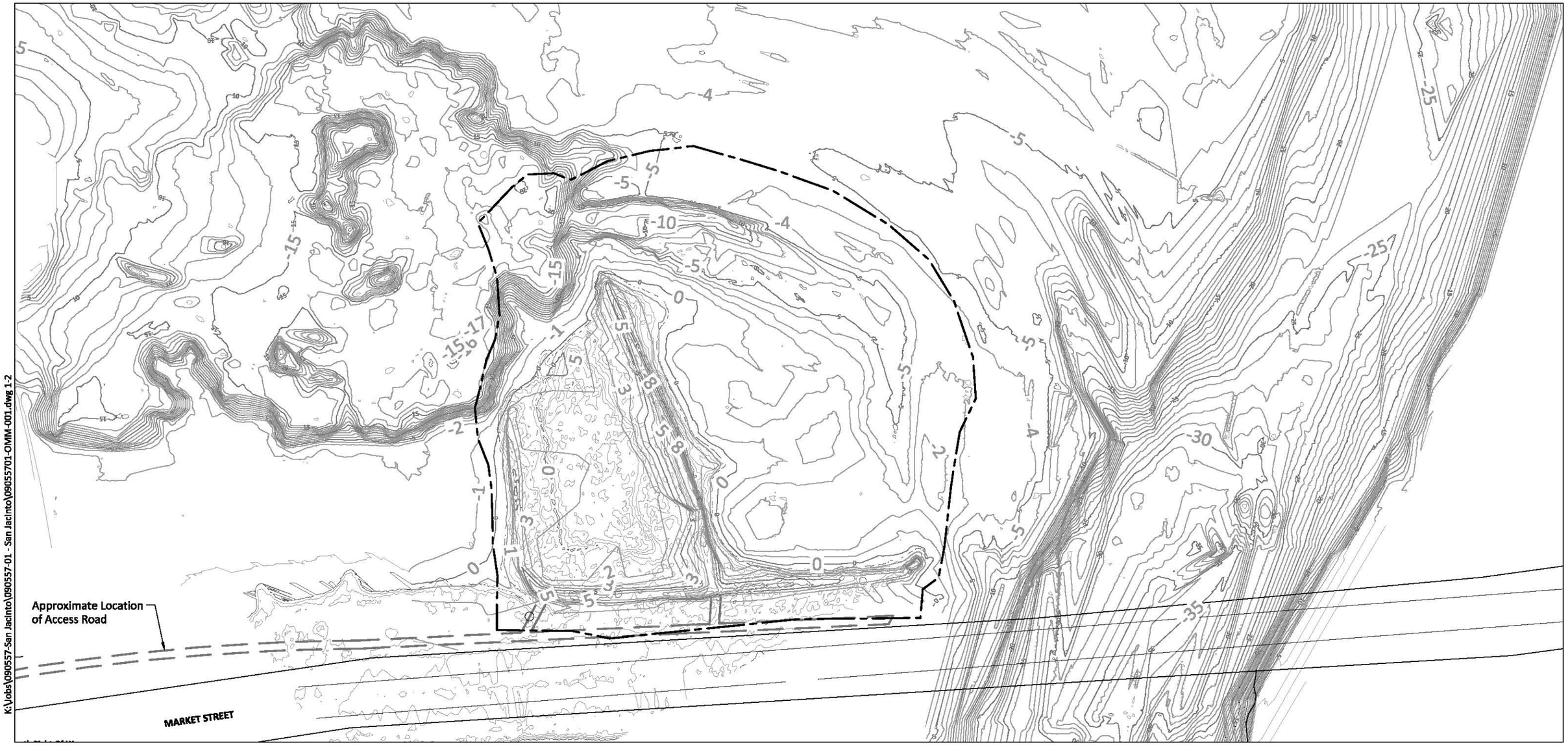


Figure 1-1
Vicinity Map
Operations, Monitoring, and Maintenance Plan
San Jacinto River Waste Pits Superfund Site

