N00213.AR.001512
NAS KEY WEST
5090.3a

FINAL TIER II UNIFORM FEDERAL POLICY SAMPLING AND ANALYSIS PLAN SUPPLEMENTAL SITE ASSESSMENT TRUMBO POINT TANK FARM NAS KEY WEST FL

9/1/2014

AGVIQ ENVIRONMENTAL SERVICES

1 Title and Approval Page

Final

Tier II Uniform Federal Policy Sampling and Analysis Plan
Supplemental Site Assessment
Trumbo Point Tank Farm

Naval Air Station Key West
Key West, Florida

Task Order No. JM14

September 2014

Prepared for

NAVFAC Naval Facilities Engineering Command

Under the

Small Business Remedial Action Contract
N62470-12-D-7004

Prepared by:

AGVIQ ENVIRONMENTAL SERVICES

Virginia Beach, Virginia

This page intentionally left blank.

Signature Page

Quality Assurance Approval:

BOWERS.KENNETH.A.1230092474

Digitally signed by BOWERS.KENNETH.A.1230092474
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USN, cn=BOWERS.KENNETH.A.1230092474
Date: 2014.10.07 09:00:08 -04'00'

NAVFAC Quality Assurance Officer / Date

Quality Assurance Review:

Taylor Sword
AGVIQ Program Quality Manager / Date: June 27, 2014

Other Approvals:

SYME.BRIAN.JASON.1108719792

Digitally signed by SYME.BRIAN.JASON.1108719792
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USN, cn=SYME.BRIAN.JASON.1108719792
Date: 2014.10.07 09:21:16 -04'00'

NAVFAC Remedial Project Manager / Date:

Tracie L. Vaught

FDEP Remedial Project Manager / Date:

This page intentionally left blank.

Executive Summary

This Uniform Federal Policy Sampling and Analysis Plan (UFP-SAP) is prepared to support the petroleum monitoring and assessment at the Trumbo Point Tank Farm (TPTF) at Naval Air Station (NAS) Key West in Key West, Florida (**Figures 1 and 2**). This UFP-SAP details various aspects of the field activities and serves as a guideline for the field activities and data assessment. It was developed in general accordance with two guidance documents: 1) U.S. Environmental Protection Agency (EPA), *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS* (EPA, 2002), and 2) *Uniform Federal Policy for Quality Assurance Project Plans* (Intergovernmental Data Quality Task Force, 2005).

This UFP-SAP was prepared under the Naval Facilities Engineering Command Southeast (NAVFAC SE), Small Business Remedial Action Contract No. N62470-12-D-7004, Task Order (TO) No. JM14, for submittal to NAVFAC SE and Florida Department of Environmental Protection (FDEP). The Department of the Navy (Navy), and the FDEP work jointly as the NAS Key West Tier I Partnering Team.

TPTF has been used as a fuel storage and distribution point by the Navy since 1942. A concrete seawall, approximately 2 feet thick and 15 to 20 feet below land surface (bls), extends along the north perimeter of the site. Several aboveground storage tanks (ASTs), as well as associated piping and various pump houses used to transport fuel from the ASTs, are located at the TPTF-Navy (North) site. The area within the tank farm has been leased by the Navy to several contractors for the supply and transportation of fuel; the northeastern portion of the tank farm contains three ASTs (Tanks 1, 2, and 3 as shown on **Figure 2**) in a bermed area that is leased by the Key West Pipeline Company. The TPTF-Navy (South) site currently consists of an open, grassy area. Most of the storage systems were demolished (above-grade structures only) by the mid-1990s and the large concrete cut and fill tanks were backfilled and graded, with the sub-grade structures abandoned in-place.

Based on soil and groundwater contamination identified during several preliminary investigations conducted at TPTF, a Contamination Assessment Report was completed in 1996 by ABB Environmental Services, Inc. (ABB-ES). The Contamination Assessment Report identified areas of LNAPL across TPTF and recommended continued LNAPL recovery as an interim remedial action and development of a Remedial Action Plan (RAP) for the site (ABB-ES, 1998). The suspected sources of LNAPL at the TPTF-Navy (North) site are historical releases from Tanks 1, 2, and 3, and Pipelines 1 and 2. Tank 1 (1,050,000-gallon capacity) and Tank 2 (2,310,000-gallon capacity) contain JP-5 jet fuel, and Tank 3 (2,310,000-gallon capacity) historically contained JP-5, but is not currently in use. Former Tank D-2 historically contained “diesel fuel marine.” The tank locations are shown on **Figure 2**.

The RAP recommended LNAPL recovery followed by monitored natural attenuation (MNA) for the contamination in groundwater, and identified several areas at TPTF as impacted with petroleum LNAPL that required active remediation (ABB-ES, 1999).

The groundwater data collected as a part of this UFP-SAP will be used to support MNA as the final remedy for the TPTF-Navy groundwater plume(s). The last comprehensive sampling event at TPTF-Navy was conducted in 2011, and more recent groundwater data, plus additional soil data, are warranted. The specific objectives of this proposed groundwater monitoring will be to:

- Obtain data for development of an effective approach for MNA of the subsurface contamination that is in the form of LNAPL and dissolved phase plumes at TPTF-Navy (North) and TPTF-Navy (South).
- Provide a current snapshot of the horizontal and vertical extent of the groundwater plume(s).
- Provide a current assessment of conditions for natural attenuation.
- Provide background concentrations for arsenic and benzo(a)pyrene equivalent (BEQs) in surface soil.
- Assess the fractionation of total recoverable petroleum hydrocarbon (TRPH) in surface soil.

- Assess the nature and extent of arsenic and BEQ exceedances in soil, as necessary.

To achieve these objectives, the following field activities will be conducted:

- Site preparation, including vegetation clearance, and utility location
- Collection of groundwater samples from existing monitoring wells
- Collection of soil samples for background data collection and, total petroleum hydrocarbon (TPH) speciation, and delineation as necessary
- Installation and sampling of up to two additional groundwater monitoring wells, if needed
- Site restoration and investigation-derived waste management

Groundwater samples from all sampling locations will be analyzed for the site-specific chemicals of concern and select geochemical parameters (temperature, pH, dissolved oxygen, oxidation-reduction potential, specific conductance, and turbidity). A select number of groundwater samples will also be analyzed for natural attenuation indicator parameters including total and dissolved manganese and iron, chloride, nitrate, sulfate, sulfide, methane, total dissolved solids, and total inorganic carbon. The final locations for the new monitoring wells may be altered based on the field conditions. Additional locations may be selected based on the analytical results.

This UFP-SAP will help ensure that environmental data collected or compiled are scientifically sound, of known and documented quality, and suitable for the intended uses (environmental characterization and determination of the path forward). The laboratory information cited in this UFP-SAP is specific to Gulf Coast Analytical Laboratory. If additional laboratory services are requested that require modification to the existing UFP-SAP, the revised sections will be submitted to the Navy and regulatory agencies for approval.

Contents

Appendixes

Figures

Acronyms and Abbreviations

°C	degrees Celsius
ABB-ES	ABB Environmental Services, Inc.
AFVR	aggressive fluid vapor recovery
AGVIQ	AGVIQ LLC
AHA	Activity Hazard Analysis
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
BEQ	benzo(a)pyrene equivalent
bls	below land surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CA	corrective action
CAR	Contamination Assessment Report
CFR	Code of Federal Regulations
CH2M HILL	CH2M HILL Constructors, Inc.
COC	chemical of concern
COPC	chemical of potential concern
DBCP	dibromochloropropane
DL	detection limit
DO	dissolved oxygen
DoD	Department of Defense
DOT	Department of Transportation
DPT	direct-push technology
DQI	data quality indicator
DV	data validation
EDB	ethylene dibromide
EICP	Extracted Ion Current Profile
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
EPH	extractable petroleum hydrocarbon
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FID	flame ionization detector
FL-PRO	Florida Petroleum Residual Organic
FTL	Field Team Lead
GCTL	groundwater cleanup target level
GLYPQC	Groundwater Low Yield/Poor Quality Criteria
HLA	Harding Lawson Associates
HSM	Health & Safety Manager
ICAL	initial calibration
ID	identification
IDW	investigation-derived debris
ISM	Incremental Sampling Method
LCS	laboratory control sample

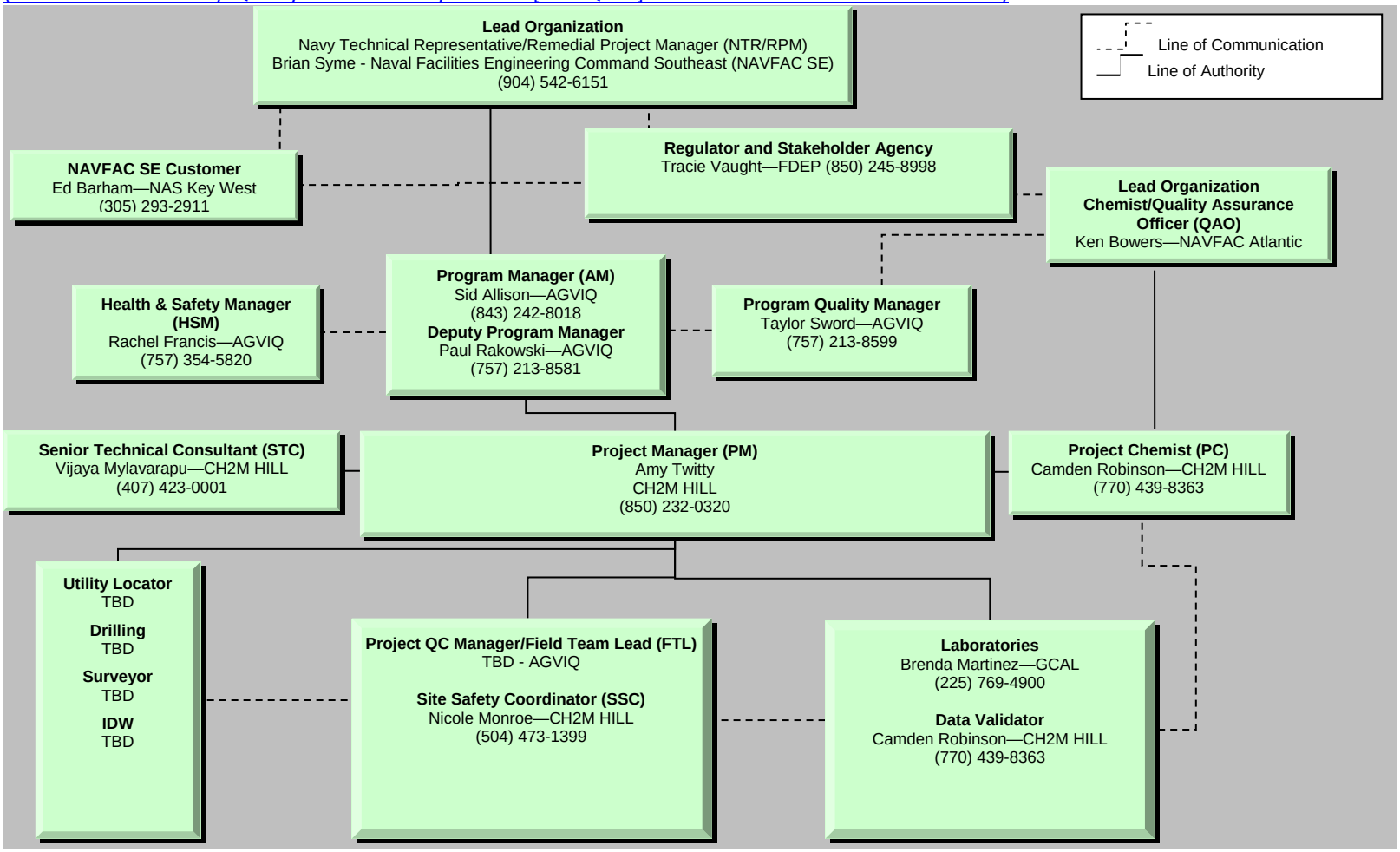
LIF	laser induced fluorescence
LNAPL	light non-aqueous phase liquid
LOD	limit of detection
LOQ	limit of quantitation
MADEP	Massachusetts Department of Environmental Protection
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
ml	milliliters
MNA	monitored natural attenuation
MPC	measurement performance criteria
MS/MSD	matrix spike/matrix spike duplicate
MSWC	Marine Surface Water Criteria
MTBE	methyl tert-butyl ether
NADC	Natural Attenuation Default Concentration
NAMP	Natural Attenuation Monitoring Plan
NAS	Naval Air Station
NAVFAC SE	Naval Facilities Engineering Command, Southeast
Navy	Department of the Navy
NIRIS	Navy Installation Restoration Information System
NTR	Navy Technical Representative
ORP	oxidation-reduction potential
PAH	polynuclear aromatic hydrocarbon
PAL	project action limit
PC	Project Chemist
PIL	project indicator limit
PM	Project Manager
POC	point of contact
PPRP	Petroleum Product Recovery Program
PQL	project quantitation limit
PVC	polyvinyl chloride
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RAP	Remedial Action Plan
RPD	relative percent difference
RPM	Remedial Project Manager
SCTL	Soil Cleanup Target Level
SOP	Standard Operating Procedure
SSC	Site Safety Coordinator
STC	Senior Technical Consultant
SVOC	semivolatile organic compound
T&D	transportation and disposal
TarGOST®	Tar-specific Green Optical Screening Tool
TAT	turnaround time

TBD	to be determined
TDS	total dissolved solids
TIC	total inorganic carbon
TO	Task Order
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TPTF	Trumbo Point Tank Farm
TRPH	Total Recoverable Petroleum Hydrocarbon
UCL	95 percent upper confidence level
UFP-SAP	Uniform Federal Policy-Sampling and Analysis Plan
USCG	U.S. Coast Guard
UST	underground storage tank
UVOST®	Ultraviolet Optical Screening Tool
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbon

This page intentionally left blank.

2 Project Organizational Chart

(Uniform Federal Policy-Quality Assurance Project Plans [UFP-QAPP] Manual Section 2.4.1 – Worksheet #5)



This page intentionally left blank.

3 Communication Pathways

(UFP-QAPP Manual Section 2.4.2 – Worksheet #6)

The communication pathways for the Uniform Federal Policy - Sampling and Analysis Plan (UFP-SAP) are shown below.

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or E-mail	Procedure, Pathway, etc.
Communication with the Department of the Navy (Navy) (lead agency)	NTR/RPM	Brian Syme	brian.syme1@navy.mil (904) 542-6151	Primary point of contact (POC) for Navy; can delegate communication to other internal or external POCs. RPM will notify FDEP via email or telephone within 24 hours of field changes affecting the scope or implementation of the design. Navy will have 30 days for UFP-SAP review. All sampling data will be presented and discussed during partnering meetings.
Communication with Florida Department of environmental Protection (FDEP)	FDEP Federal Facilities Project Manager	Tracie Vaught	Tracie.Vaught@dep.state.fl.us (850) 245-8998	Primary POC for FDEP; can delegate communication to other internal or external POCs. Upon notification of field changes, FDEP will have 24 hours to approve or comment on the field changes. All data results will be presented and discussed during partnering meetings.
Communication regarding overall project status and implementation and primary POC with Navy RPM and FDEP	Project Manager (PM)	Amy Twitty	Amy.Twitty@ch2m.com (850) 232-0320	Oversees project. If field changes occur, the PM will work with the Navy RPM to communicate field changes to the team via email within 24 hours. All data results will be communicated to the project team during the first partnering meeting following data receipt.
Technical communications for project implementation, and data interpretation	Senior Technical Consultant (STC)	Vijaya Mylavarapu	vijaya.mylavarapu@ch2m.com (407) 423-0001 x52190	Team members will contact the STC regarding questions/issues encountered in the field, input on data interpretation, etc., as needed. The STC will have 24 hours to respond to technical field questions as necessary. Additionally, the STC will review the data (as necessary) prior to partnering team discussion and reporting review.
Quality issues during project implementation and data interpretation	Program QC Manager (QCM)	Taylor Sword	tsword@tikigaq.com (757) 213-8599	Team members will contact the QCM regarding quality issues during project implementation. The QCM will report to the PM, and the NAVFAC Quality Assurance Officer (QAO).
Communications regarding project management and implementation of work related to Task Order (TO) No. JM14	PM	Amy Twitty	Amy.Twitty@ch2m.com (850) 232-0320	Responsible for forwarding all information and materials about the project to the Navy and the STC as necessary. POC for field sampling team.
Health and Safety	SSC	Nicole Monroe	Nicole.Monroe@ch2m.com (504) 473-1399	Responsible for the adherence of team members to the site safety requirements described in the Health and Safety Plan. Will report health and safety incidents and near misses to the PM.
UFP-SAP changes in field	Project QC Manager	TBD	TBD	Prepares documentation of deviations from the UFP-SAP in the field logbook and immediately notifies the PM. Deviations will be made only with approval from the PM.

