MOTIVA
ENTERPRISES LLC

February 25, 2021

VIA ELECTRONIC DELIVERY

Richard Ehrhart
United States Environmental Protection Agency – Region 6
Multimedia Planning and Permitting Division
Federal Facilities Section 6PD-F
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Re: Revised Ready for Reuse Request for
MOTIVA ENTERPRISES LLC PORT NECHES TERMINAL
EPA ID No. TXD980626022
TCEQ SWR No. 30017

Dear Mr. Ehrhart,

This revised request for a Ready for Reuse (RfR) determination from the EPA is for the Motiva Port Neches Terminal (PNT), a crude oil terminal located on Port Neches, Texas. Additional information obtained in response to EPA comments on the original RfR submittal in May 2020 has been added to this submittal.

This RfR determination request is made to allow Motiva to continue to use the facility as an oil storage terminal, and to allow future construction of additional tankage and other improvements as may be necessary. This request does not apply to the Port Neches Canal, which is being addressed through the Texas Commission on Environmental Quality (TCEQ) Texas Risk Reduction (TRRP) program.

The RfR report presents information to demonstrate:

- The site is ready for reuse and will remain protective for its current industrial use in its current state;
- Current environmental condition and future planned industrial use of the site;
- The site conditions associated with historic and ongoing industrial operations are protective of human health and the environment; and
- Dense Non-aqueous phase Liquid (DNAPL) is from an off-site source and is well defined within the site boundaries and based on a thorough site characterization does not affect ongoing industrial operations at the site or represent an unacceptable risk to current industrial operations.

Motiva believes that this Ready for Reuse document meets all the requirements specified for a positive determination from EPA which will result in the closure of the 1988 Consent Agreement/ Final Order. If you have any questions, please contact Matt Baker with my staff.

Sincerely,

MOTIVA ENTERPRISES LLC

Brenda J Allen
Director, Corporate HSE

CC: Eleanor Wehner - TCEQ Remediation Division, Austin Tx
Enclosure

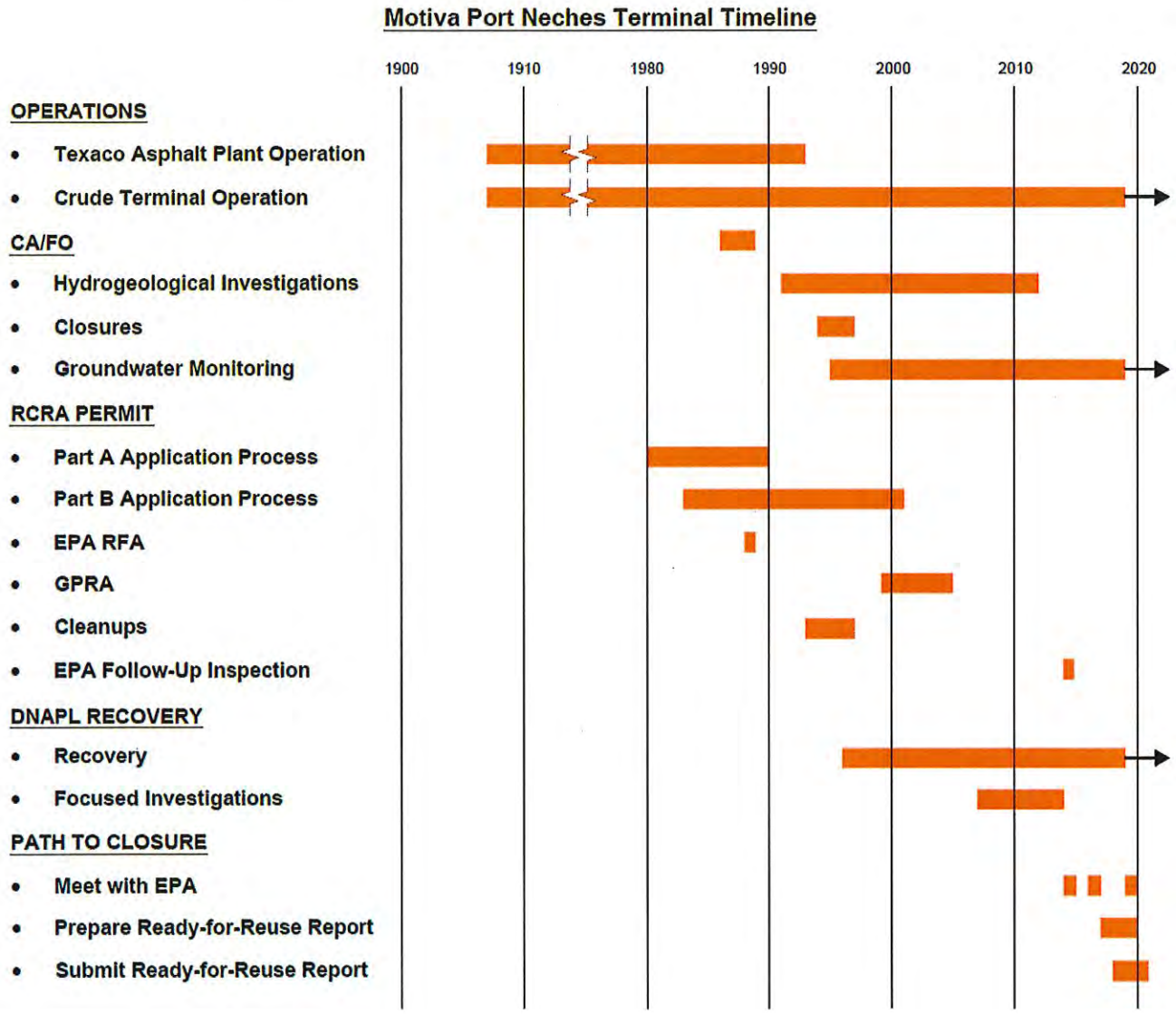
Motiva Entreprises LLC
HSE
PO Box 4540
Houston, Texas 77210-4540

1.0 SITE DESCRIPTION AND SITE HISTORY

The Motiva Port Neches Terminal was previously known as the Texaco Asphalt Facility (also Star Enterprise Port Neches Asphalt Refinery). It is in the City of Port Neches, Jefferson County. The facility encompasses approximately 566 acres.

The majority of the acreage is (and was) used for storage of crude oil. The asphalt plant produced asphalt using a vacuum distillation process, which produced lighter end hydrocarbons as a co-product, that were then piped to the Port Arthur Refinery for use in producing refined products. Asphalt production ceased in 1993. Terminal operations have continued and expanded since 1993.

The following timeline depicts the site history:



2.0 BACKGROUND

Motiva filed a Part A permit application to ensure interim status while work was being done to determine non-hazardous waste and/or clean closure status. Subsequently, Motiva decided to clean close the hazardous waste unit which eliminated the need for filing a Part B permit application. As part of the Part A permit process, EPA conducted a third party RCRA Facility Assessment of the entire facility, which is discussed in a paragraph 2.2 below.

This section identifies several activities that have occurred at the property, including the USEPA Consent Agreement and Final Order (CA/FO), the Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) resulting from the RCRA Facility Assessment, the resulting actions including hydrogeologic evaluations and groundwater monitoring for the two units discussed in paragraph 2.1.

2.1 Consent Agreement/Final Order

The USEPA Region VI issued a Consent Agreement/Final Order (CA/FO) for the Port Neches Terminal on June 27, 1988[1]. The Consent Agreement/Final Order (CA/FO) identified 2 units that required closure:

- **Oil Recovery Reservoir** – Partially closed in place (remainder was clean-closed) during RCRA interim status. Subsequent to closure, the mixture rule was vacated following *Shell Oil Co. vs EPA – 1991,* which voided the classification of the ORR as a hazardous waste impoundment.
- **Rodriguez Reservoir** – Clean closed during RCRA interim status

Motiva agreed to further corrective action if releases from the two units were discovered. Groundwater investigation found no evidence of release from the units. However, DNAPL-related constituents were found in our most downgradient well. DNAPL is not associated with Motiva operations, as indicated by further investigations and records review. DNAPL is further discussed in Section 3.3.

The CA/FO stated that during the month of September 1982, listed hazardous waste (K051, API separator sludge), was placed in the Rodriguez Reservoir. During a February 1986 inspection, the EPA inspector observed liquids (stormwater flow) flowing from the Rodriquez Reservoir into the Oil Recovery Reservoir. The liquids (stormwater flow) were determined to be mixed with and/or derived from hazardous wastes placed in the Rodriguez Reservoir. As mentioned above, subsequent to closure the mixture rule was vacated following *Shell Oil Co. vs EPA – 1991,* which voided the classification of the Oil Recovery Reservoir as a hazardous waste impoundment.

The CA/FO required that the Rodriguez Reservoir and the Oil Recovery Reservoir be properly closed, and that hydrogeologic investigations be performed and reported in accordance with various plan submittals and approvals described in the CA/FO. Semi-annual groundwater monitoring is ongoing as documented in reports that are submitted to and approved by the USEPA.

2.1.1 Hydrogeologic Investigation

Hydrogeologic investigations have been performed as required by the CA/FO and approved by the USEPA, beginning with the *Phase I Investigation Report* in July 1990[2], continuing with the Phase II Hydrogeologic Investigation in September 1991[3], a Revised Phase II Hydrogeologic Investigation in August 1993[4], and the *Phase II Investigation Addendum Report* in January 1994[5]. Additional soil borings and monitoring wells were installed as part of the Groundwater Quality Assessment Program Implementation and Semiannual Groundwater Monitoring Report (February 1998[6]). A plan view of the site and cross section illustrating the stratigraphy are provided as Figures 1 and 2.

May 1990 – Phase I Hydrogeologic Investigation

- 6 soil borings installed to identify COCs in subsurface and determine stratigraphy in area around Rodriquez Reservoir

July 1991 – Phase II Hydrogeologic Investigation

- 28 soil borings and 7 piezometers were installed down to a depth of 80 feet BGS
- Chemical and geotechnical characterization of subsurface geology and groundwater gradient were determined
- Installation of MW-4 in the A-Sand which indicated free phase DNAPL at the bottom of the A-Sand

July 1996 – Groundwater Quality Assessment Program (GWQAP)

- Submitted in response to a meeting with EPA Region VI on June 25, 1996
- Included the installation of additional soil borings to delineate extent of X-Sand
- Install additional A-Sand borings to delineate DNAPL impact in the A-sand

February 1998 – GWQAP Implementation Report

- Borings installed in X-sand and A Sand
- 3 additional monitor wells and 1 recovery well were installed in late 1997

As a result of the investigations, permeable units suitable for monitoring wells were identified. The uppermost unit, referred to as the X-sand, consists of dredge spoils and fill materials, and occurs to a nominal depth of 15 feet. This is the uppermost unit in which monitoring wells were installed.

Beneath the dredge spoils is a layer consisting primarily of clays. Beneath the clays, the A-sand occurs some 25 feet below ground surface over much of the site. The base of this layer generally slopes to the north northwest, deepening from approximately 38 feet below ground surface at the southeastern property line to approximately 53 feet below ground surface along the Neches River in the northwest portion of the facility. The A-sand is the lower groundwater unit that is monitored as part of the groundwater monitoring program at the facility.

More clays occur beneath the A-sand. Beneath these clays beginning approximately 60 feet below grade is another permeable unit known as the B-sand. The B-sand is not part of the groundwater monitoring network.

2.1.2 Monitoring Well Network

Monitoring wells were installed at the Port Neches terminal in 1981 and 1986, to monitor shallow groundwater adjacent to two RCRA interim status units, the Rodriguez Reservoir and the Oil Recovery Reservoir. The monitoring well network was expanded to comply with the CA/FO, as approved by the USEPA in June 1994. Monitoring is performed in two permeable units: The X-sand, the uppermost permeable zone comprising shallow dredge fill material, and the deeper A-sand.

The monitoring well network has evolved (with EPA approval) over the years, and currently includes ten (10) X-sand monitoring wells, five (5) A-sand monitoring wells, one (1) A-sand DNAPL recovery well (see Section 3.1.3). The program included six (6) observation wells installed in 2009 for gauging purposes. The observation wells were sampled in (2016) at the request of the USEPA (these were subsequently abandoned). A well location map is included as Figure 3.

2.1.3 Compliance Monitoring

Constituents of concern were selected based on operational history (i.e., Skinner list for refineries) of the site and subsequently approved by EPA.

Groundwater monitoring of the X-sand and the A-sand is performed and reported on a semi-annual basis. The first semi-annual event was performed in January 1995. Groundwater conditions, as documented during the October 2019 semi-annual groundwater monitoring event (March 2020[7]), are summarized in the following paragraphs.

There were no critical Protective Concentration Limit (PCL) exceedances for dissolved-phase Volatile Organic Constituents (VOCs) or Semi-Volatile Organic Constituents (SVOCs) in the X-sand monitoring wells. For metals, there were no PCL exceedances with the exception of arsenic in three (3) monitoring wells, which is consistent with historical detections. Light Non-Aqueous Phase Liquid (LNAPL) had been detected intermittently in two (2) monitoring wells; none was observed during the April 2019 or October 2019 events.

Dense Non-Aqueous Phase Liquids (DNAPL) and associated degradation daughter compounds were detected above critical PCLs in the A-sand, in a localized area in the northeast corner of the site. This area is near the property line shared with a former chemical plant. DNAPL and chlorinated compounds are not associated with crude oil storage or asphalt refining operations. Further investigation did not locate any DNAPL in the shallow sand on Motiva's property, so the DNAPL did not migrate from the ORR or Rodriguez Reservoir. It was subsequently determined that the DNAPL is related to an off-site source, as discussed in Section 3.3 and Appendix A.

2.1.4 CAFO Status

The CAFO is comprised of 29 items listed in the table below. All items have been completed. Item 8 is on-going due to the semi-annual groundwater monitoring that continues at the site.

Item No.	Status	Compliance Item Description	Date Submitted	Comments
1	Completed	Develop and submit Hydrogeologic Investigation Plan	7/25/1988	Correspondence to EPA
2	Completed	Develop and submit list of groundwater indicator parameters and include in Sampling and Analysis Plan (Item No. 6)	7/25/1988, 2/27/1990 and 3/22/1990	Correspondence to EPA
3	Completed	Implement Hydrogeologic Investigation Plan	June and July 1991	Completed in two phases, see below.
4	Completed	Submit Hydrogeologic Investigation Report	7/18/1990 and 1/14/1994	1) Phase I Hydrogeologic Investigation Report (7/18/1990) 2) Phase II Hydrogeologic Investigation Report and Addendum (1/14/1994)
5	Completed	Submit monitor well network installation plan	1/14/1994	Included in Phase II Hydrogeologic Investigation Report and Addendum, includes 10 monitoring wells
6	Completed	Submit monitor well Sampling and Analysis Plan	1/14/1994	Included in Phase II Hydrogeologic Investigation Report and Addendum
7	Completed	Install monitor well network	1/26/1995	Initial system installed in October and November 1994 consisted of 10 wells. Per items 9 and 10 below, an additional three monitor wells and one recovery well were installed in November and December 1997.