ANCHOR QEA



K:\Jobs\090557-San Jacinto\090557-01 - San Jacinto\09055701-OMM-001.dwg 1-2

Aug 02, 2011 11:30am dholmer

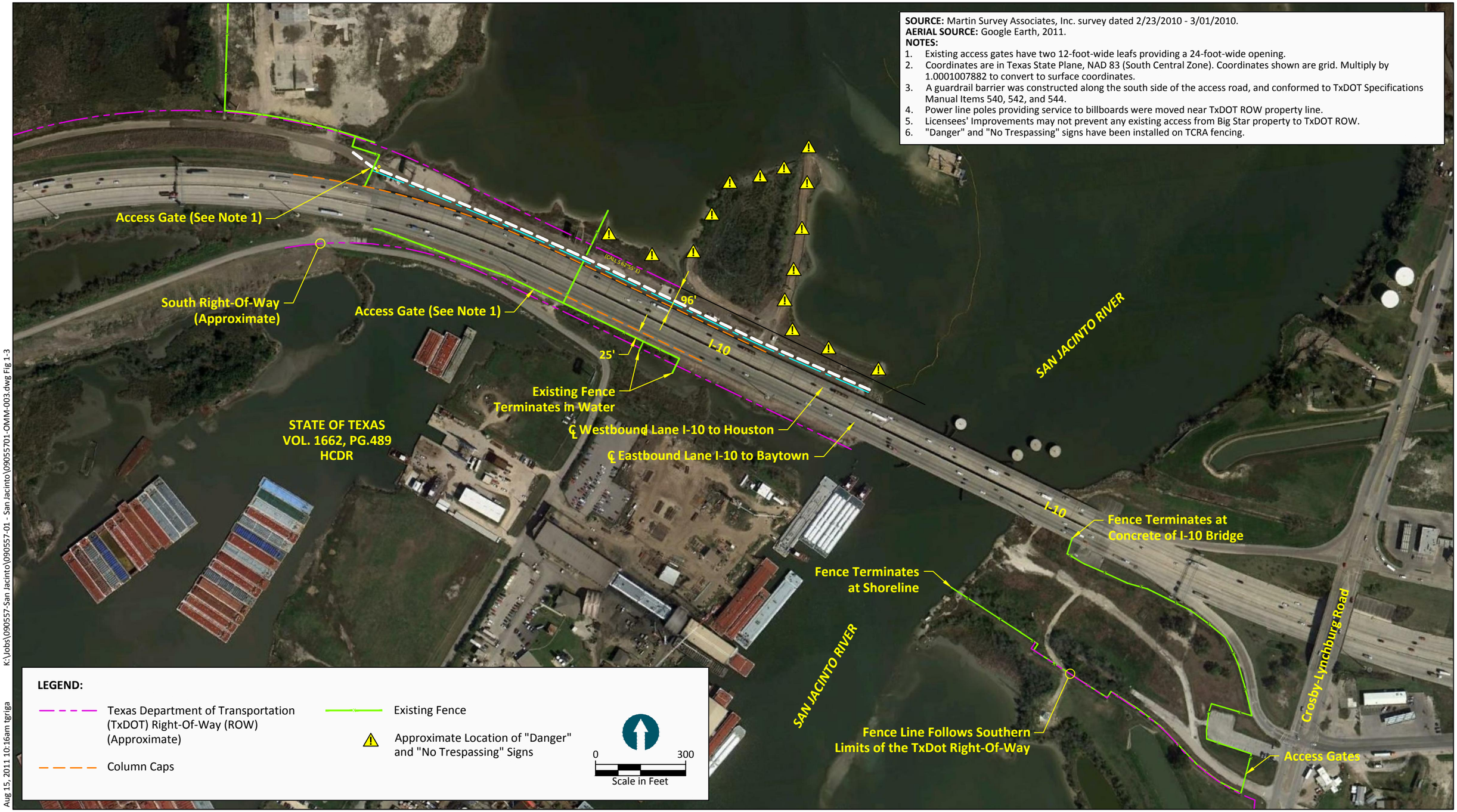
HORIZONTAL DATUM: Texas South Central, NAD83. US Survey Feet.
VERTICAL DATUM: NAVD 88.
VERTICAL CONTROL: HGCSD 33 (26.57' NAVD88 - TSARP)

LEGEND:
Pre-Construction Contour (1-foot interval)
Historic Impoundment Limit (EPA)

0 180
Scale in Feet

ANCHOR QEA

Figure 1-2
Location Map
Operations, Monitoring, and Maintenance Plan
San Jacinto River Waste Pits Superfund Site