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or E-mail	Procedure, Pathway, etc.
UFP-SAP Field Changes/ Field Progress Reports	Project QC Manager	TDB	TBD	Prepares documentation of field activities and UFP-SAP deviations (made with the approval of the PM and/or QAO) in field logbooks; provides daily progress reports to the PM. The contractor PM may notify the Navy RPM of any field data quality issues that could affect the data quality objectives or could negatively affect project schedule.
Data tracking from field collection to database upload	PC	Camden Robinson	Camden.Robinson@ch2m.com (770) 439-8363	Tracking data from sample collection through database upload.
Reporting Laboratory Data Quality Issues	Laboratory PM	Brenda Martinez	Brenda.Martinez@gcal.com (225) 769-4900	All quality assurance (QA)/quality control (QC) issues with project field samples will be reported within 1 day to the PC by the laboratory. Should analytical laboratory issues affect data usability by rendering a significant amount of rejectable or unusable data, such that the project completeness goal cannot be obtained, the PC will notify the project team, including the Navy RPM and Navy QAO.
Reporting Data Validation (DV) Issues	Data Validator	Camden Robinson	Camden.Robinson@ch2m.com (770) 439-8363	All DV issues regarding resubmissions from the laboratory will copy the CH2M HILL chemist on communications. The DV report will be due within 14 calendar days of data receipt.
Field and analytical corrective actions (CAs)	PC	Camden Robinson	Camden.Robinson@ch2m.com (770) 439-8363	CAs for field and analytical issues will be determined by the FTL and/or the PC and reported to the PM within 4 hours.
Release of Analytical Data	PC	Camden Robinson	Camden.Robinson@ch2m.com (770) 439-8363	No analytical data can be released until validation of the data is completed and has been approved by the PC. The PC will review analytical results within 7 days of receipt for release to the project team.
Field CAs	FTL/ Project QC Manager PM	TBD Amy Twitty	TBD Amy.Twitty@ch2m.com (850) 232-0320	Field and analytical issues requiring CA will be determined by the FTL/Project QC Manager or PM; the PM will ensure QAPP requirements are met by field staff.

Note: Stop Work Order: Any field member can immediately stop work if an unsafe condition, which is immediately threatening to human health, is observed. Ultimately, the FTL and PM can stop work for a period of time. NAVFAC SE can stop work at any time.

4 Project Planning Session Participants Sheet

(UFP-QAPP Manual Section 2.5.1 – Worksheet #9)

4.1 October 2013 Team Discussion

Project Name: TPTF Supplemental Site Assessment		**Site Name:**	TPTF	
Projected Date(s) of Sampling: May 2014		**Site Location:**	NAS Key West	
Project Manager:	Amy Twitty			
Date of Session:	October 24, 2013			
Scoping Session Purpose:	Teleconference call; Discussion of arsenic sampling in soil and groundwater analytical suite			
Name	**Title**	**Affiliation**	**Phone #**	**E-mail Address**
Brian Syme	RPM	NAVFAC SE	(904) 542-6151	brian.syme1@navy.mil
Amy Twitty	PM	CH2M HILL	(850) 232-0320	Amy.Twitty@ch2m.com
Kenneth Bowers	Navy Chemist	NAVFAC Atlantic	(757) 322-8341	kenneth.a.bowers@navy.mil
Tracie Vaught	FDEP Federal Facilities Project Manager	FDEP	(850) 245-8998	Tracie.Vaught@dep.state.fl.us

Comments/Decisions

The team discussed the sampling plan with regard to arsenic in soil. Amy stated the previous excavation of arsenic-contaminated soils (2001 to 2002) was to the site-specific action level of 6.9 milligrams per kilogram (mg/kg), which was calculated as twice the mean of the background concentration. However, the RAP stating the cleanup criteria was never officially approved by FDEP, which nullified the action level of 6.9 mg/kg. The current FDEP Residential Soil Cleanup Target Level (SCTL) for arsenic is 2.1 mg/kg. Amy further stated the backfill used for the excavation had a concentration of less than 3.0 mg/kg (non-detect but the detection limit was 3.0 mg/kg) which is above the Residential SCTL of 2.1 mg/kg. There are many samples that were not removed during the 2001 to 2002 excavation (plus the backfill) that are or may be above 2.1 mg/kg.

Ken had stated that resampling the area for arsenic would likely have similar results as the 1999 sampling, with many results above the 2.1 mg/kg SCTL. Ken asked if doing a risk assessment with the current data set might result in a higher action level. Tracie noted we could look into using similar exposure units as were used for Parcel K. Tracie also mentioned we could consider using the Incremental Sampling Method (ISM) at the site where 30 to 50 samples are collected per exposure unit. The samples would be composited and the resulting analytical result would be representative of the entire exposure unit.

Some areas were pointed out as being industrially zoned (TPTF-Navy [North] and the USGC property). Additionally, the MEC area in the TPTF-Navy (South) is not accessible due to the possible presence of MEC. Therefore, many of the initially proposed samples in these areas were eliminated.

Brian asked what was the previous land use east of the TPTF. No one knew.

Ken stated that since the TPTF-Navy (North) was an active site, we shouldn't have to remediate it now. Amy noted there was an Industrial direct exposure exceedance of TRPH in the TPTF-Navy (North) that would need to be addressed using TPH-speciation. The team agreed.

Regarding the groundwater sampling plan, Amy stated the 2011 Natural Attenuation Monitoring Plan (NAMP) had left off lead and a few other chemicals of concern (COCs) from the petroleum analytical suite listed in Chapter 62-780 Florida Administrative Code (FAC). COCs were removed if not detected during the 2011 sampling

event. Tracie stated she would need multiple sampling events with non-detects or no exceedances before we could remove them from the list.

Action Items

- Amy will look into the options of ISM, full risk assessment, and background soil sampling for arsenic.
- Amy will also ask NAS Key West personnel what the previous land use was in the area east of the TPTF to evaluate suitability for background sample collection from this area.
- Amy will email the team the results of the discussion of the surface water criteria (PQL) from July 2013.

Consensus Decisions

None

4.2 November 2013 Team Discussion

Project Name: TPTF Supplemental Site Assessment		**Site Name:**	TPTF	
Projected Date(s) of Sampling: May 2014		**Site Location:**	NAS Key West	
Project Manager:	Amy Twitty			
Date of Session:	November 5, 2013			
Scoping Session Purpose:	Follow-up discussion on arsenic sampling as well as polynuclear aromatic hydrocarbon (PAH) sampling in soil			
Name	**Title**	**Affiliation**	**Phone #**	**E-mail Address**
Brian Syme	RPM	NAVFAC SE	(904) 542-6151	brian.syme1@navy.mil
Amy Twitty	PM	CH2M HILL	(850) 232-0320	Amy.Twitty@ch2m.com
Kenneth Bowers	Navy Chemist	NAVFAC SE	(757) 322-8341	kenneth.a.bowers@navy.mil

Comments/Decisions

Amy forwarded a figure from the 1999 RAP showing five arsenic background soil samples collected from outside of the TPTF-Navy site. The mean of the background samples is 3.44 mg/kg; 2x mean is 6.88 or 6.9 mg/kg which explains where the action level of 6.9 mg/kg came from in the RAP. The FDEP regulator was not able to make the call, but the team decided to approach FDEP with using the existing background data set in lieu of collecting additional samples. If FDEP concurs, no further action is required for arsenic in soil at the TPTF. If FDEP does not agree to this approach, ten samples will be collected for arsenic in the vicinity of the TPTF in accordance with FDEP's *Guidance for Comparing Background and Site Chemical Concentrations in Soil* (FDEP 2012). The site data were collected from 0 to 2 feet bls; in accordance with the guidance document, the background data set should be collected from within the same soil horizon.

Amy also presented a figure showing the low level benzo(a)pyrene equivalent (BEQ) results in soil from the 2011 sampling at the TPTF. Based on recent background sampling at a nearby Naval facility (Truman Annex), where the 2x mean is 0.57 mg/kg in the 0- to 0.5-foot depth, background sampling at the TPTF might also be helpful to show sample results are within the range of background concentrations. Ken asked if FDEP might accept the background sample results from Truman Annex since it's also on Key West and nearby.

Action Items

- Amy will ask Tracie Vaught (FDEP) if the existing arsenic background data set will be sufficient to determine the background concentration for the site.
- Amy will ask Tracie if the PAH background samples collected from Truman Annex can be used as background for the TPTF.

Consensus Decisions

None.

4.3 December 2013 Team Discussion

Project Name: TPTF Supplemental Site Assessment		**Site Name:**	TPTF	
Projected Date(s) of Sampling: May 2014		**Site Location:**	NAS Key West	
Project Manager:	Amy Twitty			
Date of Session:	December 5, 2013			
Scoping Session Purpose:	Follow-up discussion on arsenic sampling as well as PAH sampling in soil			
Name	**Title**	**Affiliation**	**Phone #**	**E-mail Address**
Tracie Vaught	FDEP Federal Facilities Project Manager	FDEP	(850) 245-8998	Tracie.Vaught@dep.state.fl.us
Amy Twitty	PM	CH2M HILL	(850) 232-0320	Amy.Twitty@ch2m.com

Comments/Decisions

Base on Action Items from the November 2013 Scoping Session, Amy met with Tracie Vaught. The following items were discussed:

- Amy asked Tracie whether the existing arsenic background dataset from 1999 (consisting of 5 samples) would be sufficient to represent the background concentration for the site. Amy presented a map showing where the samples were collected and how the mean concentration and thus 2x mean were determined. Tracie stated that we should collect a minimum of two additional samples in accordance with FDEP's *Guidance for Comparing Background and Site Chemical Concentrations in Soil* (FDEP 2012) for the arsenic background dataset which requires a minimum of seven samples for direct comparison. She will accept the original five samples. Amy noted the samples were collected from 0 to 2 feet bls, and per the guidance all samples should be collected from the same soil horizon (not broken into separate soil horizons). Tracie agreed. Amy also noted the 1999 samples were analyzed by EPA Method 6010 and not 6020. In accordance with the background guidance document, the new samples should be sampled analyzed using the same method as the previous samples. Tracie also agreed to this.
- Amy presented a figure showing the low level BEQ results in soil from the 2011 sampling at the TPTF. Based on recent background sampling at a nearby Naval facility (Truman Annex), 2x mean of background BEQ sampling is 0.57 mg/kg in the 0- to 0.5-foot depth. Amy asked Tracie if FDEP might accept the background sample results from Truman Annex as the background for TPTF since it is also on Key West. Tracie stated Truman Annex was too far from TPTF and had different land uses; therefore she was not willing to accept the Truman Annex background dataset at TPTF. She does think it is a good idea to collect a site-specific background dataset at the TPTF for BEQs to show sample results may be within the range of background concentrations.

Consensus Decisions

- Amy will prepare a work plan and SAP to include a proposal for the collection of a background dataset for arsenic to augment the existing dataset, and also proposal for collection of a background dataset for BEQs.

This page intentionally left blank.

5 Conceptual Site Model

(UFP-QAPP Manual Section 2.5.2 – Worksheet #10)

This section provides a summary of site background and key elements of the conceptual site model, followed by a narrative description of the problem statement to be addressed during the field activities in Section 6.

5.1 Background

Naval Air Station Key West

NAS Key West is located approximately 150 miles southwest of Miami, in Monroe County, Florida. NAS Key West, a complex located in several areas of the Lower Florida Keys, encompasses approximately 5,000 acres. The majority of the facility's operations and activities are concentrated on Boca Chica Key and Key West.

TPTF

During the September 2007 NAS Key West Partnering Meeting in Key West, Florida, the Partnering Team agreed that TPTF would be divided into the United States Coast Guard (USCG) area (West portion) and the area currently owned by the Navy (East portion). The TPTF-Navy area was further divided into the southern portion (planned for unrestricted/Residential use), referred to as TPTF-Navy (South), and the northern portion (industrial use), referred to as TPTF-Navy (North), to help support the different uses on the Navy property. **Figure 1** is a site location map, and **Figure 2** shows TPTF-USCG, TPTF-Navy (South), and TPTF-Navy (North).

TPTF has been used as a fuel storage and distribution point by the Navy since 1942. A concrete seawall, approximately 2 feet thick and 15 to 20 feet below land surface (bls), extends along the north perimeter of the site. Several aboveground storage tanks (ASTs), as well as associated piping and various pump houses used to transport fuel from the ASTs, are located at the TPTF-Navy (North) site. The area within the tank farm has been leased by the Navy to several contractors for the supply and transportation of fuel; the northeastern portion of the tank farm contains three ASTs (Tanks 1, 2, and 3 as shown on **Figure 2**) in a bermed area that is leased by the Key West Pipeline Company. The TPTF-Navy (South) site currently consists of an open, grassy area. Most of the storage systems were demolished (above-grade structures only) by the mid-1990s and the large concrete cut and fill tanks were backfilled and graded, with the sub-grade structures abandoned in-place.

The maintenance building in the TPTF-Navy (North) area is occupied during working hours. TPTF-Navy (North) contains active storage tanks and workers are frequently conducting maintenance/construction in the area. No inhabited enclosed structures exist in the TPTF-Navy (South) area at this time. The TPTF-Navy (South) area does not currently contain any active storage tanks. However, the area is commonly used for recreational purposes.

5.2 Historical Site Investigations

Based on soil and groundwater contamination identified during several previous investigations conducted at TPTF, a Contamination Assessment Report (CAR) was completed in 1996 by ABB Environmental Services, Inc. (ABB-ES). The CAR identified areas of LNAPL across TPTF and recommended continued LNAPL recovery as an interim remedial action and development of a Remedial Action Plan (RAP) for the site. The RAP was completed in 1999 by Harding Lawson Associates (HLA).

The RAP recommended monitored natural attenuation (MNA) for the contamination in groundwater, and identified several areas at TPTF as impacted with petroleum LNAPL that required active remediation. These areas were designated as LNAPL areas. The areas were delineated based on one or more of the following:

- Historical flame ionization detector (FID) readings taken during advancement of soil borings and installation of monitoring wells

- Direct observation of soil samples taken during advancement of soil borings and installation of monitoring wells
- Product measurements by a bailer or a product-water interface probe in completed monitoring wells

The RAP (HLS, 1999) recommended reducing petroleum contaminant source(s) using multi-phase extraction, passive product removal, and source area excavation. CH2M HILL Constructors, Inc. (CH2M HILL) began implementing the RAP in 2003 by (1) performing active LNAPL recovery via aggressive fluid vapor recovery (AFVR) using a vacuum truck attached to impacted wells, (2) conducting passive LNAPL recovery via the installation of petroleum oil traps (i.e., skimmer trap systems) inside impacted wells, (3) using a portable non-aqueous extraction technique LNAPL recovery system, and (4) removing product from wells using disposable bailers. The petroleum product removal ceased in 2010 when it was no longer feasible to remove product.

During the 1998 and 1999 additional investigations by HLA, arsenic was determined to be a COC in surface soil (HLA, 1999). Arsenic was detected above background across the site but largely around former waste oil Tank D-5. The highest arsenic concentration (440 mg/kg) was detected near a former pesticide mixing building on the west side of the TPTF-Navy (South). One of the remedial components in the RAP (HLA, 1999) included the excavation of arsenic in surface soil above the action level of 6.9 milligrams per kilogram (mg/kg). The action level was calculated as two times the mean of five background sample concentrations collected at the site. However, approval of the RAP by FDEP was never confirmed; thus, the action level of 6.9 mg/kg was never officially approved. In 2001 and 2002, a total of 3,130 tons of non-hazardous arsenic contaminated soil and debris was disposed of offsite. The majority of the excavation was from the TPTF-Navy (South), with lesser amounts excavated from the TPTF-Navy (North). The current Residential Soil Cleanup Target Level (SCTL) for arsenic is 2.1 mg/kg (TPTF-Navy [South]) while the current Industrial SCTL is 12 mg/kg (TPTF-Navy [South]). Soil remains at the site above the Residential SCTLs at the TPTF-Navy (South) but is below Industrial SCTLs in the TPTF-Navy (North). However, because arsenic is naturally occurring, background levels can be action levels for unrestricted use.

In 2001 to 2002, petroleum-contaminated soil was treated onsite using an Ion Collider Treatment technology and the cleaned soil was placed back in the excavation. As previously described, additional soil removal occurred in April 2009 as part of a LNAPL removal activity. CH2M HILL removed 858 tons of petroleum-impacted non-hazardous soil.

The suspected sources of LNAPL at the TPTF-Navy (North) site are historical releases from Tanks 1, 2, and 3, and Pipelines 1 and 2. Tank 1 (1,050,000-gallon capacity) and Tank 2 (2,310,000-gallon capacity) contain JP-5 jet fuel, and Tank 3 (2,310,000-gallon capacity) historically contained JP-5, but is not currently in use. Former Tank D-2 historically contained “diesel fuel marine.” The tank locations are shown on **Figure 2**.

The suspected source of LNAPL at the TPTF-Navy (South) site is former Tank D-4. Tank D-4 was a 1,134,000-gallon cut-and-fill underground storage tank (UST) that was constructed partially below-grade and partially above-grade, and covered with soil overburden by Eco-Care, Inc. Reportedly, the tank historically had contained “diesel fuel marine and water,” “diesel fuel marine and Navy Special,” and Bunker C fuel. The tank was demolished in 1996 to 1997. Prior to demolition, the tank was emptied and pressure cleaned/triple rinsed, and the soil overburden and concrete tank were removed to grade. The below-grade portion of the tank was left in place and filled with the concrete fragments from the above-grade tank demolition. The location of former Tank D-4 is shown on **Figure 2**.

A Petroleum Product Recovery Program (PPRP) was implemented at the site in 2003. Following AFVR events conducted as part of the PPRP, product recharge was noted in some monitoring points in the area near the abandoned tank bottom that was left in place during the 1996 to 1997 Tank D-4 demolition. The suspected source of the recharge was product that had pooled under the former Tank D-4 bottom.

In 2008, discussions with the Navy and FDEP resulted in the decision to perform hot spot removal in select areas where LNAPL thickness greater than 2 feet was observed. CH2M HILL developed the Project Execution Plan in April 2009 to outline procedures to be used to perform source area hot spot removal at the TPTF-Navy (South)

site (CH2M HILL, 2009). Remedial activities conducted in April 2009 included temporary well abandonment, soil sampling (waste characterization and backfill), soil excavation, LNAPL and contaminated groundwater removal, liquid and solid waste transportation and disposal (T&D), backfill of excavations, removal and disposal of an inactive approximately 1,000-gallon AST, site restoration, and post-interim remedial action product thickness gauging.