Item No.	Status	Compliance Item Description	Date Submitted	Comments
8	Completed On-going Execution	Implement Sampling and Analysis Plan	7/26/1995 (initial report) followed by semi-annual reports through present date	Groundwater monitoring began in January 1995 and continues with semi-annual sampling in April and October followed by reporting in January and July (typically)
9	Completed	Develop Groundwater Quality Assessment Plan for statistically significant increases	7/31/1996 and 10/30/1996	Groundwater Quality Assessment Program July 1996.
10	Completed	Implement Groundwater Quality Assessment Plan	3/3/1998	The plan was implemented between July and November 1997. It included a soil boring investigation, installation of additional monitor wells and performing a rate and extent study near the DNAPL layer in the A-Sand. Submitted results in Groundwater Quality Assessment Program Implementation included with 6th Semiannual Groundwater Monitoring Report
11	Completed	Develop Compliance Monitoring or Corrective Action Plan	3/3/1998	Recommended to continue semi-annual groundwater monitoring. Motiva has recovered DNAPL in A-Sand on a continuous basis from dedicated recovery well MW-4R (replaced in June 2009). Over 10,000 gallons of DNAPL have been recovered and disposed of off-site.
12	NA	All plans and reports are part of order and non-compliance violates order	NA	All plans and reports were submitted in compliance with the Order
13	NA	Agency disapproval and re-submittal requirements/dispute resolution	NA	NA
14	NA	Stipulated penalties for noncompliance	NA	NA
15	NA	Force majeure and notification requirements	NA	NA
16	NA	EPA does not waive any rights even with order compliance	NA	NA
17	Completed	Develop and submit written Waste Analysis Plan	8/26/1988	Submitted with ORR Closure Plan
18	Completed	Develop and submit proper written Inspection Schedule	8/26/1988	Submitted with ORR Closure Plan
19	Completed	Submit evidence of amended Personnel Training Program	8/26/1988	Submitted with ORR Closure Plan
20	Completed	Amend Contingency Plan to reflect changes and submit evidence	8/26/1988	Submitted with ORR Closure Plan
21	Completed	Develop and submit evidence that written Operating Record is maintained	8/26/1988	Submitted with ORR Closure Plan

Item No.	Status	Compliance Item Description	Date Submitted	Comments
22	NA	Observe ban on disposal of liquid hazardous waste or hazardous waste containing free liquid from being disposed of in Rodriguez Reservoir	NA	No correspondence required. Rodriguez Reservoir was clean closed in 1986.
23	NA	Submit amended Part A application including ORR	8/26/1988	Submitted with ORR Closure Plan. No RCRA permit was required.
24	Completed	Submit Soil Sampling and Analysis Plan for the Port Neches Canal and implement within 15 days of approval by EPA.	8/5/1988, 2/27/1990, 3/20/1990 and 7/18/1990 (results)	Texaco Port Neches Canal Sampling and Analysis Plan submitted August 1988 Preliminary Report on Initial Soil Borings at the PAAC and Sediment Sampling conducted at the PNC

2.2 RCRA Facility Assessment

A RCRA Facility Assessment (RFA) in the form of a Preliminary Assessment/Visual Site Inspection was conducted in July 1988[8]. The RFA was performed in anticipation of a RCRA Part B permit application that was never filed, as the only hazardous waste unit at the facility (SWMU 2) was subsequently clean closed. Sixteen (16) Solid Waste Management Units (SWMU) and four (4) Areas of Concern (AOC) were identified during the RFA, as described in the following paragraphs. Photographs of current site conditions of the SWMUs are included as Attachment B.

2.2.1 SWMU 1 - Landfill Disposal Area

The RFA noted that waste materials were not buried in the area but placed on the surface. In the past, open burning of trash, waste asphalt and crude oil tank bottoms occurred. Asphaltic materials were noted on the surface. The RFA stated that the Texas Water Commission considered the materials received by the landfill as Class 2 Nonhazardous material.

Several investigations have been performed in this area to identify a source of DNAPL which is present in the A sand underneath this unit. The investigations confirmed that asphaltic and other materials mentioned above were placed on the surface and were not buried in SWMU-1. No source of DNAPL has been identified on Motiva property. These investigations provided information that have effectively met the requirements of a RCRA Facility Investigation (RFI) and have been summarized in Appendix A.

2.2.2 SWMU 2 - Rodriguez Reservoir

The RFA noted that the closed RCRA-regulated unit historically received API separator sludge (K051, listed hazardous waste), asphalt and crude oil tank bottoms, and dredge material from the Neches River. The Texas Department of Water Resources collected sludge samples in 1980 and found no priority pollutants. The unit was subsequently clean closed as a hazardous waste storage impoundment[9,10,11].

No Further Action under corrective action authority was suggested for this unit; the groundwater monitoring has continued as part of the EPA Compliance Order.

2.2.3 SWMU 3 – Oil Recovery Reservoir

The RFA stated that this unit received effluent from the API Separator (SWMU 4) and surface runoff from an inactive sanitary lagoon, the Rodriguez Reservoir (SWMU 2) and adjacent area. Hydrocarbon staining was observed along the interior dikes.

No Further Action under corrective action authority was suggested for this unit; the groundwater is part of the EPA Compliance Order.

On February 28, 2001 EPA concurred that the ORR is a non-hazardous waste unit and that no RCRA post closure care permit is required[15].

2.2.4 SWMU 4 – API Separator

The RFA stated that this concrete unit received process wastewater, storm water runoff, process area runoff and laboratory waste. The RFA also stated that the sludge contained in the unit was a listed waste (K051) for lead and chromium.

No Further Action was suggested for this unit.

2.2.5 SWMU 5 – Slop Oil Sump

The RFA stated that this concrete unit received oily wastewater from the slop oil tanks.

No Further Action was suggested for this unit.

2.2.6 SWMU 6 – PCB Storage Area

The RFA stated that this inactive unit was a concrete slab where drums containing spent PCB-containing oils were staged prior to off-site disposal. The unit reported operated as a maximum 90-day storage area; it became inactive in 1982.

No Further Action was suggested for this unit.

2.2.7 SWMU 7 – Incinerator

The RFA stated that this inactive unit was used to burn off excess process gas when crude oil was heated in the convertors – a process that was no longer used.

No Further Action was suggested for this unit.

2.2.8 SWMU 8 – Tile Tank Farm Sump

The RFA stated that this concrete unit collected leaks and spills of asphalt and oily materials, and some storm water runoff.

No Further Action was suggested for this unit.

2.2.9 SWMU 9 – Bundle Wash Area

The RFA stated that this unit was a sloped asphalt-paved area with a small sump, normally used as a ramp for the loading dock, that was periodically used to remove sludge from the heat exchanger bundles. The heat exchange sludge contained listed waste (K050) due to chromium.

No Further Action was suggested for this unit.

2.2.10 SWMU 10 – Activated Carbon Filter Drums

The RFA reported that this unit consisted of four 55-gallon drums on a concrete slab, used to treat hydrocarbon vapors during blending of latex and asphalt. No Further Action was suggested for this unit.

2.2.11 SWMU 11 – Port Neches Canal

The RFA stated that this unit was a canal that connected the Texaco Asphalt Complex with the Texaco Port Arthur Refinery. The unit received effluent from the Oil Recovery Reservoir (SWMU 3), once-through cooling water, Jim Lake (SWMU 14) and storm water runoff. Hydrocarbon staining was noted on vegetation within the ditch. A 100-gallon oil spill, recovery and clean-up had been reported to the Texas Water Commission.

Sediment analysis performed in 1987 indicated the presence of barium, chromium, lead and silver, as well as trace amounts of ethylbenzene and xylenes.

Additional investigation was suggested for this unit, although it was noted that the unit was under investigation as a result of the EPA compliance order. Subsequent investigations were performed in accordance with TCEQ approved workplans.

2.2.12 SWMU 12 – Johnny Hearn Sump

The RFA stated that this earthen unit received runoff from the tank farm and from part of the process area not served by the Process Sewer System (SWMU 15). Hydrocarbon staining was observed in the unit.

Additional investigation was suggested for this unit. As described in Section 3.1.2.1 impacted soils were tested and removed following an investigation in 1994.

2.2.13 SWMU 13 – Tank Farm Ditches

The RFA stated that this earthen unit received runoff from product and crude oil tank storage areas. No hydrocarbon staining was noted.

Additional investigation was suggested for this unit. As described in Section 3.1.2.1 impacted soils were tested and removed following an investigation in 1994.

2.2.14 SWMU 14 – Jim Lake

The RFA stated that his earthen unit received effluent from the Johnny Hearn Sump (SWMU 12) following oil removal. No staining was observed.

Additional investigation was suggested for this unit. Based on asphalt properties, historic operations, additional stained soil removal work, and ongoing perimeter monitoring, further investigation was not required

2.2.15 SWMU 15 – Process Sewer System

The RFA stated that this concrete unit received storm water runoff from the process area, wash water from the Bundle Wash Area (SWMU 9), laboratory waste and once-through cooling water.

Additional investigation was suggested for this unit. Based on asphalt properties, historic operations, additional stained soil removal work, and ongoing perimeter monitoring, further investigation was not required

2.2.16 SWMU 16 – Trench System

The RFA stated that this concrete unit receives runoff from the process area storm water runoff. No staining was observed.

No Further Action was suggested for this unit.

2.2.17 AOC A – Drum Rack

The RFA stated that this earthen area was used for staging drums product cut samples from the process unit. Surficial staining was observed.

Further investigation was suggested for this area. As described in Section 3.1.2.1 impacted soils were tested and removed following an investigation in 1994.

2.2.18 AOC B – Tile Tank Farm Area

The RFA stated that this earthen area contained tanks that contained asphalt and water from the vacuum pipe stills. Asphalt spillage was observed inside the tank farm area.

Further investigation was suggested for this area. As described in Section 3.1.2.1 impacted soils were tested and removed following an investigation in 1994.

2.2.19 AOC C – Asphalt-Filled Drums

The RFA stated that there were drums filled with 'asphalt spill clean-up material,' and that many of the drums were broken.

Further investigation was suggested for this area. As described in Section 3.1.2.1 impacted soils were tested and removed following an investigation in 1994.

2.2.20 AOC D – Earthen Tank Farm Area

The RFA stated that prior to the 1930s, an earthen tank farm was used for storage of crude oil. The report further stated that the tanks were taken out of service and cleaned. No hydrocarbon staining was observed; the area was being used for livestock grazing.

Further investigation was suggested for this area. Construction activity in 1975 addressed the soil conditions in and around the tanks. This area is covered by the Motiva perimeter monitoring program.

2.3 Regulatory Status

This section describes the regulatory status of the Motiva Port Neches Terminal in terms of facility registration numbers, operating permits and RCRA.

2.3.1 Facility Registration Numbers

The Motiva Port Neches Terminal is an operating petroleum terminal that temporarily stores crude oil in above-ground storage tanks. The facility is a Small Quantity Generator, EPA Identification Number TXD980626022. The Texas Solid Waste Registration No. is 30017. The Texas Commission on Environmental Quality Facility Identification Number is RN100210103.

2.3.2 Permits

The facility is authorized to discharge storm water through an outfall by multi-sector general permit (MSGP) permit number TXR05CN62. It is also authorized to discharge hydrostatic test waster under permit number TXG670270.

For air emissions, the facility maintains a Title V Permit (number O-3277) and associated permits.

2.3.3 RCRA Status

A RCRA Facility Assessment (RFA) was conducted in anticipation of a RCRA Part B permit application that identified16 SWMUs and 4 AOCs. As a result of the RFA, a CA/FO was developed to address compliance issues with the Rodriguez Reservoir and Oil Recovery Reservoir. The Rodriguez Reservoir was the only hazardous waste management unit and was cleaned closed, therefore the Part B was never submitted. The Oil Recovery Reservoir was closed in accordance with TNRCC (predecessor to TCEQ) regulations.

The remaining SWMUs and AOCs have been addressed as documented in the 2014 EPA site inspection[15] and this Ready for Reuse report.

As stated in Section 3.1, the facility is subject to the CA/FO[1] issued by the USEPA in June 1988. Groundwater monitoring required by the CA/FO and approved by the USEPA is ongoing; otherwise, the actionable items listed in the CA/FO (Compliance Schedule, Paragraphs 1 through 29) have been completed. As stated in paragraph 2.1.3, during hydrogeologic investigations, DNAPL was discovered in Motiva's most down-gradient well.

Sixteen (16) SWMUs and four (4) AOCs were identified in the RFA (8). These units have been addressed, as described in Sections 4.1 through 4.3 of this Ready for Reuse request, with the exception of the Port Neches Canal (SWMU 11). The Port Neches Canal is not located within the site boundary of the Motiva Port Neches Terminal, so it does not affect the Ready for Reuse request. The Port Neches Canal is scheduled for corrective action under the TCEQ TRRP program.

3.0 SITE ASSESSMENT AND REMEDIAL ACTIVITIES

This section provides a summary of the assessment and activities conducted at the terminal to address the requirements of the CAFO and RFA.

3.1 Remedial Activities

3.1.1 Rodriquez Reservoir

The closure plan for the Rodriguez Reservoir was approved by the Texas Water Commission (TWC) on May 23, 1985 by letter. Closure activities began in October 1985 and included the following:

- Removal of standing water via vacuum truck and pump for discharge into the complex wastewater treatment facility,
- Waste materials, residues and contaminated soil were solidified with fly ash and kiln dust, excavated and transported to the Texaco Port Arthur Refinery (PAR) Class 1 landfill.

Following the removal of waste materials, verification samples were collected from the soil at seven locations and analyzed for Appendix VIII constituents, three of which contained analytical parameters above action limits for semi-volatiles and lead. Additional excavation activities were conducted in these areas until verification samples indicated a cleanup to approved limits. The Closure Certification Report was submitted to TNRCC on June 28, 1987[9]. Conditional acceptance of the closure certification on condition of a deed recordation was submitted by TNRCC via letter dated October 13, 1997[10].

Proof of deed record was submitted by Motiva on December 29, 1997 and accepted by TNRCC on April 8, 1999[11].

3.1.2 Oil Recovery Reservoir

Submittal of a Closure Plan for the Oil Recovery Reservoir (ORR) is listed as item 29 in the 1988 Compliance Agreement / Final Order (CAFO) issued by EPA. The Closure Plan was approved by TNRCC on January 18, 1995.