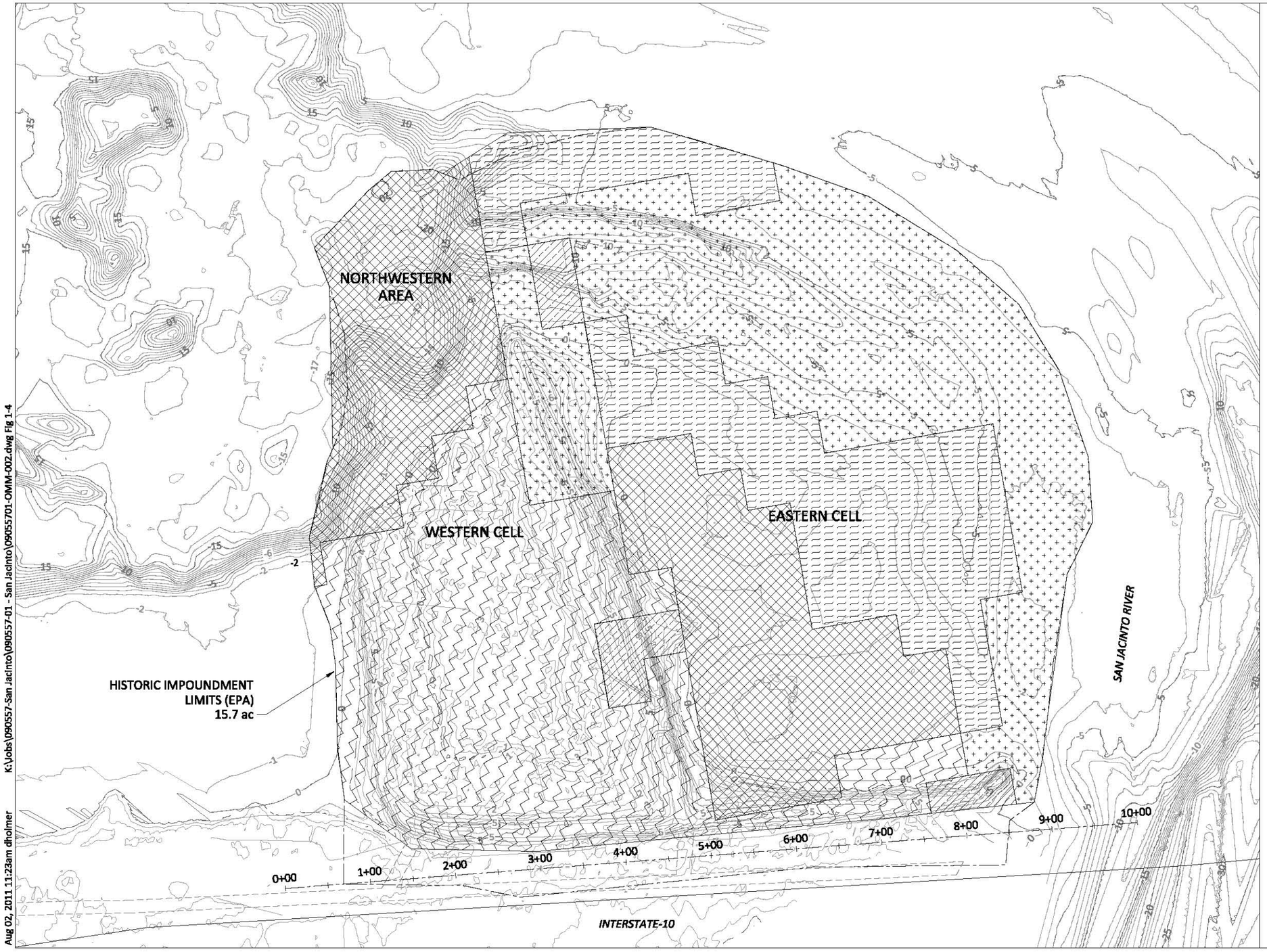


K:\Jobs\090557-San Jacinto\090557-01 - San Jacinto\09055701-OMM-003.dwg Fig 1-3

Aug 15, 2011 10:16am tgriga

ANCHOR QEA

Figure 1-3
Fence and Warning Sign Layout
Operations, Monitoring, and Maintenance Plan
San Jacinto River Waste Pits Superfund Site



LEGEND:

- Pre-Construction Contour (1-foot interval)
- Historic Impoundment Limit (EPA)
- Armored Cap $A_{(P)}$ (Recycled)
- Armored Cap $B/C_{(P)}$ (Recycled)
- Armored Cap $C_{(N)}$ (Natural)
- Armored Cap $D_{(N)}$ (Natural)
- Armored Cap $D_{(N)}$ (Natural) (24"-Thick)

0 60 120
Scale in Feet

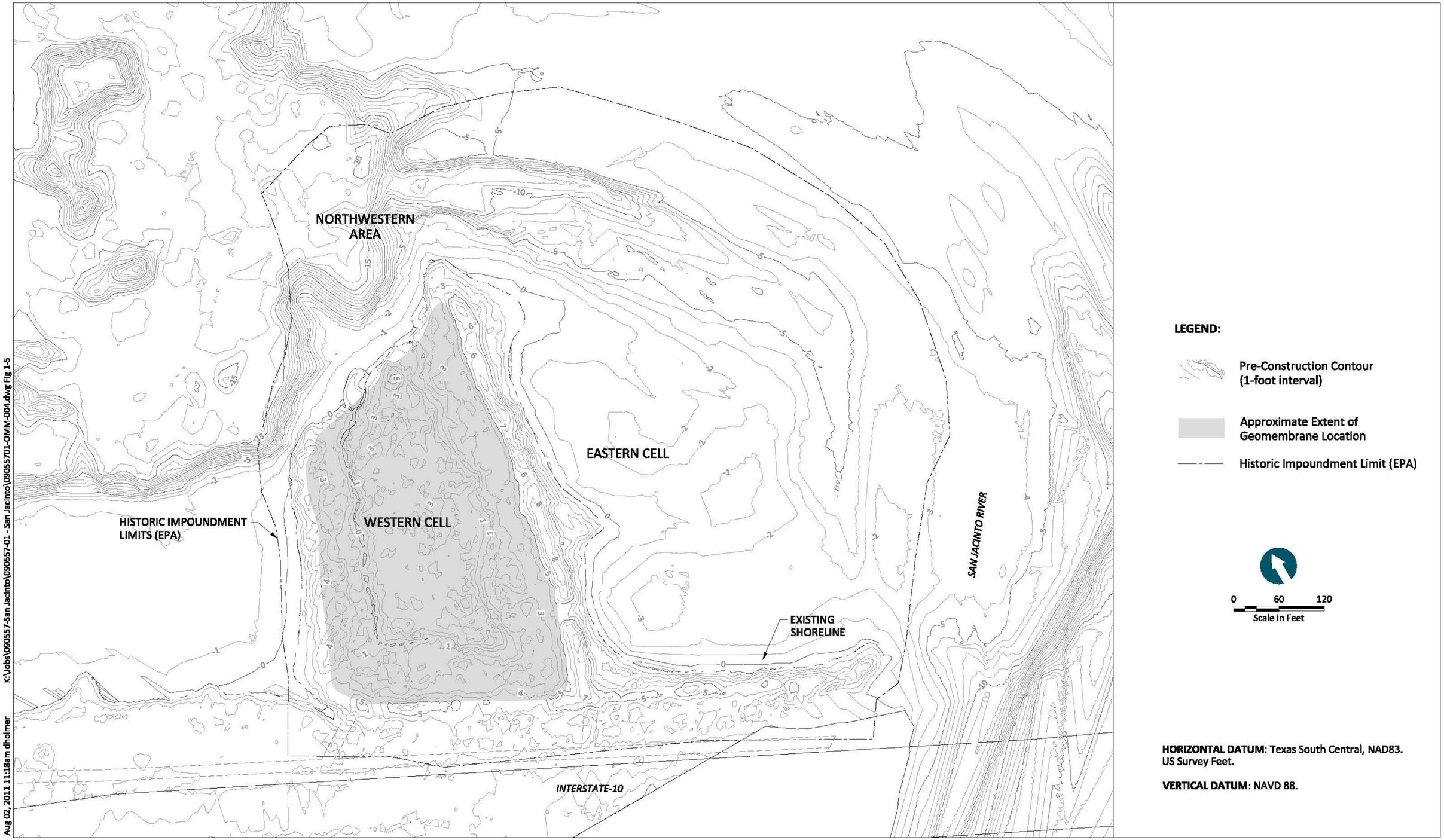
HORIZONTAL DATUM: Texas South Central, NAD83. US Survey Feet.