Twenty-five 1-inch diameter temporary monitoring points located within the footprint of the proposed excavations were abandoned at the TPTF-Navy (South) site, while a total of four excavations were completed at the former Tank D-4 site. From April 23 through April 29, 2009, CH2M HILL removed 858 tons of petroleum-impacted non-hazardous soil. As part of the source removal activities, LNAPL was recovered from each of the four open excavations. Once the excavation was completed at each location, LNAPL seeped into the excavation, making it available for removal. A total of approximately 1,703 gallons of LNAPL and contaminated groundwater was pumped out of the four open excavations by vacuum trucks. It is estimated that the removed liquid contained approximately 5 to 10 percent LNAPL. After excavation activities were complete, the site was restored to its original condition.

In November 2009, over 100 temporary wells were abandoned and several were converted to permanent monitoring points to measure LNAPL levels. In July 2010, CH2M HILL conducted a laser induced fluorescence (LIF) investigation to assess the in place (in situ) distribution of light non-aqueous phase liquid (LNAPL) in the TPTF-Navy (North and South) areas at TPTF as one part of a data gap assessment. The approach called for the measurement of in situ LNAPL thickness by attaching an appropriate LIF instrument (Tar-specific Green Optical Screening Tool [TarGOST®] and Ultraviolet Optical Screening Tool [UVOST®]) to direct push technology (DPT) rods and advancing the instrument to refusal depth at 36 locations in the TPTF-Navy (North) and TPTF-Navy (South) sites. This approach was presented in the Work Plan Assessment of In-Situ LNAPL Distribution (CH2M HILL, 2010).

The extent of the non-aqueous phase fuel product plume was delineated using LIF technology and LNAPL thickness measurements at existing monitoring wells in July 2010 (**Figures 3 and 4**). However, the LNAPL delineation indicated that the extents of floating product at the TPTF-Navy (North) and TPTF-Navy (South) sites were not completely bounded by the existing well networks. It was therefore recommended that additional shallow monitoring wells be drilled to detect the presence and thickness of LNAPL at locations where the LNAPL plumes identified using LIF were not previously defined.

A supplemental site assessment was conducted at TPTF to obtain data for development of an effective approach for MNA of the dissolved phase plumes as well as LNAPL at TPTF-Navy (North) and TPTF-Navy (South). In August 2011 and November 2011, data were gathered by installation of monitoring wells to confirm the LNAPL plume areas identified using LIF technology in July 2010; sampling of LNAPL, soil, and groundwater to assess contamination and evaluate the effectiveness of NA; and LNAPL level gauging to identify the existing LNAPL thickness in monitoring wells across the site. The results of the 2011 supplemental site assessment are summarized below.

- In August 2011, two new monitoring wells (TPTF-N-MW-03 and -04) were installed within the boundary of TPTF-Navy (North) and five new monitoring wells (TPTF-S-MW-12, -13, -14, -15, and -16) were installed within the boundary of TPTF-Navy (South). The newly installed monitoring wells were inspected for LNAPL after well installation, and LNAPL was observed in monitoring wells TPTF-S-MW-14 and -15.
- In November 2011, depth to groundwater and LNAPL levels were measured in monitoring wells across the site. The resulting potentiometric surface map indicated that groundwater flow at the site is somewhat radial. Main flow components are to the northeast and to the south, with some localized depressions. Based on historical measurements, a substantial tidal influence has been observed in the area just north of Tank 1 at TPTF-Navy (North). Changes in water levels have varied by nearly 2 feet from morning to evening in this area.
- In August 2011, groundwater samples were collected from 15 monitoring wells and analyzed for fuel components in accordance with Chapter 62-770, FAC (FDEP, 2005b). Groundwater samples from selected

monitoring wells were also analyzed for geochemical and MNA parameters. Chloride and total dissolved solids (TDS) data, along with field parameter readings for salinity and conductivity, support the classification of the aquifer as low yield/poor quality (LY/PQ) as defined in FDEP's draft *Guidance for the Evaluation of Low Yield/Poor Quality Criteria* (FDEP, 2008); groundwater at the site is brackish in nature and not suitable for potable use.

- Analytical results from the August 2011 groundwater sampling event indicated that the extent of dissolved phase contamination at TPTF-Navy (North) and TPTF-Navy (South) is limited and restricted to the site. Although several results exceeded the corresponding groundwater cleanup target levels (GCTLs), only four results (isopropylbenzene at monitoring wells KWM-22 and MW-65, dibenz(a,h)anthracene at monitoring wells MW-04 and FP-05-02-WP-21R) exceeded the corresponding Groundwater Low Yield/Poor Quality Criteria (GLYPQC) values. Of these four results, only the two isopropylbenzene detections also exceeded the corresponding Natural Attenuation Default Concentrations (NADCs). **Figure 5** presents the groundwater exceedances from 2011. Although groundwater samples from three (MW-1D, MW-63, and MW-65) of the four monitoring wells located along the seawall yielded results for total polynuclear aromatic hydrocarbon (PAHs) that exceeded the corresponding Marine Surface Water Criteria (MSWC) value of 0.031 micrograms per liter (µg/L), results for all other parameters were below the corresponding MSWC values at the four monitoring wells along the seawall.

- Based on data from the August 2011 groundwater sampling event, an evaluation of natural attenuation processes at TPTF-Navy (North) and TPTF-Navy (South) indicated that the sites are in a reducing environment (low dissolved oxygen [DO] values and highly negative oxidation-reduction potential [ORP] values) and are showing signs of natural biodegradation. Sulfate appears to be depleted across the site and significant sulfide is present, providing evidence of sulfate reduction. Nitrate also appears to be depleted with no detections across the site, providing evidence of denitrification. The generation of methane is apparent with detections across the site, providing evidence of methanogenesis.

- In August 2011, 20 soil samples were collected from 10 locations, 5 locations within the boundary of TPTF-Navy (North) and 5 locations within the boundary of TPTF-Navy (South). Samples were collected from 0 to 0.5 feet bls and 0.5 to 2 feet bls at each boring location and analyzed for fuel components in accordance with Chapter 62-770, FAC (FEDP, 2005b).

- Analytical results from the August 2011 soil sampling event indicated that the extent of soil contamination at TPTF-Navy (North) and TPTF Navy (South) is limited to TRPH and PAHs. Only one result (TRPH in one boring) within the boundary of TPTF-Navy (North) exceeded the corresponding Industrial direct exposure SCTL; results were compared to Industrial SCTLs since the land use classification for TPTF-Navy (North) is Industrial. Various results (TRPH and benzo(a)pyrene equivalent [BEQs] in multiple borings) within the boundary of TPTF-Navy (South) exceeded the corresponding Residential direct exposure SCTLs; results were compared to Residential SCTLs since the land use classification for TPTF-Navy (South) is Residential. One sample, SS-09, also exceeded the Industrial SCTL for BEQs; another sample, SS-10, exceeded the Industrial SCTL for TRPH. Three results (TRPH in two borings and 1-methylnaphthalene in one boring) across the TPTF-Navy property exceeded the corresponding leachability values based on groundwater of LY/PQ. Since the contaminated area of the TPTF-Navy (South) has recently been enclosed with protective fencing, the land use within the fenced in area could be reclassified as industrial use and the soil results compared to industrial standards.

- Based on 95 percent upper confidence level (UCL 95) calculations, three sample locations/depth intervals at TPTF-Navy (South) would require soil removal to satisfy the Residential land use classifications. These samples include TPTF-SS-08 (0.5 to 2 feet bls) due to TRPH, TPTF-SS-09 (0 to 2 feet bls) due to BEQs, and TPTF-SS-10 (0.5 to 2 feet bls) due to TRPH. **Figure 6** presents the soil exceedances from the 2011 supplemental investigation.

- Based on UCL 95 calculations, one sample location/depth interval at TPTF-Navy (North) would require soil removal to satisfy the Industrial land use classification (TPTF-SS-03 [0.5 to 2 feet bls] due to TRPH).

- Based on groundwater and product gauging measurements collected in July 2010, August 2011, and November 2011, the LNAPL plumes have been better defined and are confined within the site boundary. Product generally has been limited to the same areas over the past year.

- In August 2011, samples of LNAPL and groundwater were collected from six wells at TPTF-Navy (North) and three wells at TPTF-Navy (South) and evaluated for LNAPL physical properties and fingerprinting. The samples collected at TPTF-Navy (North) appear to be more similar to the JP-5 standard than the Bunker C standard, although there are noticeable chromatographic differences between these samples and the JP-5 standard, indicating weathering has occurred. However, the samples collected at TPTF-Navy (South), appear to be more similar to the Bunker C standard than the JP-5 standard, although there are noticeable chromatographic differences between these samples and the Bunker C standard, indicating that weathering has occurred.

- Extraction and recovery operations at TPTF have removed the most easily accessible LNAPL and, by design, have decreased the LNAPL pore saturation. Ultimately, the remaining LNAPL will be distributed as immobile, non-recoverable isolated blobs and ganglia. As the LNAPL pore saturation decreases, the mobility of the remaining LNAPL will also decrease. Furthermore, natural weathering processes leading to eventual immobilization of the remaining LNAPL at TPTF-Navy (North) and TPTF-Navy (South) are proceeding. The extent of dissolved phase contamination in groundwater above comparison criteria is limited and anaerobic biodegradation processes are apparent. Therefore, the efficiency and feasibility of active extraction and recovery operations would be expected to decline as LNAPL saturation levels decrease, the remaining LNAPL becomes increasingly viscous, and the LNAPL becomes distributed only as immobile isolated blobs and ganglia.

Based on these findings, additional assessment and/or remedial actions were warranted.

5.3 Site Description

The TPTF-Navy (North) is a fenced in area located along the surface water body Fleming Key Cut. A concrete seawall, approximately 2 feet thick and 15 to 20 feet below land surface (bls), extends along the north perimeter of the site. Several active ASTs, as well as associated piping and various pump houses used to transport fuel from the ASTs, are located at the TPTF-Navy (North) site. The TPTF-Navy (South) site is inactive and currently consists of an open, grassy area. One portion of the site is fenced in with high vegetation.

Geology

The TPTF is located within the lower Florida Keys which are underlain by the oolitic facies of the Miami Limestone (HLA, 1999). The oolitic limestone is thickest at the northern end of Stock Island, thinning to the south and southwest. The Miami Limestone overlies the Key Largo Limestone which is composed primarily of ancient coral reefs (HLA, 1999). The majority of the TPTF area has been altered or is completely manmade from imported fill in support of the Flagler Railroad/Standard Oil activities in the area.

Soil and Vegetation Types

Soil at the TPTF consists primarily of hard, sandy limestone fill mixed with gravel and shell fragments in the upper 3 feet. Material from 3 to approximately 13 feet bls generally consists of a soft, silty to sandy limestone mud. A sandy to gravelly limestone occurs from 13 to at least 50 feet bls (HLA, 1999).

The TPTF-Navy (North) area is an active AST site and is well maintained and mostly free of vegetation with the exception of low-lying grass. Portions of the TPTF-Navy (South) area are well maintained grassy areas, while higher grasses grow within the work area (where most monitoring wells are located) since maintenance personnel are not allowed within the construction fence.

Hydrogeology

Depth to groundwater is generally 4 to 7 feet bls at the site and is tidally influenced. The groundwater flows radially away from the center of the site.

Potential Contaminants

Based on previous investigations and in accordance with Tables B and C in Chapter 62-780 FAC (FDEP, 2012), chemicals of potential concern (COPCs) in groundwater include priority pollutant list-volatile organic compounds (PPL-VOCs), including methyl tert-butyl ether (MTBE) and total xylenes; PAHs including 1- and 2-methylnaphthalene; ethylene dibromide (EDB), total recoverable petroleum hydrocarbon (TRPH); and lead. Monitoring wells have been sampled in the past, but only one round of sampling has been conducted in the current monitoring well network. Based on numerous soil investigations to date, soil COCs include arsenic, PAHs including 1- and 2-methylnapthalene, and TRPH.

Potential Contaminant Migration Routes

The site has surface soil, subsurface soil and groundwater contamination resulting from either direct release or subsurface migration from surface releases.

Surface Soil: Contaminants in surface soil may migrate through surface runoff during rain events or by seeping through the soil column to subsurface soils and groundwater. Volatile compounds in surface soil could potentially volatilize to ambient air. Residual surface soil contaminants may degrade via photo-oxidation or ionization.

Subsurface Soil: Contaminants in subsurface soil may migrate laterally to surrounding subsurface soils or leach to groundwater. Volatile compounds in subsurface soils may diffuse through soils via vapor intrusion and reach surface soils/ambient air.

Groundwater: Contaminants in groundwater could potentially migrate upward via volatilization through the subsurface and surface soil to the ambient air. Contaminants may migrate through preferential flow pathways, thereby potentially affecting downgradient groundwater, subsurface soil, or surrounding surface waters.

Surface water: Contaminants that reach surface water may volatilize to ambient air or degrade via photo-oxidation, ionization or bacterial degradation. PAHs and metals may adsorb to sediments and sink to the bottom of the water body or disperse within the water currents.

The maintenance building in the TPTF-Navy (North) area could have indoor air exposure from volatile contaminants diffusing upwards from subsurface soils and groundwater. This building is occupied during working hours. TPTF-Navy (North) contains active storage tanks and workers are frequently conducting maintenance/construction in the area.

No inhabited enclosed structures exist in the TPTF-Navy (South) area at this time. The TPTF-Navy (South) area does not currently contain any active storage tanks. However, the area is commonly used for recreational purposes.

Based on the potential migration pathways identified above, potential human and ecological receptors could be present in the area and exposure media consisting of soil, sediment, groundwater and surface water as discussed below.

Nature and Extent of Contamination

LNAPL

The LNAPL was last measured and mapped in July 2010. **Figures 3** and **4** (Appendix A) depict the current LNAPL plumes at both the North and South TPTF. The plumes are limited to the areas of the former and existing ASTs and have not migrated offsite.

Groundwater

Analytical results from the August 2011 groundwater sampling event indicated that the extent of dissolved phase contamination at TPTF-Navy (North) and TPTF-Navy (South) is limited and restricted to the site. Although several results exceeded the corresponding GCTLs, only four results (isopropylbenzene at monitoring wells KWM-22 and MW-65, dibenz(a,h)anthracene at monitoring wells MW-04 and FP-05-02-WP-21R) exceeded the corresponding GLYPQC values. Of these four results, only the two isopropylbenzene detections also exceeded the corresponding NADCs. Although groundwater samples from three of the four monitoring wells located along the seawall (MW-1D, MW-63, and MW-65) yielded results for total PAHs that exceeded the corresponding MSWC value of 0.031 µg/L, results for all other parameters were below the corresponding MSWC values at the four monitoring wells along the seawall.

Soil

During the completion of the 1996 CAR and supplemental investigations in 1998 and 1999, the soil at the site was found to be contaminated with arsenic, TRPH, and PAHs. Soil samples collected during the 2011 Supplemental Site Assessment (AGVIQ-CH2M HILL, 2011) were analyzed for fuel components in accordance with Chapter 62-770, FAC (Table B), including benzene, toluene, ethylbenzene, and xylenes (BTEX) and MTBE; PAHs including 1- and 2-methylnaphthalene; and TRPH by the FL-PRO Method. Only PAHs and TRPH exceeded action levels. Arsenic and PAHs may be present at the site at naturally occurring or anthropogenic concentrations. TRPH levels may not exceed individual carbon fractions. This investigation will determine whether soil conditions exceed the action levels.

Current and Future Human and Ecological Receptors

Surface soil and surface water (seawater) are directly accessible to potential human and ecological receptors in the area. The TPTF-Navy (North) is within an industrial area, and devoid of natural ecology, thus limiting the ecological receptors to the grasses, and terrestrial invertebrates in the area. The TPTF-Navy (South) is located within the same vicinity of the TPTF-Navy (North); however, it is currently zoned for residential use and is often used for recreational camping. The groundwater flow and surface soil runoff to the surrounding seawater (Fleming Key Cut) could result in exposure to the aquatic organisms in the areas immediately adjacent to the site. Thus, aquatic ecological receptors in the area could be exposed to contaminants in groundwater discharging to the surface water. The dissolved groundwater constituents are not expected to present significant sediment accumulation.

The potential human receptors to surface soil contaminants in the TPTF-Navy (North) area include workers involved in facility maintenance including mowing, grading, or other site maintenance related work. Future construction, excavation, and pipeline and tank maintenance could involve excavation of subsurface soil and encountering shallow groundwater. Workers in the area, if such activities were to take place, would then be potential receptors to subsurface soil and groundwater contaminants. The worker population at the TPTF-Navy (North) includes Navy and civilian personnel, contractors, and visitors.

The potential human receptors to surface soil contaminants in the TPTF-Navy (South) area include workers conducting monitoring well maintenance and gauging, visitors using the area for recreational purposes, and visitors. A temporary construction fence is currently surrounding the TPTF-Navy (South) area to limit site access.

Future unlimited land use is not likely for this site because of the presence of remnant infrastructure within the site. The release of the groundwater to the surface water body is not likely to present significant human exposure concern. The groundwater at the site is considered poor quality based on FDEP criteria and therefore it is unlikely the groundwater will be used as a drinking water source.

This page intentionally left blank.