Closure activities began in February 1995 and included the following:

- Dividing the ORR into two segments (A and B),
- Depositing sludges and sediment from Area B into Area A along with other stained soils from the tank farm non-process areas of the terminal,
- Solidification of these sludges and soils in Area A utilizing Portland cement to Risk Reduction Standard 3 requirements,
- Area B was clean closed to Risk Reduction Standard 2 (RRS2) non-residential parameters, Area B was subsequently converted into a stormwater impoundment,

- Area A was sloped and compacted to finished grade. A 12-inch compacted clay cap, including a barrier between Areas A and B, was installed and covered with vegetated topsoil.

The Closure Certification Report was submitted to TNRCC on September 27, 1995[12] and the TNRCC accepted the closure of the ORR on November 7, 1996[13].

A deed record for the ORR was filed at the Jefferson County Courthouse on December 6, 1996 and proof was submitted to the TNRCC on December 19, 1996[14]

A Remedy Implementation and Certification Report for the Oil Recovery Reservoir Closure was submitted in November 2000[20] which revised and replaced the 1995 ORR Closure Certification Report. The 1995 report had designated the ORR as a hazardous waste management unit but due to intervening regulatory changes and a review of the closure activities, the ORR has been established as a non-hazardous, rather than a hazardous, unit. Sludge consolidated from the stormwater ditches in the tank farm and storage areas was originally classified as F037 as a conservative measure. Additional evaluation of this classification showed that the stormwater sludges and soils do not meet the definition of F037 waste because they were from -non-process areas of the facility and only managed stormwater.

On February 28, 2001 EPA concurred that the ORR is a non-hazardous waste unit and that no post closure care permit is required[15]

3.1.2.1 Impacted Soil and Sediment Consolidation

During preparation of the ORR closure plan, an investigation was conducted by GMS in March 1994[18]. The Purpose of the investigation was to determine the volume of process wastewater sludges present within the former Port Arthur Asphalt Complex (PAAC) as well as sediments within the segregated stormwater conveyance system and stained soils across the facility. During operation of the PAAC (1915-1993), process water flowed northward via concrete pipes and sumps to the API separator then to the ORR before being discharged to the Neches River under NPDES Permit TX000583. Through interviews with facility personnel, all process water piping was flushed with firewater in 1991 to remove sludges to the API separator before it was cleaned around 1993. Stormwater flowed southward via open ditch to a stormwater sump before being pumped into Jim Lake which was eventually routed to Port Neches Canal for discharge at the Port Arthur Refinery. Visually impacted soil areas were tested for Total Petroleum Hydrocarbons (TPH) to determine extent of contamination. It was recommended that all materials be incorporated into the ORR closure for consolidation.

Soil and sediment consolidation activities were conducted by GMS in June 1994[19] in conjunction with the closure of the ORR. The following activities were conducted during the consolidation work:

- Approximately 11,500 cubic yards of sludges and/or soils from the facility wastewater/stormwater conveyance ditches were placed into the ORR
- Approximately 4,000 cubic yards of soils containing visible hydrocarbon or asphalt accumulations were also placed into the ORR
- Report mentions that the Johnny Hearn Sump (SWMU No.12) and stormwater ditches (SWMU No. 13) were excavated until visually clean clays were encountered. All excavated material was placed into the ORR
- Visually impacted soils in the asphalt loading and handling areas were excavated and placed into the ORR as well as impacted soils adjacent to Port Neches Avenue,

A total of 15,500 cy of impacted sediments and soils were reportedly excavated from the Johnny Hearn Sump, stormwater basin, stormwater conveyance system ditches, tank ring areas and surface soils.

3.2 Groundwater Monitoring

Semi-Annual groundwater monitoring has been conducted at PNT since January 1995. The groundwater monitoring system is made up of a total of 16 wells installed in the upper two water bearing units called the X-Sand and the A-Sand. Currently there are 10 monitor wells in the X-Sand and 5 in the A-Sand that Are sampled semi-annually. MW-4R is not sampled since it is in service as a DNAPL recovery well.

Groundwater is analyzed for VOC (Method 8260B), SVOC (Method 8270C) and metals (Method 6110B) including mercury (Method 7470A) with extraneous peaks being reported as Tentatively Identified Compounds (TIC's). Since 2010, groundwater results are compared against Texas Risk Reduction Program (TRRP) Residential Tier 1 Protective Concentration Limits (PCL's).

During the most recent completed sampling event (October 2019[7]) the following information was noted:

- For the X-Sand wells, no PCL exceedances were identified for VOC or SVOC constituents,
- All metals were below PCL's in the X-Sand wells except for Arsenic which was present in wells RMW-2, RMW-4 and RMW-7.
- The A-Sand well RW-1 had PCL exceedances for SVOC (bis-2-chloroethyl ether, and bis-2-chloroisopropyl ether),
- A-Sand well MW-7R had PCL exceedances for SVOC (bis-2-chloroisopropyl ether).

The PCL exceedances in the A-Sand are a direct result of the DNAPL plume present in the area, which originated from an adjacent former chemical facility.

In addition to the wells sampled for semi-annual groundwater monitoring, Motiva conducts annual perimeter monitoring to ensure no groundwater impacts from historical or ongoing activity (currently 12 wells).

3.3 DNAPL

3.3.1 Discovery and Investigation

The presence of DNAPL near the northeastern corner of the property was first discovered during the Phase I Hydrogeologic Investigation that was conducted in 1991. DNAPL was discovered in the 2nd water bearing unit (A-sand) in 1994. Multiple investigations were conducted by Motiva and independent third parties that confirmed DNAPL did not originate from SWMU1 on PNT property

Based on the subsurface data obtained during numerous investigations, multiple lines of evidence support that the source of DNAPL originated from a neighboring former Texaco Chemical Plant with documented historical disposal of large quantities of DNAPL in a burn pit on their property (Note: Texaco Chemical and Texaco Refining operated as independent entities). Attachment A contains a supplemental report detailing the summary of subsurface investigations conducted at PNT as well as the former chemical facility. The report presents the data that demonstrate the source of DNAPL on the Motiva property is the former chemical facility.

The RFA for Tract 1 on the Texaco Property states the following:

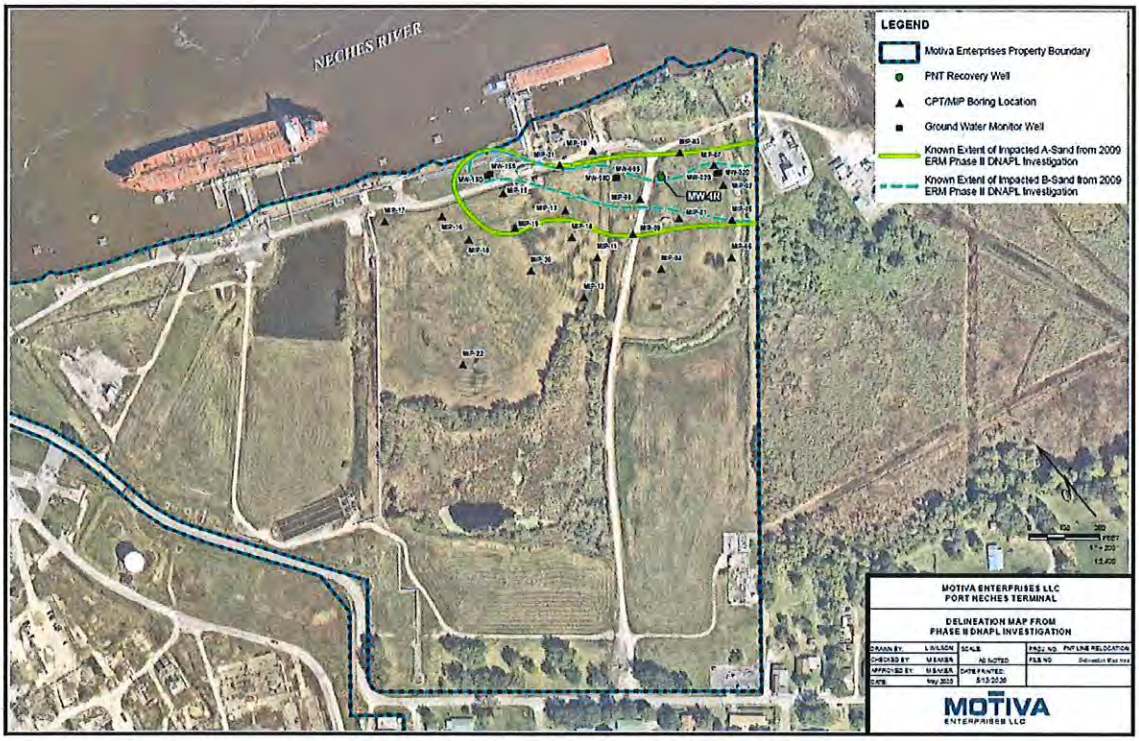
"The EPA Site Inspection Report (9/11/1981) indicates this 22.4-acre area was used since the 1950's as a dump and burning pit before being abandoned in 1977. The one acre burning pit was used from 1950-69 for burning glycol residues, waste lube oils, chlorinated hydrocarbons, (dichloropropane, ethane chloride), propylene alcohol, phenolic wastes and hydrogen fluoride. Burning pit was covered with Class III wastes (graphite blades, concrete debris, activated carbon). The rest of the landfill was used for disposal of lime slurry from propylene oxide manufacture."

The following table highlights the differences between Motiva's SWMU1 and burn pit on the former Texaco Chemical property:

Motiva	Huntsman/Chevron (Former Texaco Chemical[(a)])
Manufactured asphalt and asphalt products	Manufactured chemicals, chlorinated solvents
SWMU1 used for waste asphalt, crude bottoms and construction debris	Operated burn pit ('50-'69) for disposal of chlorinated solvents (dichloropropane, ethane chloride, etc.)
Surficial placement and burning only; no solvents	Solvents placed in open pit, burned as needed
No DNAPL found within upper sand	DNAPL found at base of upper sand

(a) - Texaco sold the Chemical site operations to Huntsman and retained corrective action liability for the former Texaco Chemical site. Subsequently, Chevron acquired Texaco and as a result, they own environmental liability for corrective actions at the Former Texaco Chemicals site. Huntsman sold the Chemical Operations to Indorama in 2019. Subsequent references in this RFR for the former Texaco Chemical site will be designated as Huntsman/Chevron which is based on our understanding from past meetings with companies and the Texaco/Huntsman transaction documents.

A Phase 1 DNAPL Investigation was conducted by Motiva in 2007, followed by a Phase II DNAPL Investigation conducted in 2009 to delineate vertical and horizontal extent. The following graphic depicts the results of Motiva's Phase II DNAPL investigation (the full-size graphic is included in Attachment A; the green and blue lines identify the interpretation of the DNAPL boundary at the time):

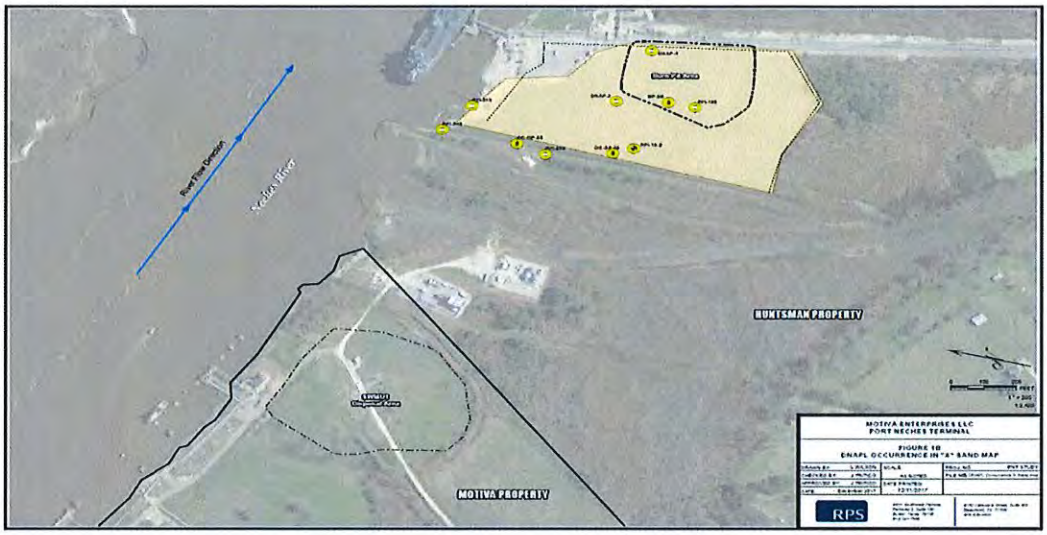


With Motiva's permission, Huntsman/Chevron conducted an investigation with a primary goal to identify a source of chlorinated solvents in Motiva's SWMU 1 in 2013. No sources of chlorinated compounds were found in SWMU 1, or in the 1st sand layer underlying SWMU 1 (X-sand).