VERTICAL DATUM: NAVD 88.

K:\Jobs\090557-San Jacinto\090557-01 - San Jacinto\09055701-OMM-002.dwg Fig 1-4
Aug 02, 2011 11:23am dholmer

ANCHOR QEA

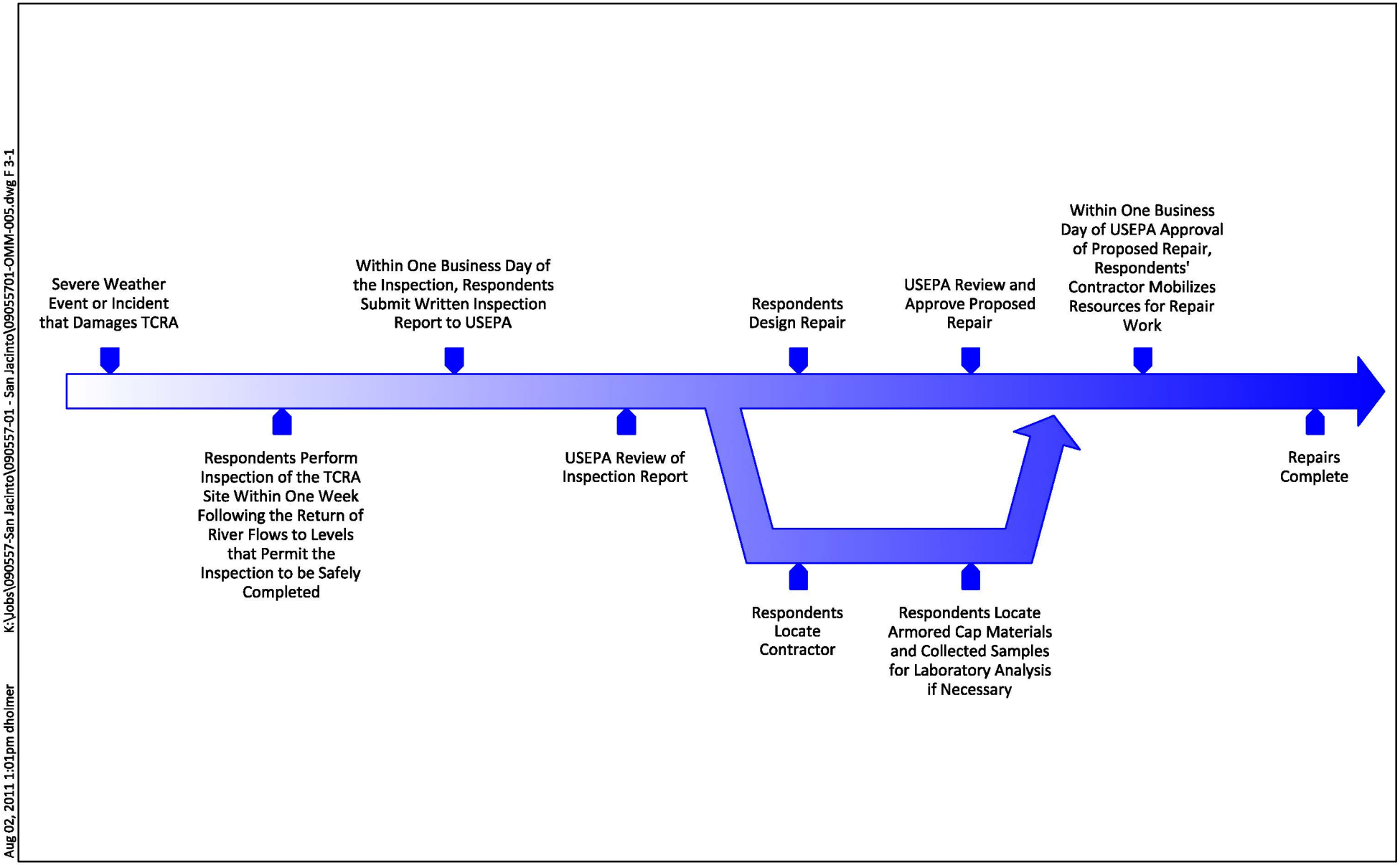
Figure 1-4
Armored Cap As-Built
Operations, Monitoring, and Maintenance Plan
San Jacinto River Waste Pits Superfund Site