6 Data Quality Objectives/Systematic Planning Process Statements

(UFP-QAPP Manual Section 2.6.1 – Worksheet #11)

6.1 Problem Statement

LNAPL removal at the TPTF using conventional means has become technically impracticable. Monitored natural attenuation (MNA) data will be used to confirm that residual LNAPL remains confined within the site boundaries, delineate the lateral and vertical extent of the LNAPL and dissolved phase plumes, and ensure that offsite migration of contaminants at concentrations exceeding criteria is not occurring. The groundwater data collected as a part of this UFP-SAP will be used to support the remedial design of the final remedy for the TPTF groundwater plume.

Surface soil conditions at the TPTF-Navy (North) and TPTF-Navy (South) will be evaluated to assess whether future remedial actions are necessary under the planned land use conditions. Background concentrations will be established for BEQs and arsenic, and historical data will be evaluated against these criteria to horizontally and vertically delineate arsenic- and BEQ-impacted soil. Arsenic soil results and proposed background sample locations are shown on **Figure 9**. TPH speciation will be used to determine if the individual carbon fractions in soil with previously detected exceedances of TRPH exceed their respective PALs. Data will be used to horizontally and vertically delineate TRPH-impacted soil. TRPH exceedances and proposed sample locations are shown on **Figure 10**. PAH exceedances in soil and proposed background sample locations are shown on **Figure 11**.

6.2 Project Quality Objectives listed in the form of if/then qualitative and quantitative statements.

If groundwater exceeds FDEP Level I GCTLs in monitoring wells that were installed for the purpose of dissolved phase plume delineation, and no outlying wells exist, then installation of additional wells for further lateral extent definition may be required.

If LNAPL (> 0.01 foot) is measured during the groundwater gauging events, then attempts will be made to actively remove LNAPL to the extent practicable. This may be accomplished by using a peristaltic pump, disposable Teflon bailer, passive bailer, or absorbent sock(s) will be installed for long term removal of LNAPL.

If previous data for arsenic and/or BEQ concentrations in soil exceed background and applicable criteria, then the COC within the identified area will be horizontally and vertically delineated through additional soil sampling and analysis.

If TRPH fractionation concentrations in soil samples exceed criteria, then TRPH within the identified area will be horizontally and vertically delineated through additional soil sampling and analysis for TRPH using the FL-PRO Method.

If arsenic, BEQs, and/or TRPH concentrations in soil do not exceed background and applicable criteria in any of the soil samples, then a request will be made to remove the chemical as a COC for soil at this site.

6.3 Environmental Questions to be Answered

The primary objective of petroleum monitoring and groundwater assessment at TPTF is to develop a sampling approach that will support a remedy of MNA at TPTF-Navy (North) and TPTF-Navy (South). This will be accomplished with groundwater sampling to assess contamination and evaluate the effectiveness of natural attenuation. Soil sampling will be performed to determine the nature and extent of soil impacts at the site. The following are the specific environmental questions to be answered by the investigation.

1. **What is the extent and distribution of LNAPL?**

   The water level/product gauging results will be used to determine the nature and extent of the LNAPL plume(s) and demonstrate that LNAPL is not spreading. LNAPL monitoring provided supporting data for evaluation of the dissolved phase.

2. **What is the extent and distribution of dissolved phase groundwater contamination?**

   The groundwater data collection will be used to help determine the nature and extent of the dissolved phase groundwater plume(s). Groundwater will be compared to the associated FDEP GCTLs.

3. **What are the current Natural Attenuation conditions?**

   The MNA data collected during this investigation will be used to evaluate the potential for natural attenuation to reduce contaminants and retard their migration. Data will also be used to assess factors contributing to LNAPL attenuation (e.g., electron acceptors in groundwater).

4. **What are the background concentrations for arsenic and BEQs in surface soil at the site?**

   The data collected from this sampling event will be used to establish background concentrations for these naturally occurring and anthropogenic compounds that may not be site-related. Arsenic and BEQ concentrations detected in historical soil samples will then be compared to the background concentrations to determine if further sampling and/or remedial actions are necessary.

5. **What is the nature and extent of soil contamination?**

   Historical data and any newly collected step-out sample data will be used to determine if arsenic and/or BEQs in surface soil exceed background, Residential, or Industrial direct exposure SCTLs or Leachability SCTLs based on groundwater of LY/PQ.

6. **Do the TRPH exceedances in surface soil exceed the individual TPH carbon fraction ranges?**

   Newly collected soil samples collocated with historical soil samples with TRPH exceeding the PAL will be used analyzed for speciated TRPH to determine if the individual carbon fractions exceed their respective PALs.

6.4 What are the Project Action Limits?

Project action limits (PALs) are media-specific standards and criteria chosen for evaluation to help provide a conservative assessment of site conditions and determine if action is needed to address concentrations of chemicals present at the site, and if so, what remedial alternative(s) are potentially appropriate. The PALs are the higher of the FDEP GCTLs and SCTLs from Tables 1 and 2 respectively in Chapter 62-777 FAC (FDEP, 2005a) and the site-specific background levels.

- PAH results in surface soil (0 to 0.5 and 0.5 to 2 feet bls) will be used to establish the background concentration for the site. Concentrations of historical PAHs in surface soil will be compared to the background as well as FDEP Residential, Industrial, and Leachability SCTLs for COCs. Arsenic results in surface soil will be used to establish a background concentration for the site. Historical soil sample results will be compared to the higher of the background concentration and the FDEP Residential SCTL. The PALs for COCs in soil are based on the higher of the background or the FDEP Residential or Leachability SCTLs from Chapter 62-777 FAC (FDEP, 2005a). The TPH Speciation results will be compared to the calculated Residential, Industrial, and Leachability SCTLs for TRPH Fractions (modified from Table C-9 of the February, 2005 CTL Manual for Chapter 62-777, FAC).

- The PALs for the dissolved-phase groundwater contaminants in onsite wells (with the exception of the wells along the seawall) are the FDEP GCTLs. The PALs for groundwater from the wells along the seawall will be the

MSWC. The PALs for COCs in groundwater are based on the lower of the FDEP CTLs for groundwater and MSW per Table I Chapter 62-777 FAC.

Analytical DLs as well as analytical methodology, limit of detections (LOD), and limits of quantitation (LOQs) will be evaluated for each constituent. The analyses sampled in groundwater will achieve a detection limit (DL) at or less than the FDEP GCTLs with the exception of dibenz(a,h)anthracene.

Although the estimated DL, LOD, and LOQ of dibenz(a,h)anthracene exceeds its respective PAL, this detection/quantification limit is established based on the lowest detection levels achievable using the current best available technology. Therefore, the estimated DL, LOD, and LOQ of this compound is considered to be adequate.

6.5 What will the data be used for?

The data will be used to answer the environmental questions previously defined above.

- Groundwater sampling data will be used to provide indications of the horizontal extent of the dissolved groundwater plume.
- Background soil data will be used to develop arsenic and PAHs levels in soil.
- Surface soil TPH speciation sampling data will be used to assess whether the surface soil conditions meet the Residential, Industrial, or Leachability action levels.
- MNA data will be collected to evaluate the reducing state of the aquifer and to approximate the natural attenuation contributions to overall mass reduction. No specific range of values for these parameters is required. This analysis should also reveal which oxidation-reduction processes at the site are effective at contamination degradation.

6.6 What types of data are needed and how much data is needed

Worksheet #8 contains detailed information on the types of data needed for this project, including proposed sample locations and sampling rationale. Groundwater samples will need to be collected from 17 existing monitoring wells to be analyzed for the site-specific COCs. The groundwater sampling locations are shown on **Figure 7**. A select number of groundwater samples will also be analyzed for the MNA parameters. All groundwater and soil samples will be submitted for laboratory analysis to offsite laboratories (GCAL, LLC). **Worksheet #11** details the laboratory analytical protocol. Sampling techniques are described in the Sample Details Table in **Worksheet #9**.

The following presents a summary of the samples required. **Worksheets #8 and #9** provide sample locations, numbers, rationale, and methodology.

- Soil
  - Two additional background surface soil samples (0 to 2 feet) for arsenic by Method 6010C. Step-out samples at 10-foot increments as needed for historical samples exceeding background.
  - Seven sets (0 to 0.5 feet and 0.5 to 2 feet) of background surface soil samples for PAHs by Method 8270D. Step-out samples at 10-foot increments as needed for historical samples exceeding background.
  - Four soil samples analyzed for TPH Speciation by MADEP-VPH/ EPH. Step out samples at 10-foot increments as needed for TRPH analysis by FL-PRO.
- Groundwater

- Analytical data: PPL VOCs including MTBE and total xylenes; PAHs including 1- and 2-methylnaphthalene; EDB, TRPH; lead; and natural attenuation indicator parameters including total and dissolved manganese and iron, chloride, nitrate, sulfate, sulfide, methane, total dissolved solids, and total inorganic carbon [TIC].
- Field data: Water quality parameters (pH, conductivity, DO, ORP, temperature, and turbidity)

6.7 Are there any special data quality needs, field or laboratory, in order to support environmental decisions?

The offsite laboratory analytical data will be of the quantity and quality necessary to provide technically sound and defensible assessments with respect to the aforementioned project objectives. QC sample requirements are detailed in the Groundwater Samples Detail Table in **Worksheet #9**. For action decisions, the laboratory will follow the measurement performance criteria (MPC) in **Worksheet #5** for field QC samples and **Worksheet #12** for laboratory QC samples**.** These MPC are consistent with the DoD Quality Systems Manual (QSM) as applicable and with laboratory in-house limits where the QSM does not apply.

To reach lower limits, the laboratory will report concentrations between the LOQ and DL as estimated. These results will have a J qualifier applied to them to indicate they are quantitative estimates.

Except for geochemical and geotechnical data, data will be validated by AGVIQ using the procedures listed in **Worksheet #13**. A full Level IV equivalent data package and QC sampling are required for these data. A Level IV equivalent data package includes a case narrative, all field sample results, QC forms, and raw data.

6.8 How will data be collected and generated? How will the data be reported?

AGVIQ personnel will oversee the installation of the new monitoring wells (if needed). They will also collect the groundwater samples from the newly installed and existing monitoring wells, as outlined above. The sample locations are shown on **Figure 7**. Data will be collected and generated in accordance with the standard operating procedures (SOPs) contained in this UFP-SAP. The fieldwork is tentatively scheduled to begin in February 2014. The samples will be shipped by overnight courier to GCAL, which are under subcontract to AGVIQ for analysis.

Once generated, analytical data collected during the sampling event will be submitted to Camden Robinson of CH2M HILL for validation against analytical methodology requirements and MPC presented in this UFP-SAP.

AGVIQ will receive validated data and upload it into a centralized electronic database used for Navy projects (Navy Installation Restoration Information System [NIRIS]) by the project team(s).

The specific results will be reported in the TPTF Annual Report and used in support of the remedial design for the TPTF.

6.9 How will the data be archived?

Data will be archived according to procedures dictated via the Navy Response Action Contract program/contract. Laboratory soil data will be archived in accordance with federal law, and all analytical data will be uploaded into a centralized database developed and maintained by AGVIQ (NIRIS) and used for Navy projects. At the end of the project, hard copies of archived laboratory data and validation reports will be returned to the Navy.

6.10 Who will use the data?

The data will be used by the Navy, its contractors, and the other stakeholder agencies to refine the current understanding of the TPTF groundwater plume and soil concentrations in support of the future remedial decisions. If appropriate, the information will be used to evaluate actions to be taken to provide adequate protection of human health and the environment. Engineers and scientists will evaluate the data for decision

making and a chemist will evaluate laboratory data quality. Once published in the Administrative Record, the data will be available to the public.

6.11 How will the Data Usability be Documented?

The following is a summary of the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:

- Non-detected constituents will be evaluated to ensure that project required quantitation limits in **Worksheet #10** were achieved. If project quantitation limits were achieved and the verification and validation steps yielded acceptable data, then the data are considered usable.
- The Data Validator is the only party who may apply qualifiers to the data. Minor QC exceedances will result in "estimated" data, represented by J, UJ, B, and NJ (NJ for TICs only) qualifiers. Major QC exceedances will result in "rejected" data, represented by R-qualifiers. The effect on availability and usability of rejected results will be evaluated.
- For duplicate sample results, the most conservative value will be used for project decisions.
- Analytical data will be checked to ensure the values and any qualifiers are appropriately transferred to the electronic database. These checks include comparison of hardcopy data and qualifiers to the electronic data deliverable. Once the data have been uploaded into the electronic database, another check will be performed to ensure all results were loaded accurately.
- Field and laboratory precision will be compared as relative percent difference (RPD) between the two results.
- Deviations from the UFP-SAP will be reviewed to assess whether CA is warranted and to assess impacts on achievement of project objectives.

The evaluative procedures used to assess overall measurement error associated with the project are:

- To assess whether a sufficient quantity of acceptable data is available for decision making, the data will be reconciled with MPC following validation and review of data quality indicators (DQIs).
- If significant biases are detected with laboratory QA/QC samples, they will be evaluated to assess their impact on decision making. Low biases will be described in greater detail as they represent a possible inability to detect compounds that may be present.
- If significant deviations are noted between lab and field precision, the cause will be further evaluated to assess the impact on decision-making.

The documentation that will be generated during the usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies, include:

- Data tables will be produced to reflect detected and non-detected constituents and geochemical parameters. Data qualifiers will be reflected in the tables and discussed in the annual report.
- A DV report will be provided as an appendix to the annual report.
- If needed, a technical memorandum will be produced that will identify any data usability limitations and make recommendations for CA.

The personnel responsible for performing the usability assessment are:

- The AGVIQ PM, PC, and other team members as necessary.

This page intentionally left blank.

7 Field Quality Control Samples

(UFP-QAPP Manual Section 2.6.2 – Worksheet #12)

Field QC samples will be collected to assist in evaluating whether the results reported from the field effort meet the precision, accuracy, and representativeness requirements for this project. Presented in the following tables are details about the frequency at which each QC sample will be collected, what constitutes acceptable field QC results, and what aspect of data quality is indicated by the outcome of each QC sample.

Measurement Performance Criteria Table – Field QC Samples

Matrix: Groundwater
Analytical Group: PPL VOCs (including MTBE and total xylenes) and 1,2-Dibromoethane (EDB)
Analytical Method/SOP Reference: SW846 5030/8260B / GCAL SOP GCMSV-003 and SW846 8011 / GCAL SOP GC-034

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria
Field Duplicates	PPL VOCs and EDB	One field duplicate per 10 samples	Precision	PPL VOCs - RPD <20% EDB - RPD <30%
Equipment/Rinsate Blanks	PPL VOCs and EDB	One equipment per 10% samples collected	Bias/Contamination	No target analytes greater than or equal to the ½ LOQ
Trip Blanks	PPL VOCs and EDB	One per sampling cooler with VOCs and/or EDB	Bias/Contamination	No target analytes greater than or equal to the ½ LOQ
Cooler Temperature Indicator	PPL VOCs and EDB	One per cooler	Accuracy/ Representativeness	Samples should be received at the laboratory at 0°C - 6°C.

Matrix: Groundwater / Soil
Analytical Group: PAHs and TRPH
Analytical Method/SOP Reference: SW846 8270D low-level / GCAL SOP GCMSSV-004; Florida Petroleum Residual Organic (FL-PRO) / GCAL SOP GC-031

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria
Field Duplicates	PAHs and TRPH	One field duplicate per 10 samples	Precision	RPD <20% for water; RPD <30% for soils (PAHs); RPD <25% for soils (TRPH)
Equipment/Rinsate Blanks	PAHs and TRPH	One equipment per 10% samples collected	Bias/Contamination	No target analytes greater than or equal to the ½ LOQ
Cooler Temperature Indicator	PAHs and TRPH	One per cooler	Accuracy/ Representativeness	Samples should be received at the lab at 0°C -6°C.

Matrix: Soil
Analytical Group: TPH Speciation
Analytical Method/SOP Reference: MADEP-VPH/ extractable petroleum hydrocarbon (EPH) / GCAL SOP GC-032/GC-025

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria
Field Duplicates	TPH Speciation	One field duplicate per 10 samples	Precision	RPD <30% for VPH; RPD <40% for EPH
Equipment/Rinsate Blanks	TPH Speciation	One equipment per 10% samples collected	Bias/Contamination	No target analytes greater than or equal to the ½ LOQ
Cooler Temperature Indicator	TPH Speciation	One per cooler	Accuracy/ Representativeness	Samples should be received at the lab at 0°C -6°C.

Matrix: Groundwater / Soil
Analytical Group: Select Metals (total lead; total arsenic for soils)
Analytical Method/SOP Reference:, SW846 6010C / GCAL SOP MET-010

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria
Field Duplicates	Select metals*	One field duplicate per 10 samples	Precision	RPD <20% for water and soil
Equipment/Rinsate Blanks	Select metals*	One equipment per 10% samples collected	Bias/Contamination	No target analytes greater than or equal to the ½ LOQ
Cooler Temperature Indicator	Select metals*	One per cooler	Accuracy/ Representativeness	Samples should be received at the laboratory at 0°C - 6°C.

*Waters: total lead; Soils: total arsenic.

8 Sampling Design and Rationale

(UFP-QAPP Manual Section 3.1.1 - Worksheet #17)

8.1 General Approach

The primary objective of the petroleum monitoring and assessment project at TPTF is to obtain data for development of an effective approach for MNA of the subsurface contamination that is in the form of LNAPL and dissolved phase plumes at TPTF-Navy (North) and TPTF-Navy (South). This will be accomplished with the installation of up to two additional monitoring wells (if needed), and soil and groundwater sampling to assess contamination and evaluate the effectiveness of natural attenuation.