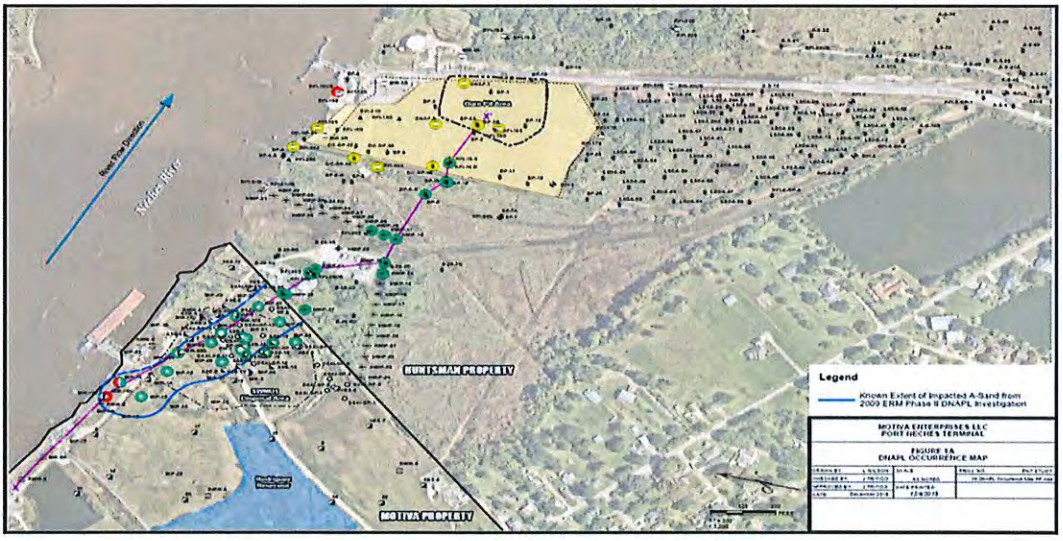
Early Huntsman/Chevron investigations on the Former Texaco Chemical Site assessed dissolved phase solvent constituents, not phase separated chlorinated solvents (DNAPL). Huntsman installed a 3-sided slurry wall based on GW gradient, assuming the contaminant was in the dissolved phase. However, DNAPL sinks through sands and travels downslope along confining layer at the base of the sand unit. DNAPL can desiccate clays when it pools,

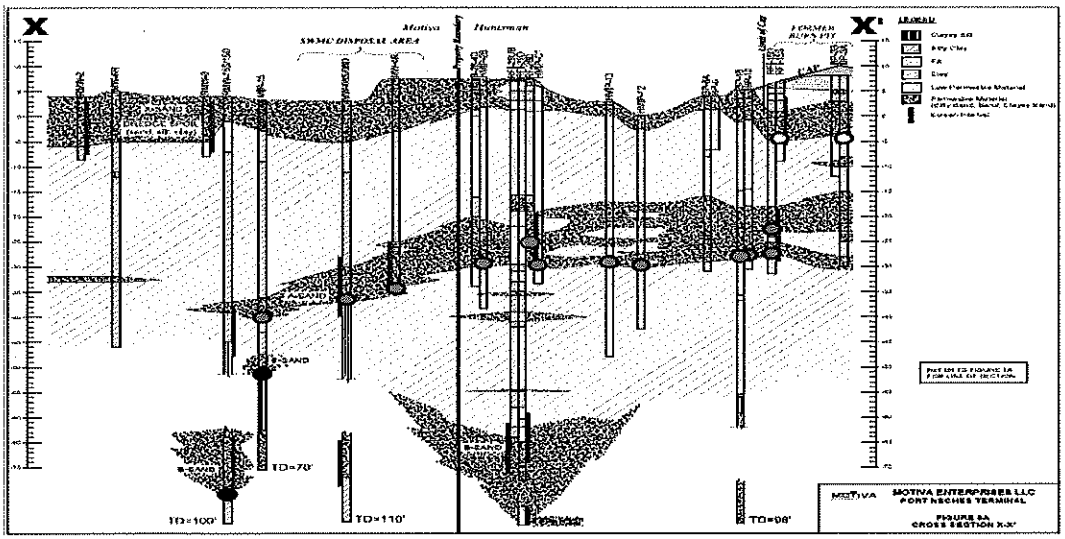
creating its own travel pathways through resulting cracks and fissures. Confining layers of underlying sands slope away from open end of Burn Pit, continuing downslope beneath Motiva property to Neches River.

As illustrated below, DNAPL in the uppermost sand (X-sand), as represented by the yellow circles, has only been found on the Huntsman property.



The DNAPL travel path from the Burn Pit, all the way to Neches River, is illustrated in the two figures below (Yellow circles indicate observation of DNAPL in the X-Sand, Turquoise circles indicate observations of DNAPL in the A-Sand and Red circles indicate observations of DNAPL in the B-Sand). The first figure is a plan view illustrating the origin in the Burn Pit and moving across Motiva property. The second figure is a cross section that illustrates the downward migration and down slope travel path along the base of the confining layer of the sand units.





The following points summarize the DNAPL investigations:

- Data demonstrates that DNAPL sank through sands and traveled downslope on the confining layer away from source (Burn Pit).
- Investigations document that confining layers slope away from the shallow source area.
- Data confirms that DNAPL has migrated to deeper sands, which is consistent with DNAPL desiccation of clays, creating a vertical pathway.
- The DNAPL has been defined vertically and laterally on Motiva property.
- No DNAPL has been found in the shallow sands and no DNAPL source has ever been found on Motiva's property.
- DNAPL has been found in the shallow sand on the former chemical property.
- The data documents that the DNAPL originated from the Burn Pit and migrated through the A and B sands across Motiva's Property.

3.3.2 DNAPL Recovery

During the Phase II Hydrogeologic Investigation, which was conducted in 1994, a monitoring well was installed in this area (MW-4) and the presence of DNAPL in the A-Sand was confirmed. In 2008, MW-4R was reinstalled during the Phase II DNAPL investigation in because the DNAPL had degraded the PVC casing causing the screen to collapse. The new well was constructed out of stainless-steel casing. A pilot recovery program was begun on MW-4R in February 1996 and an initial quantity of 100 gallons was initially removed from the well.

The current recovery system is made up of a peristaltic pump installed in MW-4R. A field technician checks weekly and adjusts the pumping interval, as needed to maximize the volume of DNAPL that is recovered. The recovered material is pumped directly into a 55-gallon drum for off-site disposal. To date, 14,989 gallons of DNAPL are estimated to have been recovered.

3.4 Current Site Use

The PNT facility is currently an operating crude oil terminal in an industrial setting and will continue to be operated as such in the future. Soil and groundwater quality as well as the depth to DNAPL (greater than 40 feet) on PNT property is such that surficial work and shallow excavations do not pose an exposure risk to routine operations. The terminal maintains procedures and training to ensure that workers and the environment are protected.

3.5 Status of SWMUs and AOCs

On July 17, 2014 representatives of the EPA conducted a RCRA corrective action inspection at the Port Neches Terminal. The purpose of the inspection was to perform a visual assessment of the SWMUs, and AOC's listed in the 1988 RFI/VSI[16]. The table below summarizes the EPA inspector's comments from 2014 as well as Motiva's comment on current status:

Unit	Name	2014 EPA COMMENTS	MOTIVA COMMENTS
SWMU 1	Landfill Disposal Area	Several seeps of black asphaltic material 1) Several seeps were noted containing black asphalt like material east of Recovery Well RW-1. 2) DNAPL is present in the A-sand and B-sand groundwater bearing unit(s) and the nature and extent of the hazardous waste/ constituents has not been defined. Potential receptors could likely be the aquatic life in the Neches River.	Several investigations have been performed in this area looking for a source of DNAPL which is present in the A sand underneath this unit. It has been determined that asphaltic materials were deposited on top of the soil and not buried in SWMU-1. SWMU 1 was used prior to waste regulations being promulgated. No source of DNAPL has been identified on Motiva property (see Appendix A). Motiva considers this area closed.
SWMU 2	Rodriguez Reservoir	No concerns were noted during the inspection	Clean Closed in 1986
SWMU 3	Oil Recovery Reservoir	No concerns were noted during the inspection	Closed in 1996
SWMU 4	API Separator	No concerns were noted during the inspection	No additional comments Motiva concurs – consider closed.
SWMU 5	Slop Oil Sump	During the facility tour, it was noted that this unit was out of service and no longer used.	This area was cleaned to visual during the 1994 sludge consolidation project tied to the ORR closure. Motiva considers closed.
SWMU6	PCB Storage Area	The exact location of this SWMU was undetermined during the site tour. No concerns were noted in the approximate locality of the SWMU during the inspection.	Motiva concurs – consider closed.
SWMU 7	Incinerator	No concerns were noted during the inspection	Motiva concurs – consider closed.
SWMU 8	Title Tank Farm Sump	No concerns were noted during the inspection	Motiva concurs – consider closed.
SWMU 9	Bundle Wash Area – P&S Bldg.	No concerns were noted during the inspection	Motiva concurs – consider closed.
SWMU 10	Activated Carbon Filter Drums	The exact location of this SWMU was undetermined during the site tour. No concerns were noted in the approximate locality of the SWMU during the inspection.	Carbon filter drums were removed soon after the asphalt plant ceased operations in 1993.
SWMU 11	Port Neches Canal	No concerns were noted during the inspection	This area which is located outside of the boundaries of PNT and is not included in the ready for reuse consideration.
SWMU 12	Johnny Hearn Sump	This Unit was confirmed to have an earthen bottom.	This sump was cleaned to visual during the 1994 sludge

		I requested analysis of the bottom material from Mr. Baker. Mr. Baker also mentioned that he believed that the sump had been cleaned.	consolidation activities tied to the ORR closure. Motiva considers resolved.
SWMU 13	Tank Farm Ditches	No concerns were noted during the inspection	This area was cleaned to visual during the 1994 sludge consolidation activities tied to the ORR closure. Motiva concurs – consider closed.
SWMU 14	Jim Lake	No concerns were noted during the inspection.	Motiva concurs – consider closed.
SWMU 15	Process Sewer System	This SWMU was not inspected during the site tour.	The 1994 sludge consolidation report states that the process sewer system was flushed prior to the sludge consolidation project. This system was demolished during the demo of the asphalt refinery. Motiva considers closed.
SWMU 16	Trench System	This SWMU was not inspected during the site tour. During the Visual Site Inspection in 1988, oil staining was observed in the concrete trench.	The 1994 sludge consolidation report states that the trench system was demolished during the demolition of the asphalt refinery. Motiva considers closed.
AOC 1	Drum Rack (near lab building)	No concerns were noted during the visual inspection, but during the Visual Site Inspection in 1988, inspectors observed drums in this AOC were corroded and the ground beneath the drum rack was heavily stained. The drums reportedly contained product cut samples.	Motiva concurs no concerns noted during 2014 visual inspection. Area was removed and Motiva considers resolved.
AOC 2	Tile Tank Farm Area	No concerns were noted during the visual inspection, but during the Visual Site Inspection in 1988, inspectors did observe numerous spills of asphalt in this AOC.	Motiva concurs no concerns noted during 2014 visual inspection. Area was removed and Motiva considers closed.
AOC 3	Asphalt Filled Drums	No concerns were noted during the visual inspection, but during the Visual Site Inspection in 1988, inspectors did observe damaged drums that appeared to have released the contents.	Motiva concurs no concerns noted during 2014 visual inspection. Area was removed and Motiva considers closed.
AOC 4	Earthen Tank Farm	This AOC is located south of the current facility boundary and was not inspected during the site tour. Unit is currently owned by the Huntsman Corporation.	Motiva concurs considers closed.

4.0 CONCLUSIONS

This Ready for Reuse report demonstrates the following:

- The site is ready for reuse and will remain protective for its current use in its current state;
- The current environmental condition and future use of the site;
- The site Is protective of human health and the environment;
- DNAPL is from an off-site source (Section 3.3 and Appendix A), but does not affect ongoing industrial operations on Motiva's property; and
- The off-site source does not affect ongoing industrial operations on Motiva's property.

Based upon the above, Motiva's Ready for Reuse request addresses the CA/FO, RFA and related DNAPL-issues for Motiva's property.

5.0 REFERENCES

1. Consent Agreement and Final Order (CA/FO); June 27, 1988; United States Environmental Protection Agency Region VI;
2. Phase I Hydro-geologic Investigation Report (Preliminary Report on Initial Soil Borings at the Port Arthur Asphalt Complex and Sediment Sampling Conducted at the Port Neches Canal in Port Neches Texas); GMS & Associates; July 1990
3. Report of Findings for Phase II Hydrogeologic Investigation, Star Enterprise – Port Arthur Asphalt Complex; GeoMonitoring Services; September 1991
4. Phase II Hydrogeologic Investigation, Star Enterprise - Port Neches Terminal; GeoMonitoring Services; August 1993
5. Phase II Hydrogeologic Investigation Addendum – Star Enterprise Port Neches Terminal, Response to EPA/PRC Technical Review Comments; GeoMonitoring Services; January 1994
6. Groundwater Quality Assessment Program, Implementation and Semiannual Groundwater Monitoring Report, Star Enterprise – Port Neches Terminal; GeoMonitoring Services; February 1998;
7. Semi-Annual Groundwater Monitoring Report – 2H2019 - Port Neches Terminal; Groundwater & Environmental Services, Inc.; February 11, 2020;
8. RCRA Facility Assessment - Preliminary Review/Visual Site Inspection Report; A. T. Kearney, Inc and Harding Lawson Associates; September 1988;
9. Closure Certification Report, Rodriguez Reservoir, Port Arthur Asphalt Complex, Port Neches, Texas; ERT; June 1987;
10. Acceptance of Final Closure Certification – Rodriguez Reservoir; TNRCC; October 13, 1997
11. Acceptance of Deed Certification – Rodriguez Reservoir; TNRCC; April 8, 1999
12. Oil Recovery Reservoir Closure Certification Report Cover Letter; Star Enterprise; September 27, 1995;
13. Acceptance of Closure Certification and Notice of Post Closure Care Requirements – Oil Recovery Reservoir; TNRCC; November 7, 1996;
14. Oil Recovery Reservoir – Proof of Deed Recordation; Star Enterprise; December 19, 1996;
15. Concurrence letter on ORR regulatory Status - EPA Region 6, February 28, 2001
16. Inspection Report - Region 6 Compliance Assurance and Enforcement Division; EPA; July 17, 2014;
17. Excerpts from 2019 Motiva Groundwater Perimeter Monitoring Report - Groundwater & Environmental Services, Inc.; March 20, 2020;
18. **Star Enterprise Port Neches Terminal Primary Sludge Investigation - April 1994;**
19. **Sludge Consolidation Project Star Enterprise - Port Neches Terminal Summary Report - July 1994;**
20. **Remedy Implementation and Certification Report for the Oil Recovery Reservoir Closure - November 2000**

Attachments

Attachment A – DNAPL Study

ATTACHMENT A
Evaluation of DNAPL Occurrence Present Beneath Port Neches Terminal

RPS Group, Inc. (RPS) conducted an evaluation of the dense non-aqueous phase liquid (DNAPL) that is present beneath the Motiva Enterprises LLC (Motiva) Port Neches Terminal (PNT). The evaluation was conducted using data collected in numerous investigations conducted in behalf of Motiva and Huntsman Petrochemical LLC (Huntsman). The evaluation concludes that the source of DNAPL found beneath the Motiva property is a disposal area found on the adjacent Huntsman property.

The evaluation included the following:

- Review available historical reports and associated data to develop a comprehensive representation for both properties.
- Develop cross-sections using available hydrogeologic data to document the presence of DNAPL in the sand units beneath the sites (shallowest to deepest: X Sand, A Sand and B Sand).
- Develop contour maps of the base of the A sand as DNAPL is heavier than water and descends through the water column then migrates along the contour of the underlying confining clay.
- Develop maps and cross-sections to illustrate the movement of DNAPL from Huntsman to Motiva property.