K:\Jobs\090557-San Jacinto\090557-01 - San Jacinto\09055701-OMM-004.dwg Fig 1-5
Aug 02, 2011 11:18am dholmer

ANCHOR QEA

Figure 1-5
Geomembrane Location
Operations, Monitoring, and Maintenance Plan
San Jacinto River Waste Pits Superfund Site



Aug 02, 2011 1:01pm dholmer K:\Jobs\090557-San Jacinto\090557-01 - San Jacinto\09055701-OMM-005.dwg F 3-1

ANCHOR QEA

Figure 3-1
TCRA Repair Timeline
Operations, Monitoring, and Maintenance Plan
San Jacinto River Waste Pits Superfund Site

APPENDIX A
ARMORED CAP MATERIAL ANALYTE LIST

Appendix A
Armored Cap Material Analyte List

Parameter	Analytical Method	Reporting Limit (mg/kg)	TCEQ Tier I Residential Soil PCLs[1] (mg/kg)	TRRP Tier 1 Sediment PCLs [4] (mg/kg)	TCEQ Marine PEL[5] (mg/kg)	Required Fill Chemical Concentration Criteria (mg/kg)
Metals						
Aluminum	6010B/6020	10	6.4E+04	1.5E+05	NL	6.4E+04
Antimony	6010B/6020	5.0	2.7E+00	8.3E+01	NL	2.7E+00
Arsenic	6010B/6020	5.0	2.5E+00	1.1E+02	4.2E-02	4.2E-02
Cadmium	6010B/6020	0.20	7.5E-01	1.1E+03	4.2E-03	4.2E-03
Chromium	6010B/6020	0.50	1.2E+03	3.6E+04	1.6E-01	1.6E-01
Copper	6010B/6020	0.50	5.2E+02	2.1E+04	1.1E-01	1.1E-01
Lead	6010B/6020	2.0	1.5E+00	5.0E+02	1.1E-01	1.1E-01
Mercury	7471A	0.005	3.9E-03	3.4E+01	7.0E-04	7.0E-04
Nickel	6010B/6020	2.0	7.9E+01	1.4E+03	4.3E-02	4.3E-02
Silver	6010B/6020	0.50	2.4E-01	3.5E+02	1.8E-03	1.8E-03
Zinc	6010B/6020	5.0	1.2E+03	7.6E+04	2.7E-01	2.7E-01
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	8270C	0.10	2.4E+00	1.5E+03	--	2.4E+00
1,2-Dichlorobenzene	8270C	0.10	8.9E+00	6.6E+04	--	8.9E+00
1,3-Dichlorobenzene	8270C	0.10	3.4E+00	2.2E+04	--	3.4E+00
1,4-Dichlorobenzene	8270C	0.10	1.1E+00	2.3E+03	--	1.1E+00
2,4-Dimethylphenol	8270C	0.10	1.6E+00	3.1E+03	--	1.6E+00
2-Methylnaphthalene	8270C	0.10	8.5E+00	2.5E+03	NL	8.5E+00
2-Methylphenol	8270C	0.10	3.6E+00	7.7E+03	--	3.6E+00
4-Methylphenol	8270C	0.10	3.2E-01	7.7E+02	--	3.2E-01
Acenaphthene	8270C	0.10	1.2E+02	7.4E+03	8.9E-02	8.9E-02
Acenaphthylene	8270C	0.10	2.0E+02	7.4E+03	1.3E-01	1.3E-01
Anthracene	8270C	0.10	3.4E+03	3.7E+04	2.5E-01	2.5E-01
Benz[a]anthracene	8270C	0.10	5.6E+00	1.6E+01	6.9E-01	6.9E-01
Benzo[a]pyrene	8270C	0.10	5.6E-01	1.6E+00	7.6E-01	5.6E-01
Benzo[b]fluoranthene	8270C	0.10	5.7E+00	1.6E+01	--	5.7E+00
Benzo[g,h,i]perylene	8270C	0.10	1.8E+03	3.7E+03	--	1.8E+03
Benzo[k]fluoranthene	8270C	0.10	5.7E+01	1.6E+02	--	5.7E+01
Benzoic acid	8270C	0.60	9.5E+01	6.1E+05	NL	9.5E+01
Benzyl alcohol	8270C	0.10	2.9E+00	4.6E+04	NL	2.9E+00
Bis[2-ethylhexyl]phthalate	8270C	0.10	4.3E+01	2.4E+02	--	4.3E+01
Butyl benzyl phthalate	8270C	0.10	1.3E+02	3.1E+04	--	1.3E+02
Chrysene	8270C	0.10	5.6E+02	1.6E+03	8.5E-01	8.5E-01
Dibenz[a,h]anthracene	8270C	0.10	5.5E-01	1.6E+00	1.3E-01	1.3E-01
Diethyl phthalate	8270C	0.10	7.8E+01	1.2E+05	--	7.8E+01
Dimethyl phthalate	8270C	0.10	3.1E+01	1.2E+05	--	3.1E+01
Di-n-butyl phthalate	8270C	0.10	1.7E+03	1.5E+04	--	1.7E+03
Di-n-octyl phthalate	8270C	0.10	1.3E+03	3.1E+03	--	1.3E+03
Fluoranthene	8270C	0.10	9.6E+02	4.9E+03	1.5E+00	1.5E+00
Fluorene	8270C	0.10	1.5E+02	4.9E+03	1.4E-01	1.4E-01
Hexachlorobenzene	8270C	0.10	5.6E-01	8.9E+00	NL	5.6E-01
Hexachlorobutadiene	8270C	0.10	1.6E+00	3.1E+01	--	1.6E+00
Hexachloroethane	8270C	0.10	9.2E-01	1.5E+02	--	9.2E-01
Indeno[1,2,3-c,d]pyrene	8270C	0.10	5.7E+00	1.6E+01	--	5.7E+00
Naphthalene	8270C	0.10	1.6E+01	2.5E+03	3.9E-01	3.9E-01
N-nitrosodiphenylamine	8270C	0.10	1.4E+00	9.0E+02	--	1.4E+00
Pentachlorophenol	8270C	0.20	9.2E-03	5.6E+01	--	9.2E-03