- Obtain data for development of an effective approach for MNA of the subsurface contamination that is in the form of LNAPL and dissolved phase plumes at TPTF-Navy (North) and TPTF-Navy (South)
- Provide a current snapshot of the horizontal and vertical extent of the groundwater plume(s)
- Provide a current assessment of conditions for natural attenuation
- Provide background concentrations for arsenic and BEQs in surface soil
- Assess the fractionation of TRPH in surface soil
- Assess the nature and extent of TRPH, arsenic, and BEQ exceedances, as necessary

To achieve these objectives, the following field activities will be conducted:

- Site preparation, including vegetation clearance, and utility location
- Collection of groundwater samples from 17 existing monitoring wells
- Collection of surface soil samples for background data collection and TPH speciation, and delineation as necessary
- Installation and sampling of up to two additional groundwater monitoring wells, if needed
- Site restoration and investigation-derived waste management

8.2 Sample Matrices

Sample matrices are limited to samples of groundwater from the target monitoring wells and surface soil.

8.3 Analytical Groups

Groundwater analytical groups consist of fuel components in accordance with Chapter 62-780 FAC (Tables B and C) including BTEX and PPL VOCs including MTBE and total xylenes; 18 PAHs from Table B including 1- and 2-methylnaphthalenes; EDB, TRPH, and lead. MNA indicator parameters including select metals (total/dissolved iron and manganese), nitrate, chloride, sulfate, sulfide, TIC, TDS, and methane will also be analyzed. Results will be used to evaluate the current status of groundwater contamination at Trumbo Point.

Reference Areas, Sample Numbers, and Locations

Groundwater samples will be collected from a minimum of 17 wells located at the TPTF-Navy. The number of wells sampled for each parameter is listed below as well as in the table at the Samples to be Collected Table at the end of this worksheet. Additional locations may be selected based on the analytical results if data gaps are identified.

Two background soil samples for arsenic in surface soil will supplement the existing background dataset. Fourteen new background samples will be collected from seven locations two depths each for PAHs. TPH speciation will

also be collected from four former TRPH exceedances. If these TPH speciation results exceed the Residential, Industrial, and/or Leachability SCTLs, then additional samples will be collected for TRPH delineation in four cardinal directions 10 feet away from any exceedance. Samples may also be collected from 2 to 4 feet bls for vertical delineation.

To summarize the sampling activities:

- 17 total wells to be sampled and analyzed for BTEX and PPL VOCs including MTBE and total xylenes; 18 PAHs from Table B including 1- and 2-methylnaphthalenes; EDB, TRPH, and lead during the first semiannual groundwater sampling event. Up to 19 wells will be sampled during the second semiannual groundwater sampling event.
- 13 of the 17 samples will also be analyzed for total / dissolved iron and manganese, anions (nitrate, chloride, and sulfate), sulfide, methane, TDS, and TIC.
- 14 background soil samples (7 borings at two depths each) to be sampled and analyzed for PAHs.
- 4 soil locations (4 borings from 0.5 to 2 feet bls) to be sampled and analyzed for TPH speciation from sample locations previously exceeding TRPH SCTLs.
- If needed, soil samples will be collected for TRPH delineation in 4 cardinal directions 10 feet away from any TPH speciation exceedance.
- 2 soil background locations to be sampled and analyzed for arsenic; these will be combined with existing 5 samples to develop a site specific background concentration.

Proposed groundwater sample locations are shown in **Figure 7**. **Figure 8** shows the November 2011 LNAPL plumes and the proposed wells to be used for water level and LNAPL gauging. Proposed sol sample locations are shown in **Figures 9, 10, and 11**. The final locations of the monitoring wells may be altered based on the field conditions. Additional locations may be selected based on the analytical results.

The sampling rationale for the soil and groundwater locations is discussed below.

Groundwater Sampling Rationale

In the 2011 Supplemental Site Assessment Report of Findings and Natural Attenuation Monitoring Plan, Trumbo Point Tank Farm (AGVIQ-CH2M HILL, 2011), a groundwater sampling plan was presented. The wells presented in this UFP-SAP include those wells and one deep well (MW-1D). These wells were chosen based on the spacial representation of the plume, as well as to capture the horizontal and vertical delineation. The wells represent adequate delineation of the horizontal and vertical extent of the groundwater plume(s) for site-specific COCs and to update the assessment of conditions for natural attenuation. All of these samples will be analyzed for the following:

- PPL VOCs (including MTBE and total xylenes)
- EDB
- PAHs
- TRPH
- Metals-Lead only
- pH (via field test)
- ORP (via field test)
- DO (via field test)
- Specific conductance (via field test)
- Turbidity (via field test)

A subset of these wells will also be analyzed for the select suite of MNA parameters listed below. The wells in this subset were chosen to assess the conditions for natural attenuation across the site.

- Methane
- Sulfide
- TIC
- TDS
- Nitrate
- Chloride
- Sulfate
- Total/dissolved iron and manganese

Soil Sampling Rationale

Soil samples for arsenic and PAH background analysis will be collected near the former tank farm but in areas not impacted by former activities at the TPTF (**Figures 9 and 11**).

Soil samples for TPH speciation will be collected at four locations where TRPH exceedances were previously detected (**Figures 6 and 10**). If there are any exceedances then additional step-out samples will be collected for TRPH analysis.

The following table indicates the total number of samples to be collected for each analyte. Complete sample details and which locations will be collected for each analyte is included in **Worksheet #9**.

Sampling Frequency

Groundwater samples will be collected semiannually for one year. Background soil sampling and TPH speciation will be collected one time, during the first semiannual event. Delineation samples, if needed, will be collected during the second semiannual sampling event.

Samples to be Collected

Matrix	Depth of Samples	Analysis	Method	Preliminary Number of Samples	Rationale	Sampling Strategy
Groundwater	Middle of well screen	PPL VOCs (including MTBE and total xylenes), EDB, PAHs, TRPH, lead-only (total),	8260B, 8011, 8270SIM, FL-PRO, and 6010C	17 samples X 2 events = 34 samples	Assess current site-wide conditions and complete COC delineation in the vicinity of Trumbo Point	See **Figure 7** for sampling locations.
		Iron & manganese only (total & dissolved), and MNA parameters anions (nitrate, chloride, sulfate), sulfide, TIC, TDS, and methane	6010C, 300.0 (nitrate, chloride, sulfate), SM 4500 S2-F, SM5310B, SM 25410C, and RSK-175	13 samples X 2 events = 26 samples	Evaluate the effectiveness of the selected remedies on reducing groundwater COCs	
Soil	0.5-2 feet	TPH Speciation	MADEP VPH/EPH	4	Assess the TPH fraction of the TRPH exceedances	See **Figure 10** for sampling locations.
Soil	0.5-2 feet	TRPH (if needed)	FL-PRO	TBD	Collect additional step-out samples if the TPH fraction exceeds PAL	Step out in 10 ft increments from original sample exceedances, as needed
Soil - Background	0-2 feet	Arsenic only (total),	6010C	2	Evaluate the current site background conditions	See **Figure 9** for sampling locations.

Samples to be Collected

Matrix	Depth of Samples	Analysis	Method	Preliminary Number of Samples	Rationale	Sampling Strategy
Soil - Background	0-0.5 feet, 0.5-2 feet	PAHs	8270SIM	14	Evaluate the current site background conditions	See **Figure 11** for sampling locations.

9 Field Project Implementation

9.1 Field Project Tasks

(UFP-QAPP Manual Section 2.8.1 – Worksheet #14)

9.1.1 Vegetation Clearance

Vegetation clearing will be conducted as needed in the TPTF-Navy (South) in order to access the wells and piezometers within the temporary fencing area. Based on reconnaissance conducted in October 2013, the area is significantly overgrown since it was last accessed in 2011.

9.1.2 Well Gauging

LNAPL presence and thickness (if present) will be established to confirm the extent and distribution of LNAPL at TPTF, and to demonstrate that LNAPL is limited to the areas of the former and existing ASTs and is not migrating from the former source area. A total of 31 wells (18 wells at TPTF-Navy [North] and 13 wells at TPTF-Navy [South]) will be gauged. Well gauging will be performed using an electronic oil/water interface probe marked in increments of 0.01 foot to test for the presence of product in the TPTF-Navy (North and South) area. Existing well and piezometer locations, including the 31 wells to be gauged for the presence of LNAPL, are shown on **Figure 8** and the subset of wells that are proposed for monitoring are listed below. All measurements will be collected within a 24-hour period and recorded in the field logbook.

Well Gauging and Sampling Program

Monitoring Well ID	Gauging (Water Level and LNAPL)	Chemical of Concern Sampling	MNA Sampling
TPTF-Navy (North)			
TPTF-N-MW-01	X	X	X
TPTF-N-MW-02	X		
TPTF-N-MW-03	X		
TPTF-N-MW-04	X		
MW-63	X	X	
MW-64	X	X	
MW-65	X	X	
MW-1D	X	X	
FP-05-06	X		
MW-04	X	X	X
KWM-22	X	X	X
FP-05-01-WP-03R	X		
FP-05-02-WP-21R	X	X	X
FP-05-02-WP-14R	X		
FP-16-01	X	X	X
JP-02	X	X	X
JP-03	X	X	X
MW-09-12	X		
TPTF-Navy (South)			
FP-16-02-WP-51R	X		
FP-16-02-WP-71R	X		
FP-16-02-WP-41R	X		
KWM-23	X	X	X
TPTF-S-MW-04	X	X	X
TPTF-S-MW-09	X	X	X
TPTF-S-MW-10	X		
TPTF-S-MW-11	X	X	X
TPTF-S-MW-12	X	X	X

Monitoring Well ID	Gauging (Water Level and LNAPL)	Chemical of Concern Sampling	MNA Sampling
TPTF-S-MW-13	X		
TPTF-S-MW-14	X		
TPTF-S-MW-15	X		
TPTF-S-MW-16	X	X	X

9.1.3 Utility Clearance

Before drilling activities begin for monitoring well installation and soil sampling, all buried utilities in the vicinity of the new wells/borings will be identified by a subcontracted utility locator for avoidance during drilling.

9.1.4 Monitoring Well Installation

If it is determined that additional wells are needed, monitoring wells will be installed in accordance with State of Florida South Water Management District requirements and comply with FDEP SOP PCS-006 (FDEP, 2005c) and Chapter 62-528 FAC, EPA Field Branches Quality and Technical Procedures (EPA, 2009), and American Society for Testing and Materials (ASTM) Standard ASTM D5092-04e1: Standard Practice for Design and Installation of Ground Water Monitoring Wells (ASTM, 2010).

If needed, up to two 2-inch diameter wells will be installed using a drill rig that is equipped with a 4.25-inch inner diameter hollow stem auger. All wells will be drilled to approximately 13 feet bls. The location of the wells will be based on the results of the first semiannual sampling event. The well construction details are listed below.

Well Construction Details

Aquifer Zone	Total Well Depth (feet bls)	Screen Length (feet)	Screen Interval (feet bls)
Upper Surficial	13	10	3 – 13
Upper Surficial	13	10	3 – 13

A post-hole digger or hand auger will be used to advance the first 4 to 5 feet of each soil boring. If no obstacles are encountered, the soil boring will be advanced by drilling to the required total bore depth (13 feet bls). If a soil boring must be abandoned as a result of encountering utilities, the material removed by the post-hole digger or hand auger will be returned to the borehole.

9.1.5 Installation Procedures

Monitoring Well Construction Procedures

Upon completion of the borehole to the desired depth, approximately 1 foot of sand filter pack will be placed on the bottom of the borehole by the tremie method. Monitoring wells will be constructed using 10 feet of 2-inch inner diameter Schedule 40, polyvinyl chloride (PVC), 0.020-inch, continuous slot well screen threaded to approximately 3 feet of 2-inch inner diameter Schedule 40, PVC well casing. The well end cap will be 2-inch diameter, Schedule 40 PVC, and will be flush-joint threaded to the well casing. All wells will be screened from 3 feet to 13 feet bls, or straddling the water table so that LNAPL, if present, will enter the well. No glues or solvents will be used to construct the well.

A filter pack consisting of 10/20 sieve sand will be placed within the annular space between the borehole and the screen and will be brought to a height of 1 foot above the top of the screen. A 1-foot, fine sand filter pack seal will be placed above the sand pack, followed by grout to ground surface. Each well will be finished with a flush completion set in a 2-foot-square concrete pad, and the well identification will be affixed to the completed well (e.g., using a steel tag or etched into the concrete).

Well Development

Development pumping and surging will not start until the last pumped grout in the well has had at least 24 hours to cure. Each well will be developed by using a surge block and over-pumping. Well development will be considered complete when visible sediment is removed or 1 hour of active development has been completed, whichever is sooner. Field parameters (specific conductance, temperature, pH, DO, ORP, and turbidity) will be measured during development.

9.1.6 Sampling Tasks

- Groundwater Level Measurements:
  - Before purging, the depth to groundwater will be measured in each site monitoring well to be sampled except for wells that contain LNAPL. Groundwater depths will be measured with a water level indicator to the nearest 0.01 foot, as specified in SOP-008. The downhole instruments will be decontaminated after use in each well, in accordance with SOP-013 (**Appendix A**).
- Collection of groundwater samples:
  - Groundwater samples will be collected in accordance with EPA Region 4 Field Branches Quality System and Technical Procedures (EPA, 2009) and FDEP-SOP-001/01 FS 2200 (FDEP, 2008).
  - Refer to SOPs 004 (Low Flow Purging/ Sampling techniques), 009 (Blank Prep), 010 (Chain of Custody), and 011 (Shipping Samples), DEP-SOP-001/01 FQ 1000 (Field Quality Control Requirements) for specific implementation guidelines and details.
  - Groundwater samples will be collected from monitoring wells using a submersible or peristaltic pump. Monitoring wells will be purged in accordance with SOP-004 (**Appendix A**) low-flow sampling protocol. A list of all parameters to be analyzed is included in the Groundwater Sample Details Table in **Worksheet #9.**
  - All groundwater samples will be collected from monitoring wells by placing the pump intake at the middle of the well screen interval. Water quality parameters (specific conductance, pH, turbidity, temperature, DO, and ORP) will be measured and recorded (approximately every 5 minutes) before sampling using a multi-parameter water quality meter (such as Horiba U-22), calibrated at a minimum on a daily basis and as subsequently warranted. Sampling will begin when water quality parameters have stabilized for three consecutive readings and a minimum of one well volume has been purged. Depth to water, water quality parameters, and total well depth measurements will be recorded on groundwater sampling data sheets.
- Decontamination
  - Refer to SOPs 013 and 014 (Decontamination Procedures) and FDEP-SOP-001/01 FC 1000 (Cleaning/Decontamination Procedures) for specific implementation guidelines and details.
  - All non-disposable sampling equipment will be decontaminated before use and immediately after each use in accordance with applicable SOPs referenced in **Table 9-3.** The water level indicator will be cleaned with deionized water between each measurement.
- Analyses and Testing Tasks
  - The analytical laboratory will process and prepare samples for analyses and will analyze all samples for various groups of parameters in accordance with the Groundwater Sample Details Table in **Worksheet #9**.
- Surveying
  - All newly installed monitoring wells will be surveyed by a Florida-licensed surveyor to determine location and elevation data for newly installed monitoring wells. Coordinates for all survey work will be in North American Datum 1983 (northings and eastings). Locations will be reported to the nearest 0.1 foot.

Ground elevations will be reported to the nearest 0.1 foot relative to mean sea level; elevations of wellhead top of casing will be reported to the nearest 0.01 foot. Elevations for all survey work will be in North American Vertical Datum of 1988.

9.1.7 Quality Control Tasks

- Implement SOPs for field and laboratory activities. QC samples are described in the Sample Details Table.

9.2 Field SOPs Reference Table

(UFP-QAPP Manual Section 3.1.2 – Worksheet #21)

Applicable SOPs for project tasks are listed below and the SOPs are included as **Appendix A**.