Key Facts:

- The landfill on Motiva property (SWMU 1) was a construction debris and trash landfill for the asphalt complex. Where in the past, open burning of trash, waste asphalt and crude oil tank bottoms occurred.
- There is no record of Motiva utilizing the chemicals associated with the DNAPL in SWMU 1.
- The 1 acre burn pit on Huntsman property was used from 1950 to 1969 to burn "chlorinated hydrocarbons (dichloropropane, chloroethane, etc.)" and other chemicals from the Huntsman (Texaco) chemical plant [(1)]. Dichloropropane was the most common VOC chemical identified in an Arcadis analysis of the DNAPL [(2)].
- In 2013 Arcadis conducted an investigation of SWMU 1 for the express purpose of identifying DNAPL, and concluded there was not a "definitive source of the DNAPL in the investigation area".[(2)]
- The Arcadis 2013 investigation included collecting and analyzing DNAPL samples from the A Sand in three wells (two on Motiva property and one on Huntsman property). Comparison of the analysis data showed the DNAPL to be "very similar". (Note: No DNAPL samples were collected from the shallow X Sand on Huntsman property where it is noted in at least four wells/borings in Burn Pit area.
- On Motiva's property, DNAPL was found in the deeper A and B Sands, but DNAPL was not found in the X Sand.
- An ERM contour map of the base of the A Sand dated April 16, 2012 shows a westerly down slope of 11 feet (-30 to -48 Ft. MSL) from the property line with Huntsman to the

furthermost know extent of the DNAPL plume on Motiva property. An Arcadis map dated October 13, 1999 shows the base of the A Sand with a similar grade direction from -28 Ft. MSL in the area of the burn pit to -30 Ft. MSL at the property line.

- DNAPL sinks and follows the base of a sand unit; it does not behave like dissolved constituents that follow groundwater gradient.
- An Arcadis report dated December 4, 2015 [(1)] concluded that the "complex stratigraphy (of the A Sand) would not be conducive for the transportation of a large mass of DNAPL more than 1,400 feet, particularly when not leaving evidence of residual DNAPL along the transportation pathway". The same report states "There is no evidence of DNAPL migration pathways or source areas in the area between the two properties." These statements completely disregard the six Membrane Interface Probe (MIP) locations (HMIP-10, HMIP-11, HMIP-12, HMIP-13, HMIP-14, HMIP-1C) indicating impacted strata in the area between the two sites.

Legend

A *Legend Sheet* is provided to explain and define the symbols representing the different wells, borings, and probes illustrated on the figures and cross sections. Symbols used for the geographical boundaries of the regulated units of interest, property boundaries, well name changes and referenced figures are also found on this sheet.

Stratigraphic Section Reference

The *Stratigraphic Section Reference* figure illustrates a representation of the strata found in the upper 100 feet of the area discussed in the report and referenced in the figures and cross sections. The five recognized area strata are shown with a short description of the soils approximated thickness, composition, and other characteristics. The three water bearing sands, which are the focus of this study, are color coded and labeled with their historically accepted designations.

Boring Location Map

The *Boring Location Map* shows the locations of the wells, borings, and probes advanced in the investigation area. Most of the well/boring locations and designations are taken from the "DNAPL occurrence Map (Figure TCEQ-2) dated April 17, 2012. This and other figure data was taken from figures and information provided in Arcadis' "DNAPL Source Area Site Investigation Report, NOR No.1 Landfill", April 26, 2013 and "High Resolution Site Characterization, NOR No.1 Landfill", December 15, 2015. Probe locations and information were also taken from the ERM, "Phase II Groundwater and Dense Non-Aqueous Phase Liquid (DNAPL) Investigation", December 1, 2009.

Property boundaries and regulated unit boundaries are also represented on this map.

DNAPL Occurrence Maps

Figures were generated by compiling stratigraphy and monitor well locations from the two properties.

Figure 1A - *DNAPL Occurrence Map* is a plan view showing the location of all wells and borings. DNAPL occurrence in the borings/wells is noted by the color-coded dots at the well locations. The occurrence of DNAPL is seen to be present in all three of the water bearing sands, first in the shallow X Sand on Huntsman property under the area of the Burn Pit, then progressing west

to the deeper A Sand under both properties, and finally to the deepest B sand in the western most portion of the map.

This figure was developed based on maps originally generated by Arcadis [(2)]. The presence of DNAPL was determined from the following data:

- the recovery of DNAPL from wells;
- in situ soil testing using Membrane Interface Probes (MIP);
- analysis of soil samples with volatile organic meters (OVM); and
- Boring log notes referencing visual observation of soil samples.

An important note is that earlier investigations were conducted to identify dissolved-phase constituents. DNAPL was not identified as a constituent of concern until 1999. Consequently, although a number of investigations were performed on the Huntsman property, DNAPL was not a target constituent.

The Burn Pit within the Lime Slurry Disposal area consisted of an excavated earthen pit approximately 50 feet wide, 200 feet long and several feet deep. During operation, chlorinated hydrocarbons (dichloropropane, chloroethane), propyl alcohol, phenolic wastes, hydrogen fluoride, and other chemical liquids from the Huntsman (Texaco) chemical plant were placed in the pit. The pits were excavated as needed, liquid wastes were deposited into each pit and then periodically ignited. The pit was ultimately filled with excavated soil from the area or from the next pit to be excavated.[(4)]

The Burn Pit on Huntsman property is the only area documented to have received chlorinated hydrocarbons. It is also the only place on the two properties where evidence of free phase chlorinated hydrocarbon has been found in the shallow subsurface stratum (X Sand) (See Figure 1B). 1,2-dichloropropane was the most common volatile organic compound identified from an analysis of the DNAPL collected from both sites.[(2)]

Motiva's SWMU 1 Area became active as a trash and construction waste disposal area in the early 1920s. Asphalt and crude oil tank bottoms were also reportedly occasionally placed in the area. These materials do not contain chlorinated compounds. SWMU 1 ceased operation as of 1988.

Motiva recovers DNAPL from the A Sand with well MW-4R, located in SWMU 1 area near the property line with Huntsman. The recovery operation started in 1999. To date, approximately 14,000 gallons of DNAPL have been recovered from the well. Although Motiva has been recovering DNAPL from MW-4R, the following should be noted:

- The solvents recovered from the A-Sand strata beneath the site are not consistent with historical activities at the PNT asphalt complex;
- SWMU 1 never received chlorinated hydrocarbons; and
- Despite exhaustive investigation by Huntsman's consultant, DNAPL has never been identified in the shallow X-sand Beneath SWMU 1 or elsewhere on Motiva property.

The figures illustrate all of the borings/wells with evidence of DNAPL in the X-Sand are located in the vicinity of the Burn Pit. DNAPL is found in the A-Sand beneath the SWMU 1 Disposal area and in areas east and west of SWMU 1. A lesser number of borings/wells have been installed the area between the Burn Pit and SWMU 1 but DNAPL present in the MIP locations and other wells in that area indicates a travel path from the Huntsman Burn Pit to Motiva

property.

Figure 1B – *DNAPL Occurrence in X Sand* highlights those borings/wells where DNAPL has been identified in the shallow X Sand found across the two properties. The X Sand is the shallowest water bearing sand unit. DNAPL has been identified in three borings/wells inside the Burn Pit area and seven borings/wells in and around the capped area of the Burn Pit. A slurry wall and clay cap were installed in 2001"to isolate the source area at the NOR No1 Landfill, including the former burn pits" [(4)]. It should be noted that a slurry wall was installed on three sides of the Huntsman Burn Pit, but <u>not</u> on the side between the Burn Pit and Motiva property.

DNAPL has not been identified in the X Sand at any locations on Motiva property. Arcadis conducted an extensive investigation of the subsurface soils beneath Motiva's SWMU 1 Disposal Area, collecting continuous length cores which were screened with an organic vapor analyzer (OVA) and visually inspected for DNAPL. The report of this investigation was submitted to the TCEQ in 2013 [(2)]. Twenty-one (21) borings were advanced within the boundaries of SWMU 1 Disposal Area, and forty-six (46) soil samples were collected for analysis. The report concluded the:

- "Evaluation of the soil results did not indicate a definitive source of DNAPL within the investigation area."

Also, a total of twenty-two groundwater samples were collected from the borings. The report concluded:

- "Evaluation of the groundwater results did not indicate a definitive source of DNAPL within the X-Sand."

In 2007 ERM was contracted by Motiva to investigate the subsurface soils in and around the area of SWMU 1 [(3)]. Between 2007 and 2009 twenty-two locations in the area of SWMU 1 were investigated using Membrane Interface Probe (MIP) technology. The results of that investigation indicated the A Sand and B Sand had been affected by DNAPL but there was no indication the X Sand had been impacted by DNAPL.

To date no evidence of DNAPL has been found in the X Sand on Motiva property.

Figure 1C – *DNAPL Occurrence in A Sand* highlights those borings/wells where DNAPL has been identified in the deeper A Sand. The A Sand is the second water-bearing zone in the area, 30 to 40 feet below ground surface. Included in Figure C is a cross section showing the vertical and lateral progression of DNAPL occurrence across the site from the X Sand, through the A Sand, and down to the B Sand.

The base of the A Sand slopes downward to the west (from the Huntsman property to the Motiva property) and ranges in elevation from -24 Ft. MSL under the Former Burn Pit to -32 Ft. MSL beneath the SWMU 1 Area (12 ft down slope). The base of the sand continues its downward slope to -48 Ft. MSL at the western extent adjacent to the Neches River. The descending elevation of the base of the sand can be seen in Cross-section X- X'. DNAPL has been recognized in many borings/wells along the descending slope of the A Sand base from the former Burn Pit to the area west of SWMU 1.

It is important to understand how DNAPL behaves in the subsurface. It generally sinks through sands and silts, with some spreading, until it hits a less permeable layer (clay), and then it follows the surface of the clay, moving along the base of the sand layer as a comparatively thin

mass. DNAPL also desiccates clay which facilitates the penetration of the clay and downward migration of the DNAPL. Based upon the data presented in the figures, this is how the DNAPL migrated from the Huntsman Burn Pit onto the Motiva property.

A Sand Contour Maps

Figure 2B - *DNAPL Occurrence at the Base of the A Sand* was generated using two base of the A Sand contour maps (see Attachment 1). One map, generated by ERM was developed from MIP data in 2009 and illustrated the base of the A Sand on the Motiva property only. The other map was generated in 1999 by Arcadis using well data points and showed their interpretation of the base of the A Sand on the Huntsman property. The elevations data points were loaded into ESRI Arcmap GIS mapping software program to develop Figure 2B. By using the ESRI Arcmap GIS software to generate the contours, human bias was eliminated from the contouring process.

This figure shows those boring/well locations with evidence of DNAPL near the base of the A Sand. The map shows the distribution of DNAPL extending from RFI-15D west of the Burn Pit to MIP-15 west of SWMU 1. The migration path moves down slope from -26 Ft. MSL, near the burn pit, to -48 Ft. MSL near the Motiva dock. The slope profile was placed on the map and boring/well locations were placed on the profile to illustrate the occurrence of DNAPL along the slope.

Cross-Sections

Arcadis created cross-sections from historical data on both the Huntsman and Motiva properties. The cross-sections are dated May 2005, but according to the Path/Name tags on the drawings they have been used in reports and at meetings as recently as April 2017. RPS developed three cross-sections based upon interpretation of the data from the following data sources:

- the original Arcadis cross-sections P-P', Q-Q' and R-R';
- Arcadis map titled Figure 2 - *Boring Location Map* dated November 11, 2015;
- the recovery of DNAPL from some wells;
- in situ soil testing by Membrane Interface Probes (MIP);
- analysis of soil samples with volatile organic meters (OVM); and
- visual observation of soil samples noted on boring logs.

Figure 3A Cross-Section X-X' extends from west to east across the site parallel to the Neches River. It cuts through Motiva's SWMU 1 Disposal Area across the property line and through Huntsman's NOR No. 1 Landfill, which included the Burn Pit.

The cross-section depicts the occurrence of DNAPL in the X Sand beneath the former Huntsman Burn Pit and the absence of DNAPL in the X Sand beneath the Motiva's SWMU 1 Disposal Area on the Motiva property. Arcadis conducted an extensive investigation in 2013 of the subsurface soils beneath Motiva's SWMU 1 Disposal Area and did not find any evidence of a DNAPL source.

Cross-Section X-X' also shows the base of the A Sand descending in elevation from Huntsman property to Motiva property (24-foot drop in elevation from Burn Pit to Motiva dock). The DNAPL migration path can be seen descending from the X Sand into the A Sand beneath the Burn Pit

and moving along the downward slope of the A Sand base west toward Motiva, past SWMU 1 and eventually descending to the B Sand at MIP-15 and RWM-15D.

Figure 3B Cross-Section Y-Y' goes from north to south across the SWMU 1 Disposal Area at Motiva perpendicular to the river and shows the occurrence of DNAPL at the base of the A Sand, and the absence of DNAPL in the overlying X-sand.

Figure 3C Cross-Section Z-Z' shows a portion of SWMU 1 Disposal Area in an east to west line not shown in cross-section X-X'. Made up entirely of Membrane Interface Probe (MIP) logs, the section notes the occurrence of DNAPL at each location. There was no evidence of DNAPL in the X Sand in any of the MIP borings. The plan view inset shows the occurrence of DNAPL in the "BREAKLINE" portion of the cross section, clearly indicating a direct connection between the DNAPL occurrences on both properties.

Conclusion

- DNAPL is in the shallow sand beneath the Burn Pit at Huntsman
- The 1 acre burn pit on Huntsman property was used as a waste pit from 1950 to 1969 to deposit and burn "chlorinated hydrocarbons (dichloropropane, chloroethane, etc.)" and other chemicals from the Huntsman (Texaco) chemical plant. Dichloropropane is the most common chemical identified in the A-Sand by the Arcadis analysis of the DNAPL[(2)]
- DNAPL has never been placed in the SWMU 1 Disposal Area at Motiva.
- The 2013 Arcadis report *DNAPL Source Area Site Investigation* was conducted for the express purpose of identifying DNAPL in the Motiva SWMU 1 Disposal Area. That report concluded there was not a "definitive source of the DNAPL in the investigation area".
- No DNAPL was found in the shallow soils beneath the SWMU 1 Disposal Area during the 2007 & 2009 MIP investigations conducted by ERM, despite a focused effort to identify a source on Motiva property.
- The pathway that DNAPL followed from the Huntsman Burn Pit to the Motiva property is clearly shown by the figures and cross-sections included with this evaluation. After entering the X-sand at the Burn Pit on the Huntsman property, DNAPL migrated downward to the A-sand, and followed the downward sloping base of the A-sand to the Motiva dock area. It is now accumulating in the B-Sand.