Appendix A
Armored Cap Material Analyte List

Parameter	Analytical Method	Reporting Limit (mg/kg)	TCEQ Tier I Residential Soil PCLs[1] (mg/kg)	TRRP Tier 1 Sediment PCLs [4] (mg/kg)	TCEQ Marine PEL[5] (mg/kg)	Required Fill Chemical Concentration Criteria (mg/kg)
Phenanthrene	8270C	0.10	2.1E+02	3.7E+03	5.4E-01	5.4E-01
Phenol	8270C	0.10	9.6E+00	9.2E+04	--	9.6E+00
Pyrene	8270C	0.10	5.6E+02	3.7E+03	1.4E+00	1.4E+00
Volatile Organic Compounds (VOCs)						
1,1,1,2-Tetrachloroethane	8260B	0.0050	7.1E-01	2.1E+03	NL	7.1E-01
1,1,1-Trichloroethane	8260B	0.0050	8.1E-01	1.5E+05	--	8.1E-01
1,1,2,2-Tetrachloroethane	8260B	0.0050	1.2E-02	2.7E+02	--	1.2E-02
1,1,2-Trichloroethane	8260B	0.0050	1.0E-02	9.6E+02	--	1.0E-02
1,1-Dichloroethane	8260B	0.0050	9.2E+00	7.3E+04	--	9.2E+00
1,1-Dichloroethene	8260B	0.0050	2.5E-02	9.1E+01	--	2.5E-02
1,1-Dichloropropene	8260B	0.0050	6.7E-02	5.4E+02	NL	6.7E-02
1,2,3-Trichlorobenzene	8260B	0.0050	1.3E+01	4.6E+02	NL	1.3E+01
1,2,3-Trichloropropane	8260B	0.0050	2.7E-04	7.8E+00	NL	2.7E-04
1,2,4-Trimethylbenzene	8260B	0.0050	4.9E+00	3.7E+04	NL	4.9E+00
1,2-Dibromo-3-chloropropane	8260B	0.0050	8.7E-04	1.0E+01	NL	8.7E-04
1,2-Dichloroethane	8260B	0.0050	6.9E-03	6.0E+02	--	6.9E-03
1,2-Dichloropropane	8260B	0.0050	1.1E-02	8.0E+02	--	1.1E-02
1,3,5-Trimethylbenzene	8260B	0.0050	2.7E+01	3.7E+04	NL	2.7E+01
1,3-Dichloropropane	8260B	0.0050	3.2E-02	5.4E+02	NL	3.2E-02
1,4-Dichlorobenzene	8260B	0.0050	1.1E+00	2.3E+03	NL	1.1E+00
2,2-Dichloropropane	8260B	0.0050	6.0E-02	8.0E+02	NL	6.0E-02
2-Butanone	8260B	0.0050	1.5E+01	4.4E+05	NL	1.5E+01
2-Chlorotoluene	8260B	0.0050	4.5E+00	3.1E+03	NL	4.5E+00
2-Hexanone	8260B	0.0050	1.6E-01	4.4E+04	NL	1.6E-01
4-Chlorotoluene	8260B	0.0050	2.5E+00	1.5E+04	NL	2.5E+00
4-Isopropyltoluene	8260B	0.0050	NL	NL	NL	0.0E+00
4-Methyl-2-Pentanone	8260B	0.0050	2.5E+00	5.9E+04	NL	2.5E+00
Acetone	8260B	0.0050	2.1E+01	7.3E+04	NL	2.1E+01
Benzene	8260B	0.0050	1.3E-02	9.9E+02	--	1.3E-02
Bromobenzene	8260B	0.0050	1.2E+00	1.5E+04	NL	1.2E+00
Bromochloromethane	8260B	0.0050	1.5E+00	2.9E+04	NL	1.5E+00
Bromodichloromethane	8260B	0.0050	3.3E-02	8.8E+02	NL	3.3E-02
Bromoethane	8260B	0.0050	NL	NL	NL	0.0E+00
Bromoform	8260B	0.0050	3.2E-01	6.9E+03	--	3.2E-01
Bromomethane	8260B	0.0050	6.5E-02	1.0E+03	--	6.5E-02
Carbon Disulfide	8260B	0.0050	6.8E+00	7.3E+04	NL	6.8E+00
Carbon Tetrachloride	8260B	0.0050	3.1E-02	4.2E+02	--	3.1E-02
Chlorobenzene	8260B	0.0050	5.5E-01	1.5E+04	--	5.5E-01
Chloroethane	8260B	0.0050	1.5E+01	2.9E+05	--	1.5E+01
Chloroform	8260B	0.0050	5.1E-01	7.3E+03	--	5.1E-01
Chloromethane	8260B	0.0050	2.0E-01	4.2E+03	--	2.0E-01
cis-1,2-Dichloroethene	8260B	0.0050	1.2E-01	7.3E+03	NL	1.2E-01
cis-1,3-Dichloropropene	8260B	0.0050	3.3E-03	7.3E+01	--	3.3E-03
Dibromochloromethane	8260B	0.0050	2.5E-02	6.5E+02	--	2.5E-02
Dibromomethane	8260B	0.0050	5.6E-01	7.3E+03	NL	5.6E-01
Dichlorodifluoromethane	8260B	0.0050	1.2E+02	1.5E+05	NL	1.2E+02
Ethylbenzene	8260B	0.0050	3.8E+00	7.3E+04	--	3.8E+00
Ethylene Dibromide	8260B	0.0050	1.0E-04	6.4E-01	NL	1.0E-04