Field SOPs Reference Table

Reference Number	Title, Revision Date, and/or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
SOP-001 DEP-SOP-001/01 FA 1000	Regulatory Scope and Administrative Procedures for use of FDEP SOPs, March 2008	FDEP	Logbook	N	
SOP-002 DEP-SOP-001/01 FC 1000	Cleaning/Decontamination Procedures, March 2008	FDEP	Portable steam cleaner, potable water, distilled water, liquinox, buckets, 55-gallon drums or decontamination pad, gloves	N	
SOP-003 DEP-SOP-001/01 FD 1000	Documentation Procedures, March 2008	FDEP	NA	N	
SOP-004 DEP-SOP-001/01 FM 1000	Field Planning and Mobilization, March 2008	FDEP	NA	N	
SOP-005 DEP-SOP-001/01 FQ 1000	Field Quality Control Requirements, March 2008	FDEP	NA	N	
SOP-006 DEP-SOP-001/01 FS 1000	General Sample Procedures, March 2008	FDEP	Nitrile gloves, field logbook, COC, calibration log, sample bottles and equipment	N	
SOP-007 DEP-SOP-001/01 FS 2000	General Aqueous Sampling, March 2008	FDEP	Laboratory supplied containers	N	
SOP-008 DEP-SOP-001/01 FS2200	Groundwater Sampling, March 2008	FDEP	Peristaltic/submersible pump	N	
SOP-009 DEP-SOP-001/01 FS 3000	Soil Sampling, March 2008	FDEP	Stainless steel (ss) spoon or trowel, DPT, and laboratory containers	N	

Reference Number	Title, Revision Date, and/or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
SOP-010 DEP-SOP-001/01 FS 5000	Waste Sampling, March 2008	FDEP	Department of Transportation (DOT) approved 55-gallon drums, Baker Tanks, or roll off box, drum thief or pump, stainless steel trowel, and laboratory containers	N	
SOP-011 DEP-SOP-001/01 FT 1000	General Field Testing and Measurement, March 2008	FDEP	Calibration and verification logs	N	
SOP-012 DEP-PCS-006	Design Installation and Placement of Monitoring Wells, May 2005	FDEP	Drill rig, polyvinyl chloride (PVC) well screen and riser, filter pack and seal material, surface completion material	N	
SOP-013 SESDGUID-101-R0	Design and Installation of Monitoring Wells, February 2008	EPA	Drill Rig, PVC well screen and riser, filter pack and seal material, surface completion material	N	
SOP-014 DEP-SOP-001/01 FT1200	Field Measurement of Specific Conductance (Conductivity), March 2008	FDEP	Water quality meter	N	
SOP-015 DEP-SOP-001/01 FT1300	Field Measurement of Salinity , March 2008	FDEP	Water quality meter	N	
SOP-016 DEP-SOP-001/01 FT1600	Field Measurement of Turbidity, March 2008	FDEP	Turbidimeter	N	
SOP-017	Organic Vapor Analyzer (OVA)	CH2M HILL	Flame ionization detector (FID)	N	
SOP-018	Locating and Clearing Underground Utilities, January 2008	CH2M HILL	Magnetic field methods, optical methods, ground penetrating radar, electromagnetic induction	N	
SOP-019	Preparing Field Log Books, January 2008	CH2M HILL	Field logbook	N	
SOP-020	Chain-of-Custody (COC)	CH2M HILL	COC	N	

9.3 Field Project Implementation (Field Project Instructions)

UFP-QAPP Manual Sections 3.1.1 and 3.5.2.3 – Worksheets #18, 19, 20 and 30)

Groundwater samples will be collected and analyzed as outlined below.

Groundwater Sample Details Table

(TO JM14 / Trumbo Point Tank Farm) (March and September 2014 for Groundwater Sampling)						**Analysis Group**	PPL VOCs (including MTBE and total xylenes)	1,2-Dibromo-ethane (EDB)	PAHs (including 1- and 2-methyl-naphthalene)	TRPH	Metals – Lead only	Metals – iron and manganese (total and dissolved [field filtered])	Sulfide	Methane	Nitrate, Chloride, Sulfate	TIC	TDS
						Preparation and Analytical Method	SW846 8260B	SW846 8011	SW846 8270SIM	FL-PRO	SW846 6010C	SW846 6010C	SM4500-S2-F	RSK-175	SW846 300.0	SM 5310B	SM 2540C
						Analytical Laboratory/ Analytical SOP Reference[3]	GCAL / SOP GCMSV-003	GCAL / SOP GC-034	GCAL / SOP GCMSSV-004	GCAL / SOP GC-031	GCAL / SOP MET-010	GCAL / SOP MET-010	GCAL / SOP WL-051	GCAL / SOP GC-024	GCAL / SOP WL-042	GCAL / SOP WL-043	GCAL / SOP WL-076
						Data Package Turnaround Time	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT
Gulf Coast Analytical Laboratories 7979 GSRI Rd. Baton Rouge, LA 70820 PM: Brenda Martinez (225) 769-4900						**Container Type/ Volume required (if different than container volume)**	(3) 40-mL, glass / 5 mL	(2) 40-mL, glass / 40 mL	(2)-1 Liter glass / 1000 mL	(2)-1 Liter glass / 1000 mL	(1) 250-mL plastic / 50 mL	(1) 250-mL plastic / 50 mL	(1) 500-mL plastic / 200 mL	(3) 40-mL, glass / 40 mL	1 – 250ml plastic / 10 mL	(2) 40-mL, glass / 40 mL	(1) 500-mL plastic / 200 mL
						Preservative	Cool to 0 -6°C	Cool to 0 -6°C	Cool to 0 -6°C	Cool to 0 - 6°C; HCl or H2SO4 to pH<2	Cool to 0 - 6°C; pH <2 with HNO_3	Cool to 0 - 6°C; pH <2 with HNO_3	Cool to 0 - 6°C; pH greater than 9 with sodium hydroxide (NaOH) and Zinc Acetate	Cool to 0 - 6°C; pH less than 2 with HCl	Cool to 0 -6°C	Cool to 0 - 6°C; pH less than 2 with HCl	Cool to 0 -6°C
						Holding Time (Preparation/ Analysis)[3]	14 days	14 days	7 days extract/ 40 days analysis	7 days extract/ 40 days analysis	180 days	180 days	7 days	14 days	Nitrate: 48 hours Sulfate / Chloride: 28 days	28 days	7 days
Site	**Matrix**	**Station ID**	**Sample ID**	**Coordinates (optional)**		**Depth/ Sampling Interval (ft bls)**											
				X	**Y**												
TPTF	Ground-water	TPTF-N-MW-01, MW-04, KWM-22, FP-05-02-WP-21R, FP-16-01, KWM-23, MW-63, MW-64, MW-65, MW-1D, JP-02, JP-03, TPTF-S-MW-04, TPTF-S-MW-09, TPTF-S-MW-11, TPTF-S-MW-12, TPTF-S-MW-16	<JM14> - <TPTF>- <Station ID> - <Date>	NA	NA	Mid-point of saturated screen interval	1 x 2 events	1 x 2 events	1 x 2 events	1 x 2 events	1 x 2 events						

(TO JM14/Trumbo Point Tank Farm) (March and September 2014 for Groundwater Sampling) Gulf Coast Analytical Laboratories 7979 GSRI Rd. Baton Rouge, LA 70820 PM: Brenda Martinez (225) 769-4900						**Analysis Group**	PPL VOCs (including MTBE and total xylenes)	1,2-Dibromo-ethane (EDB)	PAHs (including 1- and 2-methyl-naphthalene)	TRPH	Metals – Lead only	Metals – iron and manganese (total and dissolved [field filtered])	Sulfide	Methane	Nitrate, Chloride, Sulfate	TIC	TDS
						Preparation and Analytical Method	SW846 8260B	SW846 8011	SW846 8270SIM	FL-PRO	SW846 6010C	SW846 6010C	SM4500-S2-F	RSK-175	SW846 300.0	SM 5310B	SM 2540C
						Analytical Laboratory/ Analytical SOP Reference[3]	GCAL / SOP GCMSV-003	GCAL / SOP GC-034	GCAL / SOP GCMSSV-004	GCAL / SOP GC-031	GCAL / SOP MET-010	GCAL / SOP MET-010	GCAL / SOP WL-051	GCAL / SOP GC-024	GCAL / SOP WL-042	GCAL / SOP WL-043	GCAL / SOP WL-076
						Data Package Turnaround Time	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT
						Container Type/ Volume required (if different than container volume)	(3) 40-mL, glass / 5 mL	(2) 40-mL, glass / 40 mL	(2)-1 Liter glass / 1000 mL	(2)-1 Liter glass/ 1000 mL	(1) 250-mL plastic/ 50 mL	(1) 250-mL plastic / 50 mL	(1) 500-mL plastic / 200 mL	(3) 40-mL, glass / 40 mL	1 – 250ml plastic / 10 mL	(2) 40-mL, glass / 40 mL	(1) 500-mL plastic / 200 mL
						Preservative	Cool to 0 -6°C	Cool to 0 -6°C	Cool to 0 -6°C	Cool to 0 - 6°C; HCl or H2SO4 to pH<2	Cool to 0 - 6°C; pH <2 with HNO_3	Cool to 0 - 6°C; pH <2 with HNO_3	Cool to 0 - 6°C; pH greater than 9 with sodium hydroxide (NaOH) and Zinc Acetate	Cool to 0 - 6°C; pH less than 2 with HCl	Cool to 0 -6°C	Cool to 0 - 6°C; pH less than 2 with HCl	Cool to 0 -6°C
						Holding Time (Preparation/ Analysis)[3]	14 days	14 days	7 days extract/ 40 days analysis	7 days extract/ 40 days analysis	180 days	180 days	7 days	14 days	Nitrate: 48 hours Sulfate / Chloride: 28 days	28 days	7 days
Site	**Matrix**	**Station ID**	**Sample ID**	**Coordinates (optional)** X	Y	**Depth/ Sampling Interval (ft bls)**											
TPTF	Ground-water	TPTF-N-MW-01, MW-04, KWM-22, FP-05-02-WP-21R, FP-16-01, KWM-23, JP-02, JP-03, TPTF-S-MW-04, TPTF-S-MW-09, TPTF-S-MW-11, TPTF-S-MW-12, TPTF-S-MW-16	<JM14> - <TPTF>- <Station ID> - <Date>	NA	NA	Mid-point of saturated screen interval						1 x 2 events	1 x 2 events	1 x 2 events	1 x 2 events	1 x 2 events	1 x 2 events
Field QC Samples[1]																	
TPTF	Field Duplicate	TBD	<JM14> - <TPTF>- <FD> - <Date>			Mid-point of saturated screen interval	2 x 2 events	2 x 2 events	2 x 2 events	2 x 2 events	2 x 2 events		NA	NA	NA	NA	NA
TPTF	Matrix Spike	TBD	<JM14> - <TPTF>- <Station ID> - <Date> - <MS>			Mid-point of saturated screen interval	1 x 2 events	1 x 2 events	1 x 2 events	1 x 2 events	1 x 2 events		NA	NA	NA	NA	NA
TPTF	Matrix Spike Duplicate	TBD	<JM14> - <TPTF>- <Station			Mid-point of saturated screen interval	1 x 2 events	1 x 2 events	1 x 2 events	1 x 2 events	1 x 2 events		NA	NA	NA	NA	NA

(TO JM14/Trumbo Point Tank Farm)
(March and September 2014 for Groundwater Sampling)

Gulf Coast Analytical Laboratories
7979 GSRI Rd.
Baton Rouge, LA 70820
PM: Brenda Martinez
(225) 769-4900

Site	Matrix	Station ID	Sample ID	Coordinates (optional) X	Coordinates (optional) Y	Depth/ Sampling Interval (ft bls)	Analysis Group	PPL VOCs (including MTBE and total xylenes)	1,2-Dibromo-ethane (EDB)	PAHs (including 1- and 2-methyl-naphthalene)	TRPH	Metals – Lead only	Metals – iron and manganese (total and dissolved [field filtered])	Sulfide	Methane	Nitrate, Chloride, Sulfate	TIC	TDS
							Preparation and Analytical Method	SW846 8260B	SW846 8011	SW846 8270SIM	FL-PRO	SW846 6010C	SW846 6010C	SM4500-S2-F	RSK-175	SW846 300.0	SM 5310B	SM 2540C
							Analytical Laboratory/ Analytical SOP Reference[3]	GCAL / SOP GCMSV-003	GCAL / SOP GC-034	GCAL / SOP GCMSSV-004	GCAL / SOP GC-031	GCAL / SOP MET-010	GCAL / SOP MET-010	GCAL / SOP WL-051	GCAL / SOP GC-024	GCAL / SOP WL-042	GCAL / SOP WL-043	GCAL / SOP WL-076
							Data Package Turnaround Time	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT
							Container Type/ Volume required (if different than container volume)	(3) 40-mL, glass / 5 mL	(2) 40-mL, glass / 40 mL	(2)-1 Liter glass / 1000 mL	(2)-1 Liter glass/ 1000 mL	(1) 250-mL plastic/ 50 mL	(1) 250-mL plastic / 50 mL	(1) 500-mL plastic / 200 mL	(3) 40-mL, glass / 40 mL	1 – 250ml plastic / 10 mL	(2) 40-mL, glass / 40 mL	(1) 500-mL plastic / 200 mL
							Preservative	Cool to 0 -6°C	Cool to 0 -6°C	Cool to 0 -6°C	Cool to 0 - 6°C; HCl or H2SO4 to pH<2	Cool to 0 - 6°C; pH <2 with HNO_3	Cool to 0 - 6°C; pH <2 with HNO_3	Cool to 0 - 6°C; pH greater than 9 with sodium hydroxide (NaOH) and Zinc Acetate	Cool to 0 - 6°C; pH less than 2 with HCl	Cool to 0 -6°C	Cool to 0 - 6°C; pH less than 2 with HCl	Cool to 0 -6°C
							Holding Time (Preparation/ Analysis)[3]	14 days	14 days	7 days extract/ 40 days analysis	7 days extract/ 40 days analysis	180 days	180 days	7 days	14 days	Nitrate: 48 hours Sulfate / Chloride: 28 days	28 days	7 days
			ID> - <Date> - <MSD>															
TPTF	Equip-ment Blank	EQB	<JM14> - <TPTF>- <EB> - <Date>			NA		2 x 2 events	2 x 2 events	2 x 2 events	2 x 2 events	2 x 2 events		NA	NA	NA	NA	NA
TPTF	Trip Blank	TB	<JM14> - <TPTF>- <TB> - <Date>			NA		2 x 2 events	2 x 2 events	NA	NA	NA	NA	NA	NA	NA	NA	NA
						Total Number of Samples to the Laboratory		42	42	40	40	40	26	26	26	26	26	26

[1] Include field QC samples, excluding MNA parameters, (per site and media) including field duplicates, matrix spike/matrix spike duplicates (MS/MSDs), trip blanks, equipment blanks, and field blanks.

[3] Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared/extracted.

Frequency of QA/QC sample collection: Trip Blank- One per cooler to the laboratory containing volatiles

Field Duplicate / Equipment Blank- One per 10 field samples

MS/MSD- One pair per 20 field samples (including field QC samples)

Soil samples will be collected and analyzed as outlined below.

Soil Sample Details Table

(TO JM14 - Trumbo Point Tank Farm) Gulf Coast Analytical Laboratories 7979 GSRI Rd. Baton Rouge, LA 70820 PM: Brenda Martinez (225) 769-4900						**Analysis Group**	PAHs (background)	Metals – Arsenic only (background)	TPH Speciation		TRPH
						Preparation and Analytical Method	SW846 8270SIM	SW846 6010C	MADEP-VPH	MADEP-EPH	FL-PRO
						Analytical Laboratory/ Analytical SOP Reference[3]	GCAL / SOP GCMSSV-004	GCAL / SOP MET-010	GCAL / SOP GC-032	GCAL / SOP GC-025	GCAL / SOP GC-031
						Data Package Turnaround Time	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT
						Container Type/ Volume required (if different than container volume)	(1) 4-oz jar / 30 g	(1) 4-oz jar / 1.25 g	(1) 40mL VOA vial / 5.0 g	(1) 4-oz jar / 10 g	(1) 4-oz jar / 10 g
						Preservative	Cool to 0 -6°C	Cool to 0 -6°C	Cool to 0°C-6°C, methanol; Lab to freeze <-7°C within 48 hours of receipt / 28 days to analyze	Cool to 0 -6°C	Cool to 0 -6°C
						Holding Time (Preparation/ Analysis)[3]	14 days extract/ 40 days analysis	180 days	Cool to 0-6°C; Methanol	14 days extract/ 40 days analysis	14 days extract/ 40 days analysis
Site	**Matrix**	**Station ID**	**Sample ID**	**Coordinates (optional)**		**Depth/ Sampling Interval (ft bls)**					
				X	**Y**						
TPTF	Soil	BG01 - BG07	<JM14> - <Station ID> - <Interval Depth> - <Date>	NA	NA	0 to 0.5 ft bls 0.5 to 2 ft bls	14				

Soil Sample Details Table

(TO JM14 - Trumbo Point Tank Farm) Gulf Coast Analytical Laboratories 7979 GSRI Rd. Baton Rouge, LA 70820 PM: Brenda Martinez (225) 769-4900						**Analysis Group**	PAHs (background)	Metals – Arsenic only (background)	TPH Speciation		TRPH
						Preparation and Analytical Method	SW846 8270SIM	SW846 6010C	MADEP-VPH	MADEP-EPH	FL-PRO
						Analytical Laboratory/ Analytical SOP Reference[3]	GCAL / SOP GCMSSV-004	GCAL / SOP MET-010	GCAL / SOP GC-032	GCAL / SOP GC-025	GCAL / SOP GC-031
						Data Package Turnaround Time	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT
						Container Type/ Volume required (if different than container volume)	(1) 4-oz jar / 30 g	(1) 4-oz jar / 1.25 g	(1) 40mL VOA vial / 5.0 g	(1) 4-oz jar / 10 g	(1) 4-oz jar / 10 g
						Preservative	Cool to 0 -6°C	Cool to 0 -6°C	Cool to 0°C-6°C, methanol; Lab to freeze <-7°C within 48 hours of receipt / 28 days to analyze	Cool to 0 -6°C	Cool to 0 -6°C
						Holding Time (Preparation/ Analysis)[3]	14 days extract/ 40 days analysis	180 days	Cool to 0-6°C; Methanol	14 days extract/ 40 days analysis	14 days extract/ 40 days analysis
Site	**Matrix**	**Station ID**	**Sample ID**	**Coordinates (optional)**		**Depth/ Sampling Interval (ft bls)**					
				X	**Y**						
TPTF	Soil	BG01 - BG02	<JM14> - <Station ID> - <Interval Depth> - <Date>	NA	NA	0 to 2 ft bls		2			
TPTF	Soil	SS-03, SS-07, SS-08 and SS-10	<JM14> - <Station ID> - <Interval Depth> -	NA	NA	0.5 to 2 ft bls			4	4	TBD