Legend

- MOTIVA ENTERPRISES PROPERTY BOUNDARY
- "SURFICIAL SAND" MONITOR WELL LOCATION
- SOIL BORING LOCATION
- "B-ZONE" MONITOR WELL LOCATION
- "A-ZONE" MONITOR WELL LOCATION
- "POINT BAR" MONITOR WELL LOCATION
- MOTIVA "A-SAND" RECOVERY MONITOR WELL LOCATION
- MOTIVA "A-SAND" MONITOR WELL LOCATION
- MOTIVA "A-SAND" SOIL BORING LOCATION
- MOTIVA "X-SAND" MONITOR WELL LOCATION
- MOTIVA SOIL BORING LOCATION
- MOTIVA "B-SAND" MONITOR WELL LOCATION
- MOTIVA MIP LOCATION (ERM)
- HUNTSMAN MIP LOCATION (ARCADIS)
- DSAI-GP BORING (ARCADIS)
- DEFINITIVE PROOF OF DNAPL IN "X" SAND
- DEFINITIVE PROOF OF DNAPL IN "A" SAND
- DEFINITIVE PROOF OF DNAPL IN "B" SAND
- SLURRY WALL (CUT-OFF WALL)
- CROSS SECTIONS (SEE FIGURES 3)
- CLAY CAP (FORMER BURN PIT)
- BURN PIT AREA
- SWMU1 DISPOSAL AREA
- RODRIGUEZ RESERVOIR

NOTES:

1. ALL HORIZONTAL AND VERTICAL CONTROL IS BASED ON THE HUNTSMAN PLANT MONUMENTATION SYSTEM.
2. MONITOR WELL RFI-22B WAS RENAMED RFI-22D
3. MONITOR WELL RFI-22A WAS RENAMED RFI-22S
4. BORING LS-1 CONVERTED TO MONITOR WELL RFI-2
5. BORING LS-2 CONVERTED TO MONITOR WELL RFI-3
6. BORING LS-3 CONVERTED TO MONITOR WELL RFI-4
7. BORING LS-4 CONVERTED TO MONITOR WELL RFI-5
8. LOCATION OF BORING DK-1 IS ESTIMATED
9. THE LOCATION OF MOTIVA SOIL BORING AND PHYSICAL FEATURES TAKEN FROM FIGURES 1, 2, AND 3 OF THE GROUNDWATER QUALITY ASSESSMENT PROGRAM IMPLEMENTATION (GEOMONITORING SERVICES, FEBRUARY 1998)
10. WELL LOCATIONS, NAPL NOTATIONS TAKEN FROM ARCADIS "DNAPL OCCURRENCE MAP" (FIGURE TCEQ-2) DATED 04/17/2012 AND "BORINGS HUNTSMAN/MOTIVA PROPERTY LINE MAP" (DRAWING NUMBER 2)

MOTIVA ENTERPRISES LLC
PORT NECHES TERMINAL

LEGEND SHEET

DRAWN BY:	L WILSON	SCALE:		PROJ. NO.	PNT STUDY
CHECKED BY:	J TRITICO		AS NOTED		Legend Sheet.mxd
APPROVED BY:	J TRITICO	DATE PRINTED:			
DATE:	June 2018		6/6/2018		

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Austin, Texas 78735
512-347-7588

4180 Delaware Street, Suite 402
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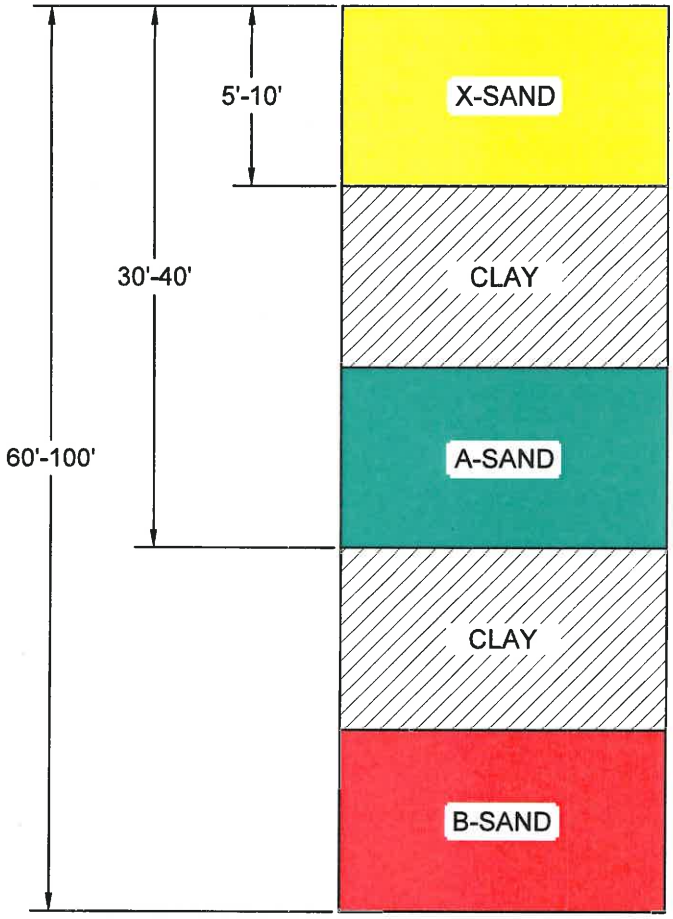
409-838-4400

STRATIGRAPHIC
SECTION
REFERENCE



X-Sand – This sandy fill (dredge spoil) is the first water bearing zone and is approximately 5-10 feet thick.

Upper Silt and Clay – Consisting of silt, silty clay, and clay this stratum ranges from 20 to 35 feet thick.

A-Sand – This second water bearing zone is a laterally discontinuous silty sand approximately 10 feet thick and ranges between 30 and 40 feet below ground surface.

Middle Silt and Clay – This 20 to 30 feet thick stratum of silt, silty clays, and clay lays between the A-Sand and B-sand.

B-Sand – The third water bearing sand zone found between 60 and 100 feet below ground surface and is believed to be laterally continuous.

MOTIVA ENTERPRISES LLC
PORT NECHES TERMINAL

STRATIGRAPHIC SECTION REFERENCE

DRAWN BY: SSWILSON	SCALE:	PROJ.	PNT STUDY
CHECKED BY: JTRITICO	See bar scale	FILE NO.	Sand Key.dwg
APPROVED BY: _	DATE PRINTED:	**FIGURE 4**	
DATE: November 8, 2017			

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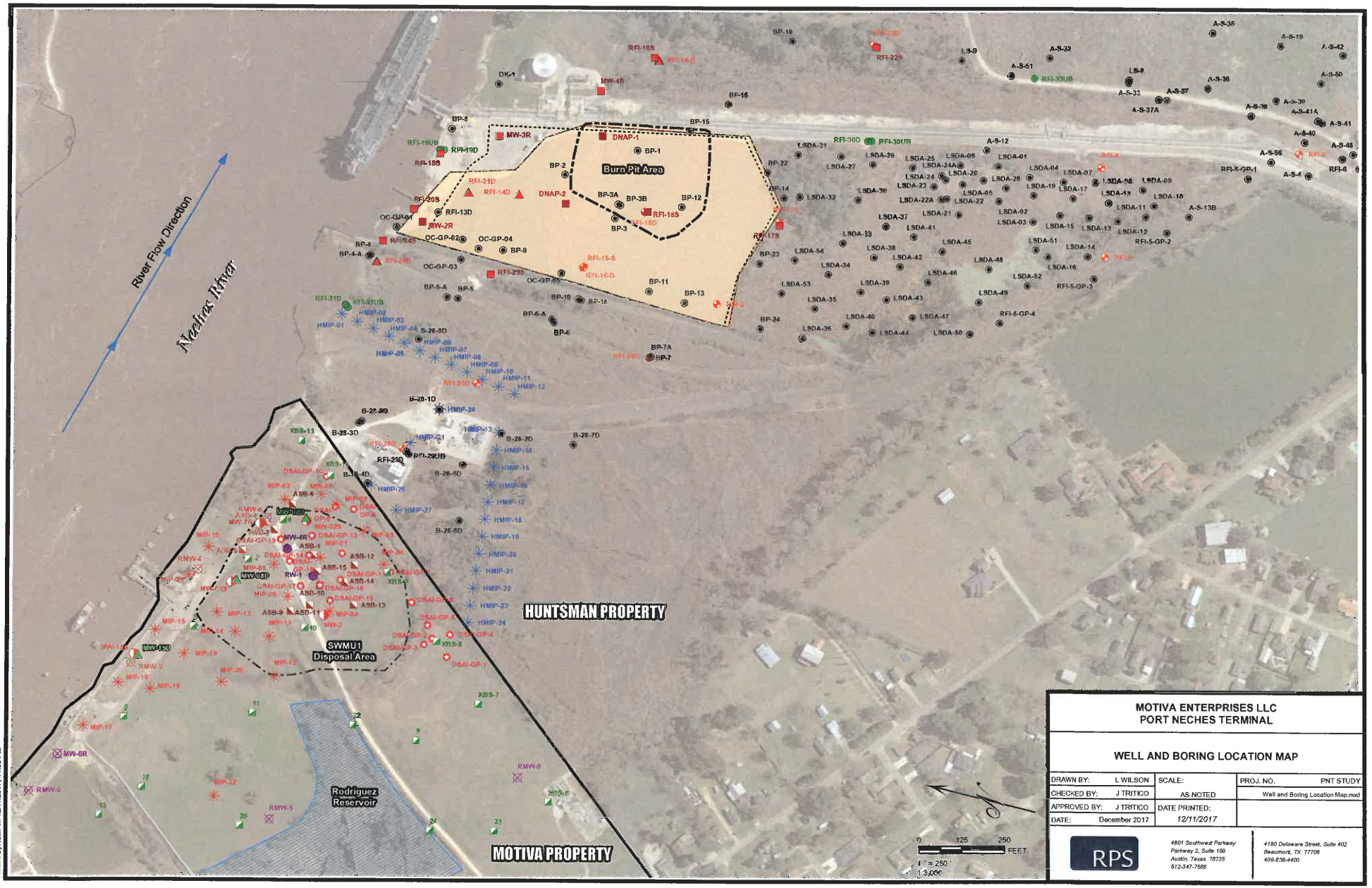

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WELL AND BORING LOCATION MAP

DRAWN BY:	L WILSON	SCALE:	PROJ. NO. PNT STUDY
CHECKED BY:	J TRITICO	AS NOTED	Well and Boring Location Map.mxd
APPROVED BY:	J TRITICO	DATE PRINTED:	
DATE:	December 2017	12/11/2017	

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J:\P\[Motiva\Port Neches Terminal\PNT Study\Well and Boring Location Map.mxd
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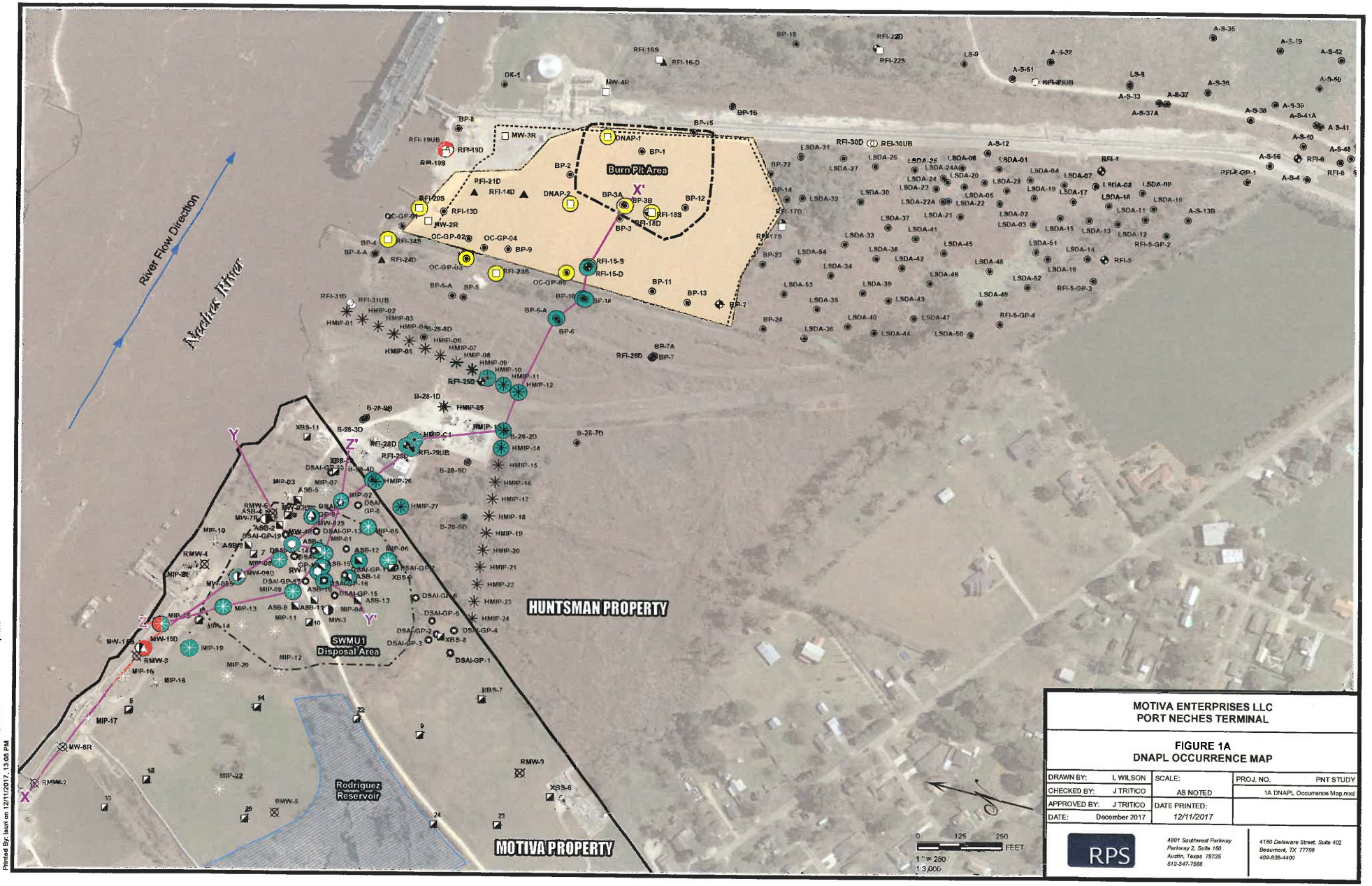

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PORT NECHES TERMINAL

FIGURE 1A
DNAPL OCCURRENCE MAP

DRAWN BY:	L WILSON	SCALE:	PROJ. NO. PNT STUDY
CHECKED BY:	J TRITICO	AS NOTED	1A DNAPL Occurrence Map.mxd
APPROVED BY:	J TRITICO	DATE PRINTED:	
DATE:	December 2017	12/11/2017	