Appendix A
Armored Cap Material Analyte List

Parameter	Analytical Method	Reporting Limit (mg/kg)	TCEQ Tier I Residential Soil PCLs[1] (mg/kg)	TRRP Tier 1 Sediment PCLs [4] (mg/kg)	TCEQ Marine PEL[5] (mg/kg)	Required Fill Chemical Concentration Criteria (mg/kg)
Isopropylbenzene	8260B	0.0050	1.7E+02	7.3E+04	NL	1.7E+02
m,p-Xylene	8260B	0.0050	5.3E+01	1.0E+06	--	5.3E+01
Methyl tert-Butyl Ether	8260B	0.0050	3.1E-01	7.3E+03	NL	3.1E-01
Methylene Chloride	8260B	0.0050	6.5E-03	7.3E+03	--	6.5E-03
Naphthalene	8260B	0.0050	1.6E+01	2.5E+03	NL	1.6E+01
n-Butylbenzene	8260B	0.0050	6.1E+01	6.1E+03	NL	6.1E+01
n-Propylbenzene	8260B	0.0050	2.2E+01	2.9E+04	NL	2.2E+01
o-Xylene	8260B	0.0050	3.5E+01	1.0E+06	--	3.5E+01
sec-Butylbenzene	8260B	0.0050	4.2E+01	2.9E+04	NL	4.2E+01
Styrene	8260B	0.0050	1.6E+00	1.5E+05	NL	1.6E+00
tert-Butylbenzene	8260B	0.0050	5.0E+01	2.9E+04	NL	5.0E+01
Tetrachloroethene	8260B	0.0050	2.5E-02	1.0E+03	--	2.5E-02
Toluene	8260B	0.0050	4.1E+00	1.5E+05	--	4.1E+00
trans-1,2-Dichloroethene	8260B	0.0050	2.5E-01	1.5E+04	--	2.5E-01
trans-1,3-Dichloropropene	8260B	0.0050	1.8E-02	5.4E+02	--	1.8E-02
Trichloroethene	8260B	0.0050	1.7E-02	4.4E+03	--	1.7E-02
Trichlorofluoromethane	8260B	0.0050	6.4E+01	2.2E+05	NL	6.4E+01
Vinyl Chloride	8260B	0.0050	1.1E-02	3.6E+01	--	1.1E-02
Organochlorine Pesticides						
DDD	8081A	0.0050	6.5E+00	1.2E+02	--	6.5E+00
DDE	8081A	0.0050	5.9E+00	8.7E+01	--	5.9E+00
DDT	8081A	0.0050	5.4E+00	8.7E+01	5.2E-02	5.2E-02
Aldrin	8081A	0.0050	5.0E-02	8.4E-01	--	5.0E-02
Dieldrin	8081A	0.0050	2.4E-02	8.9E-01	4.3E-03	4.3E-03
alpha-BHC	8081A	0.0050	4.0E-03	4.1E+00	--	4.0E-03
beta-BHC	8081A	0.0050	1.4E-02	1.4E+01	--	1.4E-02
delta-BHC	8081A	0.0050	8.7E-02	1.4E+01	--	8.7E-02
gamma-BHC (Lindane)	8081A	0.0050	4.6E-03	2.0E+01	9.9E-04	9.9E-04
alpha-Chlordane	8081A	0.0050	1.3E+01	4.1E+01	NL	1.3E+01
gamma-Chlordane	8081A	0.0050	7.3E+00	7.3E+01	NL	7.3E+00
alpha-Endosulfan	8081A	0.0050	2.3E+00	3.1E+02	--	2.3E+00
beta-Endosulfan	8081A	0.0050	2.3E+00	9.2E+02	--	2.3E+00
Endosulfan sulfate	8081A	0.0050	3.8E+02	9.2E+02	--	3.8E+02
Endrin	8081A	0.0050	3.8E-01	4.6E+01	--	3.8E-01
Endrin aldehyde	8081A	0.0050	1.9E+01	4.6E+01	NL	1.9E+01
Endrin ketone	8081A	0.0050	1.9E+01	4.6E+01	NL	1.9E+01
Heptachlor	8081A	0.0050	9.4E-02	3.2E+00	--	9.4E-02
Heptachlor epoxide	8081A	0.0050	2.9E-02	1.6E+00	--	2.9E-02
Methoxychlor	8081A	0.010	6.2E+01	7.7E+02	--	6.2E+01
Mirex	8081A	0.0050	1.3E+01	NL	--	1.3E+01
cis-Nonachlor	8081A	0.0050	5.6E+00	4.1E+01	NL	5.6E+00
Oxychlordane	8081A	0.0050	5.6E+00	4.1E+01	NL	5.6E+00
Toxaphene	8081A	0.20	1.2E+00	1.3E+01	--	1.2E+00
Trans-Nonachlor	8081A	0.0050	5.6E+00	4.1E+01	NL	5.6E+00
Chlorinated Herbicides						
2,4,5-T	8151	0.020	NL	NL	--	0.0E+00
2,4-D	8151	0.050	NL	2.5E+03	--	2.5E+03
2,4-D	8151	0.20	NL	2.5E+03	--	2.5E+03