Soil Sample Details Table

(TO JM14 - Trumbo Point Tank Farm) Gulf Coast Analytical Laboratories 7979 GSRI Rd. Baton Rouge, LA 70820 PM: Brenda Martinez (225) 769-4900						**Analysis Group**	PAHs (background)	Metals – Arsenic only (background)	TPH Speciation		TRPH
						Preparation and Analytical Method	SW846 8270SIM	SW846 6010C	MADEP-VPH	MADEP-EPH	FL-PRO
						Analytical Laboratory/ Analytical SOP Reference[3]	GCAL / SOP GCMSSV-004	GCAL / SOP MET-010	GCAL / SOP GC-032	GCAL / SOP GC-025	GCAL / SOP GC-031
						Data Package Turnaround Time	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT
						Container Type/ Volume required (if different than container volume)	(1) 4-oz jar / 30 g	(1) 4-oz jar / 1.25 g	(1) 40mL VOA vial / 5.0 g	(1) 4-oz jar / 10 g	(1) 4-oz jar / 10 g
						Preservative	Cool to 0 -6°C	Cool to 0 -6°C	Cool to 0°C-6°C, methanol; Lab to freeze <-7°C within 48 hours of receipt / 28 days to analyze	Cool to 0 -6°C	Cool to 0 -6°C
						Holding Time (Preparation/ Analysis)[3]	14 days extract/ 40 days analysis	180 days	Cool to 0-6°C; Methanol	14 days extract/ 40 days analysis	14 days extract/ 40 days analysis
Site	**Matrix**	**Station ID**	**Sample ID**	**Coordinates (optional)**		**Depth/ Sampling Interval (ft bls)**					
				X	**Y**						
			<Date>								
Field QC Samples[1]											
TPTF	Field Duplicate	TBD	<JM14> - <TPTF>- <FD> - <Date>			Varies	2	1	1	1	TBD
TPTF	Matrix Spike	TBD	<JM14> - <TPTF>- <Station ID> - <Date> - <MS>			Varies	1	1	1	1	TBD
TPTF	Matrix Spike	TBD	<JM14> - <TPTF>-			Varies	1	1	1	1	TBD

Soil Sample Details Table

(TO JM14 - Trumbo Point Tank Farm) Gulf Coast Analytical Laboratories 7979 GSRI Rd. Baton Rouge, LA 70820 PM: Brenda Martinez (225) 769-4900						**Analysis Group**	PAHs (background)	Metals – Arsenic only (background)	TPH Speciation		TRPH
						Preparation and Analytical Method	SW846 8270SIM	SW846 6010C	MADEP-VPH	MADEP-EPH	FL-PRO
						Analytical Laboratory/ Analytical SOP Reference[3]	GCAL / SOP GCMSSV-004	GCAL / SOP MET-010	GCAL / SOP GC-032	GCAL / SOP GC-025	GCAL / SOP GC-031
						Data Package Turnaround Time	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT
						Container Type/ Volume required (if different than container volume)	(1) 4-oz jar / 30 g	(1) 4-oz jar / 1.25 g	(1) 40mL VOA vial / 5.0 g	(1) 4-oz jar / 10 g	(1) 4-oz jar / 10 g
						Preservative	Cool to 0 -6°C	Cool to 0 -6°C	Cool to 0°C-6°C, methanol; Lab to freeze <-7°C within 48 hours of receipt / 28 days to analyze	Cool to 0 -6°C	Cool to 0 -6°C
						Holding Time (Preparation/ Analysis)[3]	14 days extract/ 40 days analysis	180 days	Cool to 0-6°C; Methanol	14 days extract/ 40 days analysis	14 days extract/ 40 days analysis
Site	**Matrix**	**Station ID**	**Sample ID**	**Coordinates (optional)**		**Depth/ Sampling Interval (ft bls)**					
				X	**Y**						
	Duplicate		<Station ID> - <Date> - <MSD>								
TPTF	Equip-ment Blank	EQB	<JM14> - <TPTF>- <EB> - <Date>			NA	2	1	1	1	TBD
TPTF	Trip Blank	TB	<JM14> - <TPTF>- <TB> - <Date>			NA	NA	NA	1	NA	TBD
						Total Number of Samples to the Laboratory	26	9	9	8	TBD

Soil Sample Details Table

(TO JM14 - Trumbo Point Tank Farm)						Analysis Group	PAHs (background)	Metals – Arsenic only (background)	TPH Speciation		TRPH
						Preparation and Analytical Method	SW846 8270SIM	SW846 6010C	MADEP-VPH	MADEP-EPH	FL-PRO
						Analytical Laboratory/ Analytical SOP Reference[3]	GCAL / SOP GCMSSV-004	GCAL / SOP MET-010	GCAL / SOP GC-032	GCAL / SOP GC-025	GCAL / SOP GC-031
						Data Package Turnaround Time	14 day TAT	14 day TAT	14 day TAT	14 day TAT	14 day TAT
						Container Type/ Volume required (if different than container volume)	(1) 4-oz jar / 30 g	(1) 4-oz jar / 1.25 g	(1) 40mL VOA vial / 5.0 g	(1) 4-oz jar / 10 g	(1) 4-oz jar / 10 g
Gulf Coast Analytical Laboratories 7979 GSRI Rd. Baton Rouge, LA 70820 PM: Brenda Martinez (225) 769-4900						Preservative	Cool to 0 -6°C	Cool to 0 -6°C	Cool to 0°C-6°C, methanol; Lab to freeze <-7°C within 48 hours of receipt / 28 days to analyze	Cool to 0 -6°C	Cool to 0 -6°C
						Holding Time (Preparation/ Analysis)[3]	14 days extract/ 40 days analysis	180 days	Cool to 0-6°C; Methanol	14 days extract/ 40 days analysis	14 days extract/ 40 days analysis
Site	**Matrix**	**Station ID**	**Sample ID**	**Coordinates (optional)**		**Depth/ Sampling Interval (ft bls)**					
				X	**Y**						

[1] Include field QC samples (per site and media) including field duplicates, matrix spike/matrix spike duplicates (MS/MSDs), trip blanks, equipment blanks, and field blanks.

[3] Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared/extracted.

Frequency of QA/QC sample collection: Trip Blank- One per cooler to the laboratory containing volatiles

Field Duplicate / Equipment Blank- One per 10 field samples

MS/MSD- One pair per 20 field samples (including field QC samples)

10 Reference Limits and Evaluation Tables

(UFP-QAPP Manual Section 2.8.1 – Worksheet # 15)

Samples will be collected and analyzed for the analytical groups and methods detailed in the Sample Details Table in **Worksheet #9**. The PALs and laboratory reporting limits for each analyte from these samples are provided in Reference Limits and Evaluation Tables.

Matrix: Groundwater
Analytical Group: PPL VOCs (including MTBE and total xylenes) by Method 8260B

Analyte	CAS No.	PAL (µg/L)[1]	Project QL Goal (µg/L)[2]	Laboratory Specific Limits			LCS, MS/MSD %R and RPD Limits		
				LOQs (µg/L)	LODs (µg/L)	DLs (µg/L)	LCL (%)	UCL (%)	RPD (%)
Acrolein	107-02-8	3.5	1.75	25	5	0.7840	30	160	30
Benzene	71-43-2	1	0.5	1	0.2	0.111	80	120	30
Bromodichloromethane	75-27-4	0.6	0.3	1	0.2	0.083	75	120	30
Bromoform	75-25-2	4.4	2.2	1	0.5	0.215	70	130	30
Bromomethane	74-83-9	9.8	4.9	1	0.5	0.427	30	145	30
Carbon tetrachloride	56-23-5	3	1.5	1	0.5	0.248	65	140	30
Chlorobenzene	108-90-7	17*	8.5	1	0.2	0.083	80	120	30
Chloroethane	75-00-3	12	6	1	0.5	0.235	60	135	30
Chloroform	67-66-3	70	35	1	0.2	0.155	65	135	30

[1]FDEP Chapter 62-777 FAC, Table 1 – GCTLs, groundwater and marine surface water criteria. PALs noted with an asterisk are marine surface water criteria.
[2] PQL Goals were determined on a case by case basis and in most cases are at least two times less than the PAL. If no PALs are available, the PQL Goal is equivalent to the laboratory's LOD.

Matrix: Groundwater
Analytical Group: PPL VOCs (including MTBE and total xylenes) by Method 8260B

Analyte	CAS No.	PAL (µg/L)[1]	Project QL Goal (µg/L)[2]	Laboratory Specific Limits			LCS, MS/MSD %R and RPD Limits		
				LOQs (µg/L)	LODs (µg/L)	DLs (µg/L)	LCL (%)	UCL (%)	RPD (%)
Chloromethane	74-87-3	2.7	1.35	1	0.2	0.144	40	125	30
Dibromochloromethane	124-48-1	0.4	0.2	1	0.2	0.054	60	135	30
1,2-Dichlorobenzene	95-50-1	99*	49.5	1	0.2	0.135	70	120	30
1,3-Dichlorobenzene	541-73-1	85*	42.5	1	0.2	0.138	75	125	30
1,4-Dichlorobenzene	106-46-7	3*	1.5	1	0.2	0.083	75	125	30
1,2-Dichloroethane	107-06-2	3	1.5	1	0.2	0.116	70	130	30
1,1-Dichloroethane	75-34-3	70	35	1	0.2	0.171	70	135	30
1,1-Dichloroethene	75-35-4	3.2*	1.6	1	0.5	0.2	70	130	30

[1]FDEP Chapter 62-777 FAC, Table 1 – GCTLs, groundwater and marine surface water criteria. PALs noted with an asterisk are marine surface water criteria.
[2] PQL Goals were determined on a case by case basis and in most cases are at least two times less than the PAL. If no PALs are available, the PQL Goal is equivalent to the laboratory's LOD.

Matrix: Groundwater
Analytical Group: PPL VOCs (including MTBE and total xylenes) by Method 8260B

Analyte	CAS No.	PAL (µg/L)[1]	Project QL Goal (µg/L)[2]	Laboratory Specific Limits			LCS, MS/MSD %R and RPD Limits		
				LOQs (µg/L)	LODs (µg/L)	DLs (µg/L)	LCL (%)	UCL (%)	RPD (%)
Trans-1,2-Dichloroethene	156-60-5	100	50	1	0.2	0.077	60	140	30
1,2-Dichloropropane	78-87-5	5	2.5	1	0.2	0.15	75	125	30
1,2-dichloropropene	563-54-2	NA	NA						
Ethylbenzene	100-41-4	30	15	1	0.2	0.109	75	125	30
Methylene chloride	75-09-2	5	2.5	5	0.5	0.149	55	140	30

[1]FDEP Chapter 62-777 FAC, Table 1 – GCTLs, groundwater and marine surface water criteria.
[2] PQL Goals were determined on a case by case basis and in most cases are at least two times less than the PAL. If no PALs are available, the PQL Goal is equivalent to the laboratory's LOD.

Matrix: Groundwater
Analytical Group: PPL VOCs (including MTBE and total xylenes) by Method 8260B

Analyte	CAS No.	PAL (µg/L)[1]	Project QL Goal (µg/L)[2]	Laboratory Specific Limits			LCS, MS/MSD %R and RPD Limits		
				LOQs (µg/L)	LODs (µg/L)	DLs (µg/L)	LCL (%)	UCL (%)	RPD (%)
1,1,2,2-Tetrachloroethane	79-34-5	0.2	0.1	1	0.2	0.109	65	130	30
Tetrachloroethene	127-18-4	3	1.5	1	0.5	0.193	45	150	30
Toluene	108-88-3	40	20	1	0.2	0.122	75	120	30
1,1,2-Trichloroethane	79-00-5	5	2.5	1	0.2	0.159	75	125	30
1,1,1-Trichloroethane	71-55-6	200	100	1	0.2	0.123	65	130	30
Trichloroethene	79-01-6	3	1.5	1	0.2	0.161	70	125	30
Vinyl chloride	75-01-4	1	0.5	1	0.2	0.127	50	145	30
Xylenes (total)	1330-20-7	20	10	3	0.6	0.178	75	130	30
Methyl-tert-butyl ether	1634-04-4	20	10	1	0.2	0.078	65	125	30

[1]FDEP Chapter 62-777 FAC, Table 1 – GCTLs, groundwater and marine surface water criteria. PALs noted with an asterisk are marine surface water criteria.
[2] PQL Goals were determined on a case by case basis and in most cases are at least two times less than the PAL. If no PALs are available, the PQL Goal is equivalent to the laboratory's LOD.

Matrix: Groundwater
Analytical Group: EDB by Method 8011

Analyte	CAS No.	PAL (µg/L)[1]	Project QL Goal (µg/L)[2]	Laboratory Specific Limits			LCS, MS/MSD %R and RPD Limits		
				LOQs (µg/L)	LODs (µg/L)	DLs (µg/L)	LCL (%)	UCL (%)	RPD (%)
1,2-Dibromoethane	106-93-4	0.02	0.01	0.01	0.01	0.0039	55	141	30

[1]FDEP Chapter 62-777 FAC, Table 1 – GCTLs, groundwater and marine surface water criteria.
[2] PQL Goals were determined on a case by case basis and in most cases are at least two times less than the PAL. If no PALs are available, the PQL Goal is equivalent to the laboratory's LOD.

Matrix: Groundwater
Analytical Group: PAHs (including 1- and 2-methylnaphthalene) by Method 8270SIM

Analyte	CAS No.	PAL (µg/L)[1]	Project QL Goal (µg/L)[2]	Laboratory Specific Limits			LCS, MS/MSD %R and RPD Limits		
				LOQs (µg/L)	LODs (µg/L)	DLs (µg/L)	LCL (%)	UCL (%)	RPD (%)
Acenaphthene	83-32-9	3*	1.5	0.1	0.05	0.0082	30	120	30
Acenaphthylene	208-96-8	210	105	0.1	0.05	0.0253	30	130	30
Anthracene	120-12-7	0.3*	0.15	0.1	0.05	0.041	50	120	30
Benzo(a)anthracene	56-55-3	0.05	0.025	0.1	0.05	0.019	44	123	30
Benzo(a)pyrene	50-32-8	0.2	0.1	0.1	0.05	0.0114	42	128	30
Benzo(b)fluoranthene	205-99-2	0.05	0.025	0.1	0.05	0.0087	43	129	30
Benzo(k)fluoranthene	207-08-9	0.5	0.25	0.1	0.05	0.0166	49	120	30
Benzo(g,h,i)perylene	191-24-2	210	105	0.1	0.05	0.011	46	126	30
Chrysene	218-01-9	4.8	2.4	0.1	0.05	0.0176	47	120	30
Dibenzo(a,h)anthracene	53-70-3	0.005	0.0025	0.1	0.05	0.016	36	131	30
Fluoranthene	206-44-0	0.3*	0.15	0.1	0.05	0.012	37	129	30
Fluorene	86-73-7	30*	15	0.1	0.05	0.0397	30	125	30
Indeno(1,2,3-cd)pyrene	193-39-5	0.05	0.025	0.1	0.05	0.0052	35	138	30
1-Methylnaphthalene	90-12-0	28	14	0.1	0.05	0.0312	40	140	30
2-Methylnaphthalene	91-57-6	28	14	0.1	0.05	0.0296	30	120	30
Naphthalene	91-20-3	14	7	0.1	0.05	0.0097	30	120	30
Phenanthrene	85-01-8	210	105	0.1	0.05	0.0072	43	120	30
Pyrene	129-00-0	0.3*	0.15	0.1	0.05	0.0148	47	120	30

[1]FDEP Chapter 62-777 FAC, Table 1 – GCTLs, groundwater and marine surface water criteria. PALs noted with an asterisk are marine surface water criteria.
[2] PQL Goals were determined on a case by case basis and in most cases are at least two times less than the PAL. If no PALs are available, the PQL Goal is equivalent to the laboratory's LOD.

Matrix: Groundwater
Analytical Group: TRPH by FL-PRO

Analyte	CAS No.	PAL (µg/L)[1]	Project QL Goal (µg/L)[2]	Laboratory Specific Limits			LCS, MS/MSD %R and RPD Limits		
				LOQs (µg/L)	LODs (µg/L)	DLs (µg/L)	LCL (%)	UCL (%)	RPD (%)
TRPH	NA	5000	2500	100	100	76.1	55	118	20

[1]FDEP Chapter 62-777 FAC, Table 1 – GCTLs, groundwater and marine surface water criteria.
[2] PQL Goals were determined on a case by case basis and in most cases are at least two times less than the PAL. If no PALs are available, the PQL Goal is equivalent to the laboratory's LOD.

Matrix: Groundwater
Analytical Group: Metals by 6010C

Analyte	CAS No.	PAL (µg/L)[1]	Project QL Goal (µg/L)[2]	Laboratory Specific Limits			LCS, MS/MSD %R and RPD Limits		
				LOQs (µg/L)	LODs (µg/L)	DLs (µg/L)	LCL (%)	UCL (%)	RPD (%)
Lead	7439-92-1	8.5*	4.25	1.0	0.5	0.25	80	120	20

[1]FDEP Chapter 62-777 FAC, Table 1 – GCTLs, groundwater and marine surface water criteria. PALs noted with an asterisk are marine surface water criteria.
[2] PQL Goals were determined on a case by case basis and in most cases are at least two times less than the PAL. If no PALs are available, the PQL Goal is equivalent to the laboratory's LOD.