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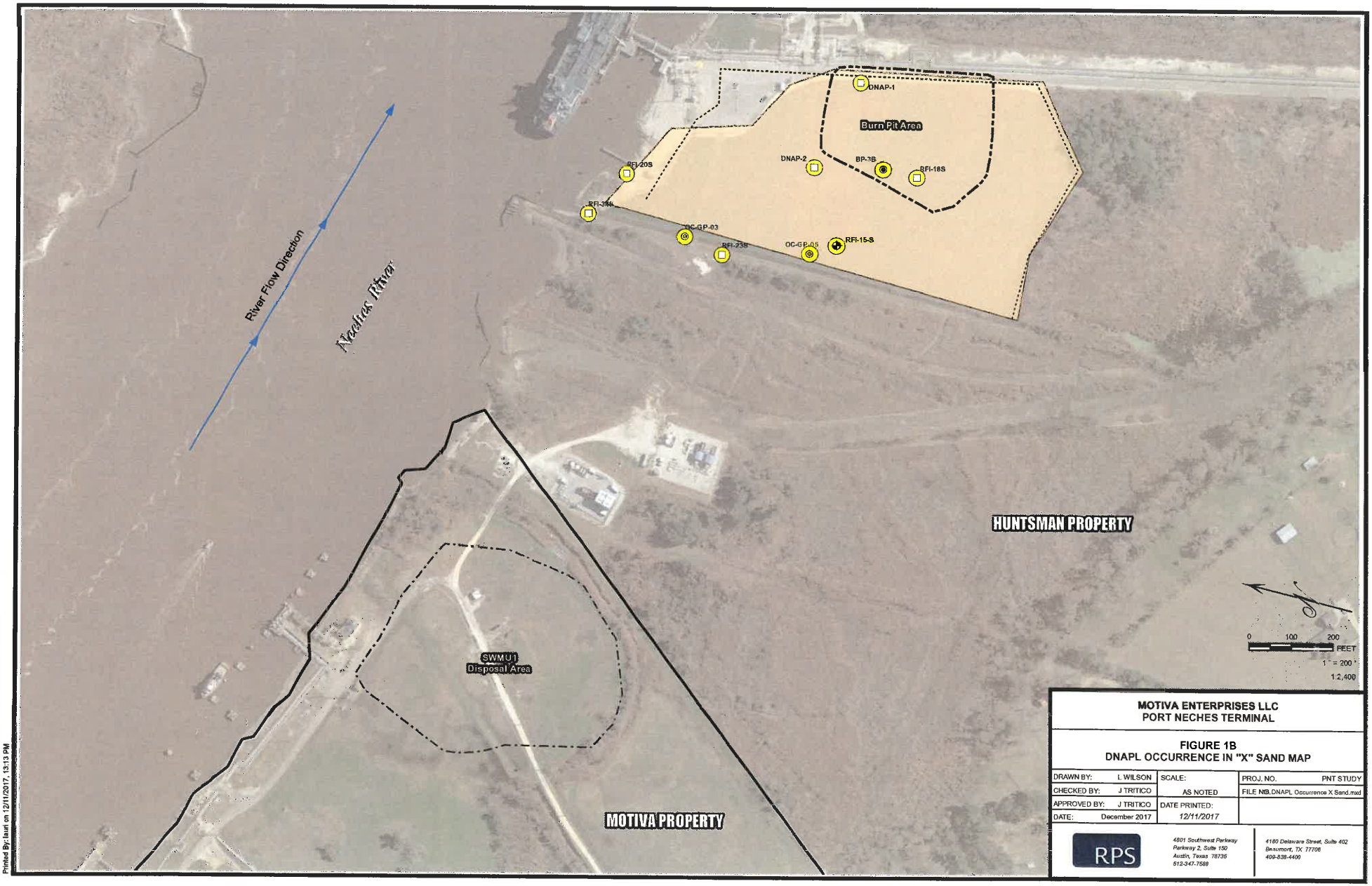

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FIGURE 1B
DNAPL OCCURRENCE IN "X" SAND MAP

DRAWN BY:	I. WILSON	SCALE:	PROJ. NO. PNT STUDY
CHECKED BY:	J TRITICO	AS NOTED	FILE NO. DNAPL Occurrence X Sand.mxd
APPROVED BY:	J TRITICO	DATE PRINTED:	
DATE:	December 2017	12/11/2017	

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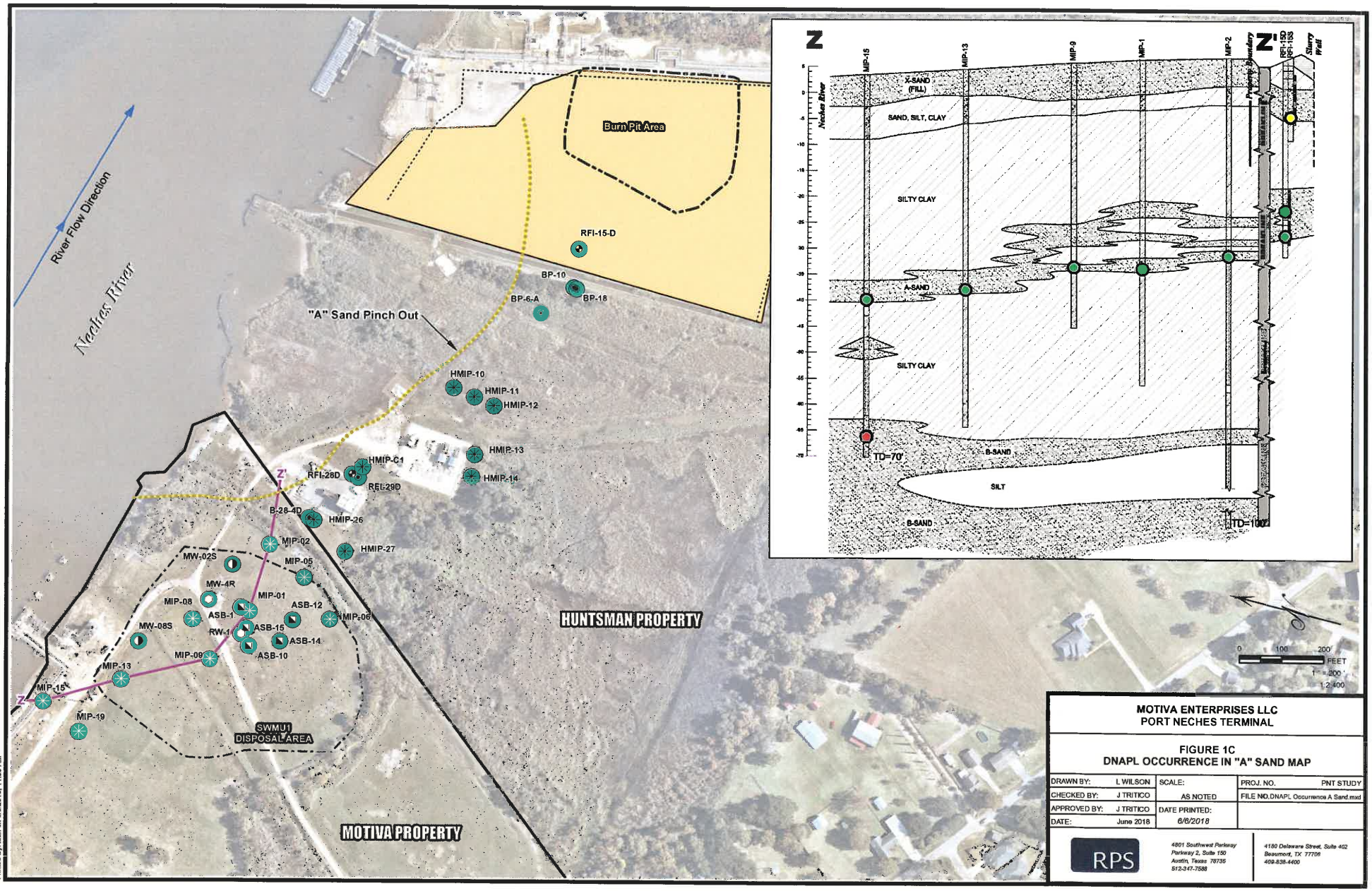

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FIGURE 1C
DNAPL OCCURRENCE IN "A" SAND MAP

DRAWN BY:	L WILSON	SCALE:	PROJ. NO. PNT STUDY
CHECKED BY:	J TRITICO	AS NOTED	FILE NO. DNAPL Occurrence A Sand.mxd
APPROVED BY:	J TRITICO	DATE PRINTED:	
DATE:	June 2018	6/6/2018	

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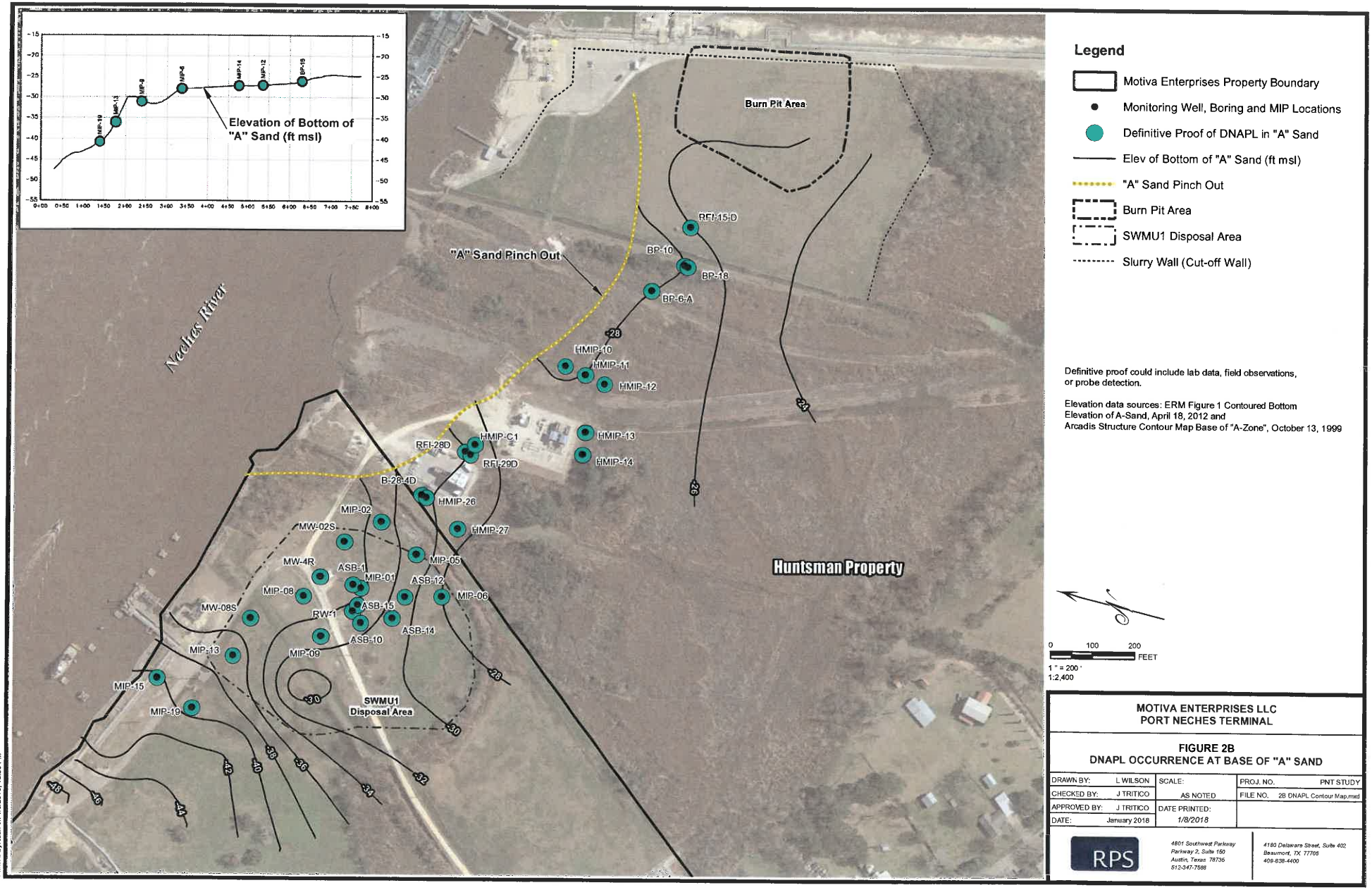

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FIGURE 2B
DNAPL OCCURRENCE AT BASE OF "A" SAND

DRAWN BY:	L WILSON	SCALE:	PROJ. NO. PNT STUDY
CHECKED BY:	J TRITICO	AS NOTED	FILE NO. 2B DNAPL Contour Map.mxd
APPROVED BY:	J TRITICO	DATE PRINTED:	
DATE:	January 2018	1/8/2018	