Appendix A
Armored Cap Material Analyte List

Parameter	Analytical Method	Reporting Limit (mg/kg)	TCEQ Tier I Residential Soil PCLs[1] (mg/kg)	TRRP Tier 1 Sediment PCLs [4] (mg/kg)	TCEQ Marine PEL[5] (mg/kg)	Required Fill Chemical Concentration Criteria (mg/kg)
Dalapon	8151	0.050	2.9E-01	4.6E+03	NL	2.9E-01
Dicamba	8151	0.020	7.3E-01	4.6E+03	NL	7.3E-01
Dichlorprop	8151	0.050	2.3E-01	1.5E+03	NL	2.3E-01
Dinoseb	8151	0.020	1.8E-01	1.5E+02	NL	1.8E-01
MCPA	8151	10	1.2E-02	7.7E+01	NL	1.2E-02
MCPP	8151	10	2.3E-02	1.5E+02	NL	2.3E-02
Silvex	8151	0.020	2.6E+00	1.2E+03	NL	2.6E+00
Polychlorinated Biphenyls (PCBs)						
Total PCBs	8082	0.010	1.1E+00	2.3E+00	1.9E-01	1.9E-01
Dioxin/Furans, ng/kg						
Dioxins		ng/kg [2]	ng/kg [2]	ng/kg [2]	ng/kg [2]	ng/kg [2]
2,3,7,8-TCDD	1613B	1.0	(3)	(3)	NL	(3)
1,2,3,7,8-PeCDD	1613B	5.0	(3)	(3)	NL	(3)
1,2,3,4,7,8-HxCDD	1613B	5.0	(3)	(3)	NL	(3)
1,2,3,6,7,8-HxCDD	1613B	5.0	(3)	(3)	NL	(3)
1,2,3,7,8,9-HxCDD	1613B	5.0	(3)	(3)	NL	(3)
1,2,3,4,6,7,8-HpCDD	1613B	5.0	(3)	(3)	NL	(3)
OCDD	1613B	10	(3)	(3)	NL	(3)
Furans						
2,3,7,8-TCDF	1613B	1.0	(3)	(3)	NL	(3)
1,2,3,7,8-PeCDF	1613B	5.0	(3)	(3)	NL	(3)
2,3,4,7,8,-PeCDF	1613B	5.0	(3)	(3)	NL	(3)
1,2,3,4,7,8-HxCDF	1613B	5.0	(3)	(3)	NL	(3)
1,2,3,6,7,8-HxCDF	1613B	5.0	(3)	(3)	NL	(3)
1,2,3,7,8,9-HxCDF	1613B	5.0	(3)	(3)	NL	(3)
2,3,4,6,7,8-HxCDF	1613B	5.0	(3)	(3)	NL	(3)
1,2,3,4,6,7,8-HpCDF	1613B	5.0	(3)	(3)	NL	(3)
1,2,3,4,7,8,9-HpCDF	1613B	5.0	(3)	(3)	NL	(3)
OCDF	1613B	10	(3)	(3)	NL	(3)

Notes:

1. TCEQ TRRP Tier I Residential Soil PCL Values, 30-acre source area, includes Total Soil Combined and GW Soil Ingestion (Class 1) exposure routes.
2. Dioxin/furan concentrations expressed in ng/kg. All other concentrations in table expressed in mg/kg.
3. Acceptable dioxin/furan concentration is less than 0.45 ng/kg of 2,3,7,8-TCDD and 5 ng/kg TEQ based on WHO 2005[6] TEFs
4. TCEQ TRRP Tier 1 Sediment PCL Values, includes ingestion and dermal pathways
5. TCEQ Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data, 2004
6. Van den Berg et al. 2006. The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds. Toxicological Sciences 93(2): 223-241.

NL - Not Listed
-- No value given