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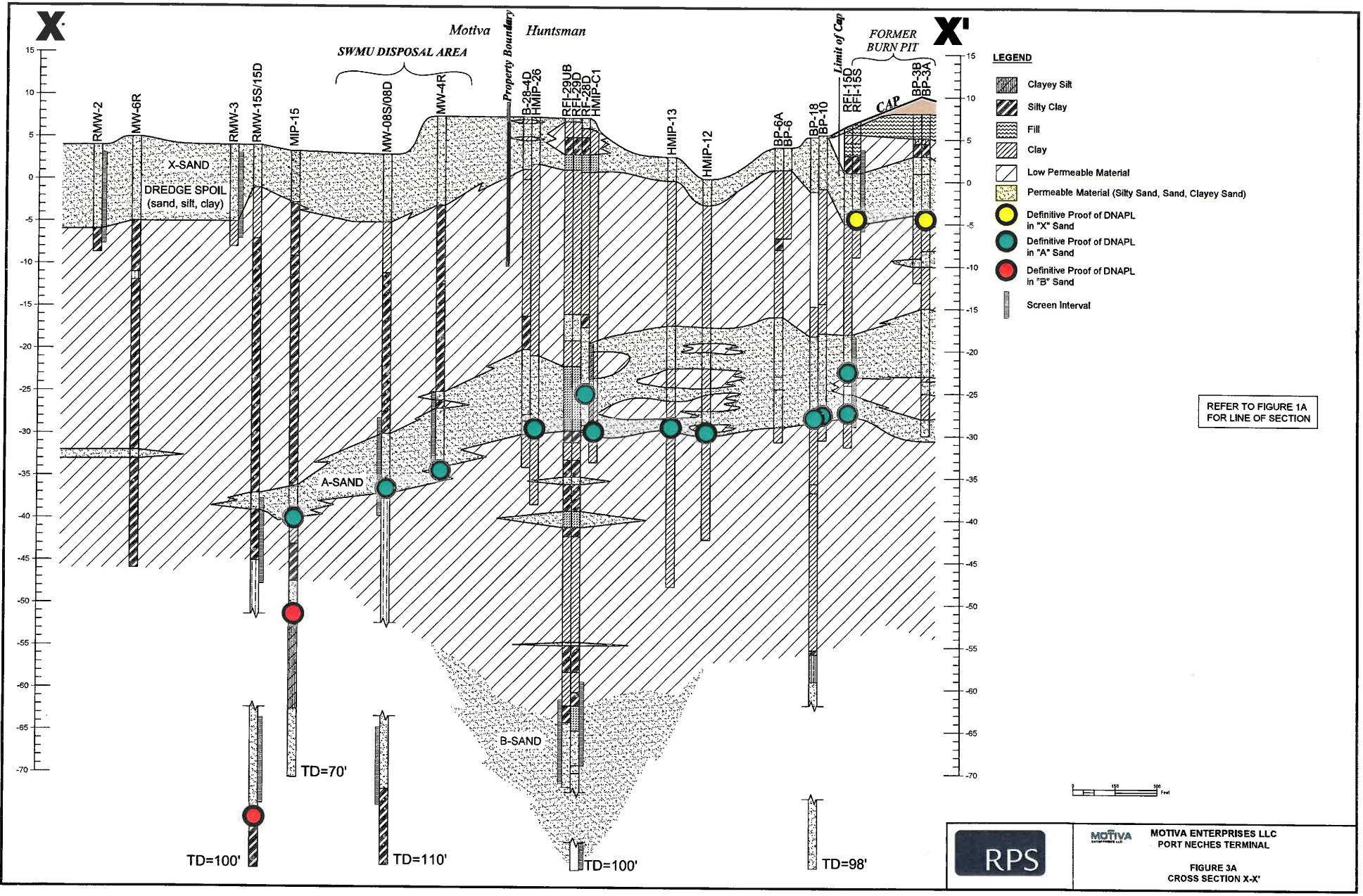

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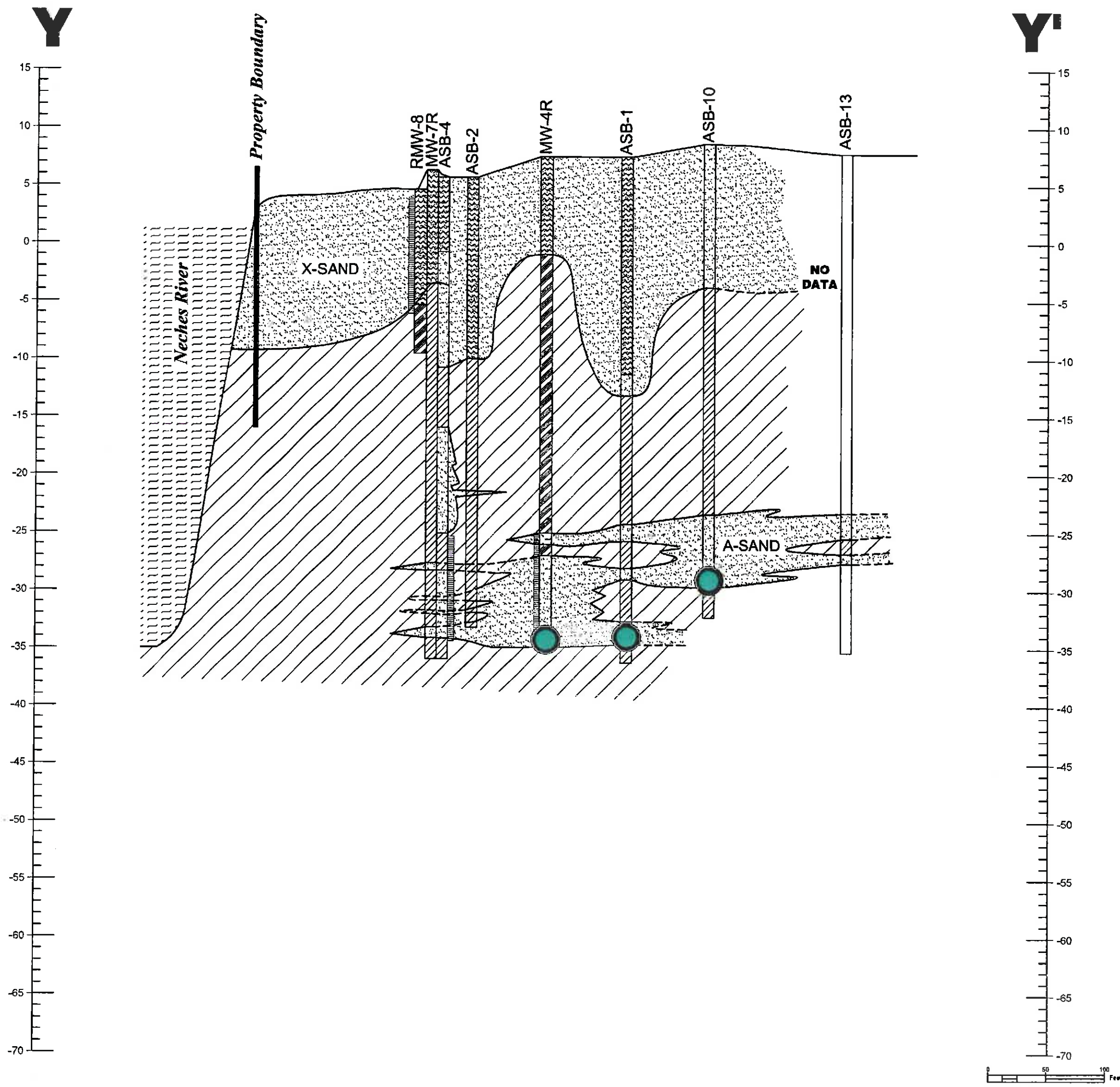
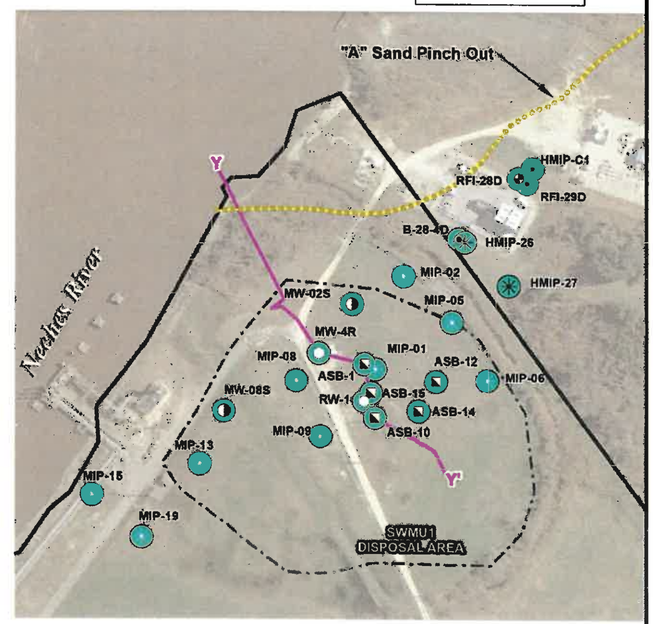
FIGURE 3A
CROSS SECTION X-X'



LEGEND

- Clayey Silt
- Silty Clay
- Fill
- Clay
- Low Permeable Material
- Permeable Material (Silty Sand, Sand, Clayey Sand)
- Definitive Proof of DNAPL in "A" Sand
- Screen Interval

REFER TO FIGURE 1A FOR LINE OF SECTION



NOTE:

1. MW-4 was replaced in 2009 by MW-4R and screen from 32' to 42' below grade. This well is presently a DNAPL recovery well.

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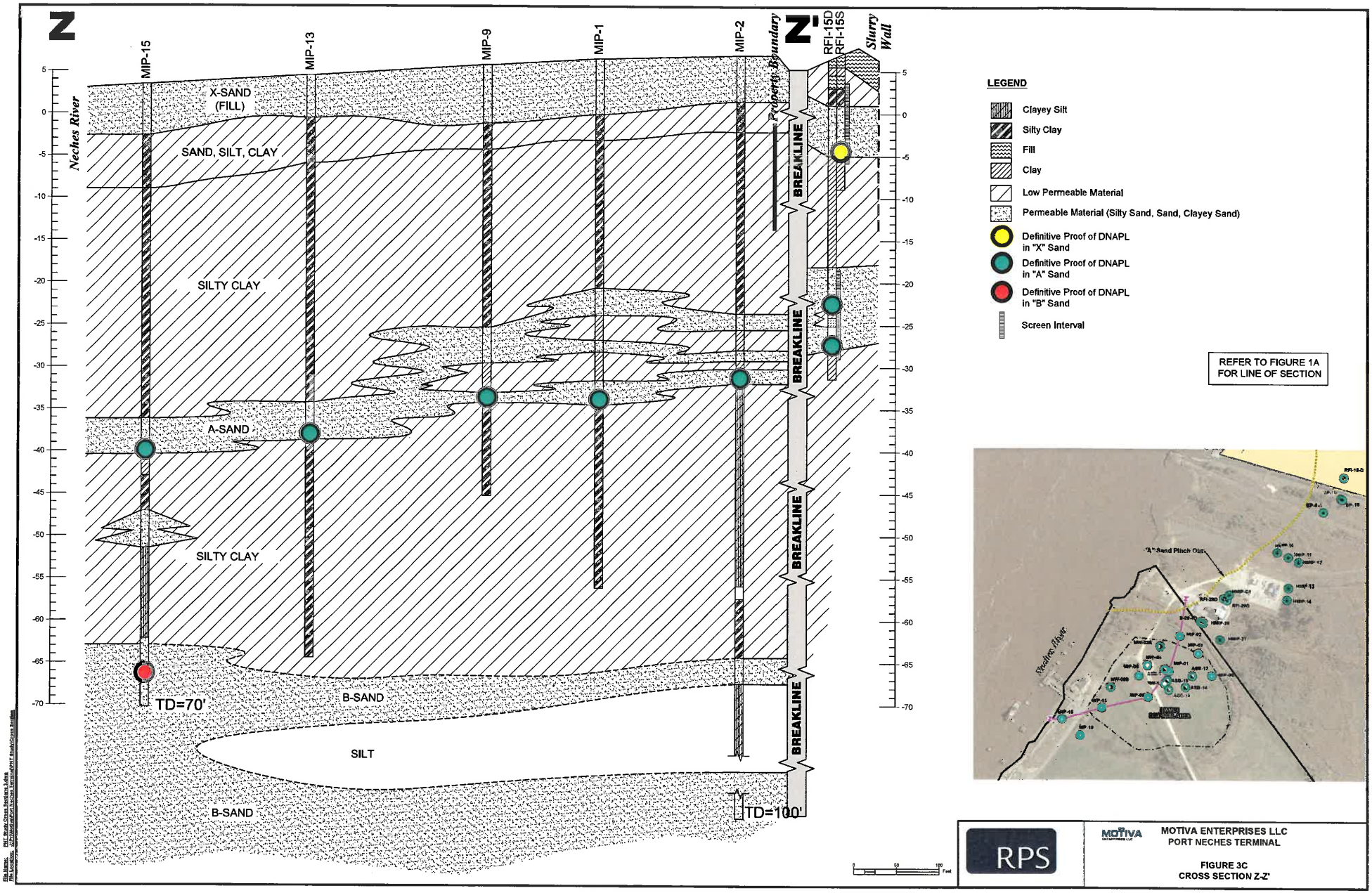
FIGURE 3B
CROSS SECTION Y-Y'


Z
Z'
MIP-15
MIP-13
MIP-9
MIP-1
MIP-2
RFI-15D
RFI-15S
Property Boundary
Slurry Wall
Neches River
X-SAND (FILL)
SAND, SILT, CLAY
SILTY CLAY
A-SAND
SILTY CLAY
B-SAND
SILT
B-SAND
TD=70'
TD=100'
BREAKLINE
BREAKLINE
BREAKLINE
BREAKLINE
LEGEND
Clayey Silt
Silty Clay
Fill
Clay
Low Permeable Material
Permeable Material (Silty Sand, Sand, Clayey Sand)
Definitive Proof of DNAPL in "X" Sand
Definitive Proof of DNAPL in "A" Sand
Definitive Proof of DNAPL in "B" Sand
Screen Interval
REFER TO FIGURE 1A FOR LINE OF SECTION
"A" Sand Pinch Out
Neches River
RPS
MOTIVA
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PORT NECHES TERMINAL
FIGURE 3C
CROSS SECTION Z-Z'

References:

(1) Arcadis, “High Resolution Site Characterization, NOR No.1 Landfill”, December 15, 2015

(2) Arcadis, “DNAPL Source Area Site Investigation Report, NOR No.1 Landfill”, April 26, 2013

(3) ERM, “Phase II Groundwater and Dense Non-Aqueous Phase Liquid (DNAPL) Investigation”, December 1, 2009

(4) Arcadis, “Phase II RCRA Facility Investigation (RFI)”, 1999

Attachment B – Current Site Conditions

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-1

Landfill Disposal Area Facing Northwest

(Note MW-4 DNAPL Recovery System in the Fenced in Area)

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-1

Landfill Disposal Area Facing North

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-2

Rodriguez Reservoir Facing North

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-3

Oil Recovery Reservoir Facing Northwest

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-3

Oil Recovery Reservoir Facing Southeast

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-4

API Separator Facing East

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-4

API Separator Facing Northwest

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-5

Slop Oil Sump Facing Northwest

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-5

Slop Oil Sump Facing South

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-5

Slop Oil Sump

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-6

Approximate Location of Former PCB Storage Area Facing Northwest

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-7

Approximate Location of Former Incinerator Facing Northwest

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-7

Approximate Location of Former Incinerator Facing West

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-8/AOC-B

Approximate Location of Former Tile Tank Farm/Sump Facing Southeast

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-8

Approximate Location of Former Tile Tank Farm/Sump Facing East

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-9

Former Bundle Wash Area Facing Northwest

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-9

Former Bundle Wash Area Facing Southeast

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-10

Approximate Location of Former Carbon Drums Facing Northwest

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-10

Approximate Location of Former Carbon Drums

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-12

Johnny Hearn Sump Facing Southeast

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-12

Johnny Hearn Sump Facing Northwest

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-13

Tank Farm Ditches Facing East

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-13

Tank Farm Ditches Facing North

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-13

Tank Farm Ditches Facing Northwest

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-14

Jim Lake Facing Southeast

Motiva Enterprises, LLC Port Neches Terminal
Current Condition of SWMUs November 5, 2020

SWMU-14

Jim Lake Facing Northwest