Matrix: Soil
Analytical Group: PAHs by Method 8270SIM

Analyte	CAS No.	PAL (mg/kg)[1]	Project QL Goal (mg/kg)[2]	Laboratory Specific Limits			LCS, MS/MSD %R and RPD Limits		
				LOQs (mg/kg)	LODs (mg/kg)	DLs (mg/kg)	LCL (%)	UCL (%)	RPD (%)
Acenaphthene	83-32-9	2.1	1.05	0.0033	0.00167	0.00109	40	140	30
Acenaphthylene	208-96-8	27	13.5	0.0033	0.00167	0.00131	40	140	30
Anthracene	120-12-7	2500	1250	0.0033	0.00167	0.000269	40	140	30
Benzo(a)anthracene	56-55-3	#	#	0.0033	0.00167	0.00154	40	140	30
Benzo(a)pyrene	50-32-8	0.1*	0.05	0.0033	0.00167	0.00031	40	140	30
Benzo(b)fluoranthene	205-99-2	#	#	0.0033	0.00167	0.000988	40	140	30
Benzo(k)fluoranthene	207-08-9	#	#	0.0033	0.00167	0.000388	40	140	30
Benzo(g,h,i)perylene	191-24-2	2500*	1250	0.0033	0.00167	0.000595	40	140	30
Chrysene	218-01-9	#	#	0.0033	0.00167	0.00111	40	140	30
Dibenzo(a,h)anthracene	53-70-3	#	#	0.0033	0.00167	0.00099	40	140	30
Fluoranthene	206-44-0	1200	600	0.0033	0.00167	0.000366	40	140	30
Fluorene	86-73-7	160	80	0.0033	0.00167	0.000408	40	140	30
Indeno(1,2,3-cd)pyrene	193-39-5	#	#	0.0033	0.00167	0.000421	40	140	30
1-Methylnaphthalene	90-12-0	3.1	1.55	0.0033	0.00167	0.000811	40	140	30
2-Methylnaphthalene	91-57-6	8.5	4.25	0.0033	0.00167	0.000698	40	140	30
Naphthalene	91-20-3	1.2	0.6	0.0033	0.00167	0.000372	40	140	30
Phenanthrene	85-01-8	250	125	0.0033	0.00167	0.000474	40	140	30
Pyrene	129-00-0	880	440	0.0033	0.00167	0.000552	40	140	30

[1]FDEP Chapter 62-777 FAC, Table 2 – SCTLs, direct exposure, Residential and Industrial criteria or Leachability based on Groundwater Criteria.
[2] PQL Goals were determined on a case by case basis and in most cases are at least two times less than the PAL. If no PALs are available, the PQL Goal is equivalent to the laboratory's LOD.
*SCTL-Residential criteria
Site concentrations for carcinogenic polycyclic aromatic hydrocarbons must be converted to benzo(a)pyrene equivalents before comparison with the appropriate direct exposure SCTL for benzo(a)pyrene using the approach described in the February 2005 'Final Technical Report: Development of Cleanup Target Levels (CTLs) for Chapter 62-777, FAC.

Matrix: Soil

Analytical Group: TRPH by FLPRO; TPH Speciation by Method MADEP-VPH / EPH

Analyte	CAS No.	PAL (mg/kg)	Project QL Goal (mg/kg)	Laboratory Specific Limits			LCS, MS/MSD %R and RPD Limits		
				LOQs (mg/kg)	LODs (mg/kg)	DLs (mg/kg)	LCL (%)	UCL (%)	RPD (%)
Petroleum Hydrocarbons (C8-C40) – If needed	NA	340	170	10	10	9.52	63	153	25
C5-C8 Aliphatics	NA	960	480	1.5	0.75	0.239	70	130	30
C9-C12 Aliphatics	NA	1700	850	1.0	0.5	0.227	70	130	30
C9-C10 Aromatics	NA	380	190	0.5	0.25	0.158	70	130	30
C9-C18 Aliphatics	NA	2900	1450	20	3	2.435	40	140	40
C19-C36 Aliphatics	NA	42,000	21,000	20	3	1.361	40	140	40
C11-C22 Aromatics	NA	1000	500	20	5	2.949	40	140	40

Matrix: Soil

Analytical Group: TAL Metals by Method 6010C

Analyte	CAS No.	PAL (mg/kg)[1]	Project QL Goal (mg/kg)[2]	Laboratory Specific Limits			LCS, MS/MSD %R and RPD Limits		
				LOQs (mg/kg)	LODs (mg/kg)	DLs (mg/kg)	LCL (%)	UCL (%)	RPD (%)
Arsenic (by method 6010C)	7439-92-1	2.1*	1.05	0.8	0.4	0.2	80	120	20

[1]FDEP Chapter 62-777 FAC, Table 2 – SCTLs, direct exposure, Residential criteria or Leachability based on Groundwater Criteria.

[2] PQL Goals were determined on a case by case basis and in most cases are at least two times less than the PAL. If no PALs are available, the PQL Goal is equivalent to the laboratory's LOD.

*SCTL-Residential criteria

11 Analytical SOP References Table

(UFP-QAPP Manual Section 3.2.1 – Worksheet #23)

Information contained in the laboratory SOPs will be used for the handling and analysis of the samples; the SOPs are listed below.

Analytical SOP References Table

Lab SOP Number	Title, Revision Date, and Number	Date Last Reviewed (or revised)	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM	Modified for Project Work? (Y/N)
EXT-001	SOP for BNA Solids, Revision 19, 4/11/13	4/11/13	Definitive	Solid, semivolatile organic compound (SVOCs)	NA	N	N
EXT-003	SOP for BNA by Separatory Funnel, Revision 23, 4/1/13	4/1/13	Definitive	Water, PAHs	NA	N	N
GC-024	SOP for the Analysis of Dissolved Gases by RSK-175, 4/10/13, Revision 8	4/10/13	Definitive	Water, Dissolved Gases	Agilent GC/FID	N	N
GC-025	SOP for the Preparation and Analysis of EPH, Revision 9, 12/17/13	12/17/13	Definitive	Solid and Water /EPH	GC/FID Agilent 6890N	N	N
GC-031	SOP for the Preparation and Analysis of TRPH by FL-PRO, Revision 9, 07/15/13	7/15/13	Definitive	Water and Solid /TRPH	GC/FID Agilent 6890N	N	N
GC-032	SOP for the Analysis of VPH, Revision 4, 12/10/13	12/10/13	Definitive	Solid and Water /VPH	GC/FID Agilent 6890N	N	N
GC-034	SOP for EDB and dibromochloropropane (DBCP) by Micro-extraction and GC/ECD, 7/25/13, Revision 9	7/25/13	Definitive	Water/EDB	Agilent GC/ECD	N	N
GCMSV-003	SOP for the Analysis of Volatile Samples by 8260B, 10/3/13, Revision 24	10/3/13	Definitive	Water, VOC	Agilent GC/MS	N	N
GCMSSV-004	SOP for the Analysis of Method 8270C, Revision 8, 1/25/13	1/25/13	Definitive	Solid, SVOCs	Agilent GC/MS	N	N
MET-004	SOP for 3050B Metals Digestion, 10/8/13, Revision 16	10/8/13	Definitive	Solids, Metals	NA	N	N
MET-005	SOP for 3010A Metals Digestion, 10/8/13, Revision 16	10/8/13	Definitive	Waters	NA	N	N

Analytical SOP References Table

Lab SOP Number	Title, Revision Date, and Number	Date Last Reviewed (or revised)	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM	Modified for Project Work? (Y/N)
MET-010	SOP for the Analysis of Samples by ICP, 12/17/13, Revision 20	12/17/13	Definitive	Metals digestates	Perkin Elmer 5300DV	N	N
WL-042	SOP for the Analysis of Anions by IC, 8/6/13, Revision 17	8/6/13	Definitive	Water, Anions	Dionex IC	N	N
WL-043	SOP for the Analysis of TOC, 12/12/13, Revision 12	12/12/13	Definitive	Water, TIC	Shimadzu TOC Analyzer	N	N
WL-051	SOP for Sulfide, 1/31/14, Revision 9		Definitive	Aqueous	NA	N	N
WL-076	SOP for Solids, Revision 1, 6/25/13	6/25/13	Definitive	Water	Mettler Toledo Analytical Balance	N	N
GEN-009	Waste Collection, Storage, and Disposal, 12/6/13 Revision 9	12/6/13	NA	LOGIN	NA	N	N
SAD-001	Sample Receiving and LIMS Log-in, 8/23/13 Revision 19	8/23/13	NA	LOGIN	NA	N	N

Note:
DoD Environmental Laboratory Accreditation Program (ELAP) certification is required for this work. A copy of the current DoD ELAP letter is included in **Appendix B**.

12 Laboratory QC Samples Table

(UFP-QAPP Manual Section 3.4 – Worksheet #28)

Laboratories analyzing samples in support of this work will perform laboratory QC samples at the frequency required by the DoD QSM 4.2. Details regarding each laboratory QC sample are provided in the following tables.

Laboratory QC Samples Table

Matrix: Groundwater

Analytical Group: PPL VOCs (including MTBE and total xylenes)

Analytical Method/SOP Reference: SW846 5030 / 8260B / GCAL SOP GCMSV-003

QC Sample	Frequency & Number	Method / SOP Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per batch; maximum of 20 samples	No analytes detected > ½ LOQ. For common laboratory contaminants, no analytes detected > LOQ.	Correct problem; reanalyze any sample associated with a blank that fails criteria, except when the sample analysis resulted in a non-detect.	Analyst, Supervisor, QA Manager	Bias Contamination	Same as Method QC Acceptance Limits.
Surrogates	In all field samples, calibrations and QC standards	**Surrogate** / **Water**: 1,2-Dichloroethane-d4 70-120; 4-Bromofluorobenzene 75-120; Dibromofluoromethane 85-115; Toluene-d8 85-120	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when appropriate.	Analyst, Supervisor, QA Manager	Accuracy Bias	Same as Method QC Acceptance Limits.
LCS	One per batch; maximum of 20 samples	QC acceptance criteria specified in Worksheet #10	Reanalyze and/or reprep all associated samples unless recoveries are high with no detection of analytes.	Analyst, Supervisor, QA Manager	Accuracy Bias	Same as Method QC Acceptance Limits.
Internal Standards (IS)	In all field samples, calibrations and QC standards	Retention time ± 30 seconds from retention time of the midpoint standard in the initial calibration (ICAL); Extracted Ion Current Profile (EICP) area within -50% to +100% of ICAL midpoint standard	Inspect Mass spectrometer or GC for malfunctions. Reanalyze all samples with IS failures. If reanalysis confirms matrix interference, report sample and narrate.	Analyst, Supervisor, QA Manager	Accuracy Bias	Same as Method QC Acceptance Limits.
MS/MSD	One pair per batch or as specified by client request	For matrix evaluation, use LCS recovery and RPD acceptance criteria specified in Worksheet #10; RPD ≤ 30%.	Reanalyze if sufficient sample is available unless recoveries are high with no detection of analytes. If reprep and reanalysis confirms low recoveries, report and narrate.	Analyst, Supervisor, QA Manager	Accuracy Bias Precision	Same as Method QC Acceptance Limits.
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method QC Acceptance Limits.

Note: Specifications on this table are as per DoD QSM v. 4.2.

Matrix: Groundwater

Analytical Group: EDB

Analytical Method/SOP Reference: SW846 8011 / GCAL SOP GC-034

QC Sample	Frequency & Number	Method / SOP Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per preparatory batch, maximum of 20 samples	No analytes detected > ½ LOQ.	No analytes detected > ½ RL. For common laboratory contaminants, no analytes detected > RL.	Analyst, Supervisor, QA Manager	Bias/ Contamination	Same as Method QC Acceptance Limits.
LCS	One per preparatory batch, maximum of 20 samples	Water 55%-141%	Correct problem; reanalyze all samples in the associated prep batch for failed analytes.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
MS/MSD	One pair per batch or as specified by client request	Same criteria as LCS, RPD $\leq$30%;	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when appropriate.	Analyst, Supervisor, QA Manager	Accuracy/Bias/Precision	Same as Method QC Acceptance Limits.
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method QC Acceptance Limits.

Matrix: Soil / Groundwater

Analytical Group: PAHs **(including 1- and 2-methylnaphthalene)**

Analytical Method/SOP Reference: SW846 8270SIM / GCAL SOP GCMSSV-004

QC Sample	Frequency & Number	Method / SOP Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per preparatory batch, maximum of 20 samples	No analytes detected > ½ LOQ. For common laboratory contaminants, no analytes detected > LOQ.	Correct problem; reanalyze any sample associated with a blank that fails criteria, except when the sample analysis resulted in a non-detect.	Analyst, Supervisor, QA Manager	Bias/ Contamination	Same as Method QC Acceptance Limits.
Surrogates	In all field samples, calibrations and QC standards	**Analyte** / **Soil** / **Water** 2,4,6-Tribromophenol: NA / NA 2-Fluorobiphenyl: 47 – 127 / 50-110 2-Fluorophenol: NA / NA Nitrobenzene-D5: 46 - 123 / 40-110 Phenol-D6: NA / NA Terphenyl-D14: 38 – 167 / 50-135	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when appropriate.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
LCS	One per preparatory batch, maximum of 20 samples	QC acceptance criteria specified in Worksheet #10	Reanalyze and/or reprep all associated samples unless recoveries are high with no detection of analytes.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
Internal Standards (IS)	In all field samples, calibrations and QC standards	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL; Extracted Ion Current Profile (EICP) area within -50% to +100% of ICAL midpoint standard	Inspect Mass spectrometer or GC for malfunctions. Reanalyze all samples with IS failures. If reanalysis confirms matrix interference, report sample and narrate.	Analyst, Supervisor, QA Manager	Accuracy	Same as Method QC Acceptance Limits.
MS/MSD	One pair per batch or as specified by client request	For matrix evaluation, use LCS recovery and RPD acceptance criteria specified in Worksheet #10; RPD ≤ 30%.	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when appropriate.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method QC Acceptance Limits.

Note:

Specifications on this table are as per DoD QSM v. 4.2.

Matrix: Groundwater/Soil

Analytical Group: TRPH

Analytical Method/SOP Reference: FL-PRO / GCAL SOP GC-031

<table>
<tr><th>QC Sample</th><th>Frequency & Number</th><th>Method / SOP Acceptance Limits</th><th>Corrective Action</th><th>Person(s) Responsible for Corrective Action</th><th>DQI</th><th>Measurement Performance Criteria</th></tr>
<tr><td>Method Blank</td><td>One per prep batch of 20 or fewer samples of similar matrix</td><td>No analytes detected > 1/2LOQ or >1/10 sample concentration or >1/10 regulatory limit. For common laboratory contaminants, no analytes detected >LOQ.</td><td>Correct problem; reanalyze any sample associated with a blank that fails criteria, except when the sample analysis resulted in a non-detect.</td><td>Analyst/Supervisor</td><td>Bias/ Contamination</td><td>Same as Method QC Acceptance Limits.</td></tr>
<tr><td>Surrogates</td><td>All field and QC samples</td><td><table><tr><th>Surrogate</th><th>Water</th><th>Soil</th></tr><tr><td>o-Terphenyl</td><td>60-107</td><td>51-133</td></tr><tr><td>Nonatriacontane</td><td>37-87</td><td>38-114</td></tr></table></td><td>Reanalyze and/or reprep if sufficient sample is available unless recoveries are high with no detection of analytes. If reprep and reanalysis confirms low recoveries, report and narrate.</td><td>Analyst/Supervisor</td><td>Accuracy/Bias</td><td>Same as Method QC Acceptance Limits.</td></tr>
<tr><td>LCS</td><td>One per prep batch of 20 or fewer samples of similar matrix</td><td>Water 55%-118%
Soil 63%-153%

If LCSD performed - The RPD between LCS and LCSD must be ≤ 20% for water, ≤ 25% for soil</td><td>Reanalyze and/or reprep all associated samples unless recoveries are high with no detection of analytes.</td><td>Analyst/Supervisor</td><td>Accuracy/Bias</td><td>Same as Method QC Acceptance Limits.</td></tr>
<tr><td>MS/MSD</td><td>One per prep batch of 20 or fewer samples of similar matrix</td><td>Water 55%-118%; RPD ≤ 20%
Soil 63%-153%; RPD ≤ 25%</td><td>Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when appropriate.</td><td>Analyst/Supervisor</td><td>Accuracy/Bias</td><td>Same as Method QC Acceptance Limits.</td></tr>
<tr><td>Results between DL and LOQ</td><td>NA</td><td>Apply “J” qualifier to results between DL and LOQ.</td><td>NA</td><td>Analyst/Supervisor</td><td>Accuracy</td><td>Same as Method QC Acceptance Limits.</td></tr>
</table>

Note:

Specifications on this table are as per DoD QSM v. 4.2.

Matrix: Soil

Analytical Group: TPH Speciation

Analytical Method/SOP Reference: TPH Speciation by MADEP-VPH/EPH/GCAL SOP GC-032/GC-025

QC Sample	Frequency & Number	Method / SOP Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per preparatory batch	No analytes detected > LOQ or 1/10 the amount measured in any associated sample	Correct problem; reanalyze any sample associated with a blank that fails criteria, except when the sample analysis resulted in a non-detect.	Analyst, Supervisor, QA Manager	Bias/ Contamination	Same as Method QC Acceptance Limits.
Surrogates	All field and QC samples	70-130% - VPH 40-140% - EPH	Reanalyze and/or reprep if sufficient sample is available unless recoveries are high with no detection of analytes. If reprep and reanalysis confirms low recoveries, report and narrate.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
Laboratory Control Spike (LCS)	One LCS per preparatory batch	70-130% - VPH 40-140% - EPH	Reanalyze and/or reprep all associated samples unless recoveries are high with no detection of analytes.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
MS/MSD	One per preparatory batch per matrix	For matrix evaluation, use LCS recovery and RPD acceptance criteria specified in Worksheet #10; RPD ≤ 30% for VPH and RPD ≤ 40% for EPH	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when appropriate.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
Fractionation Check (MADEP-EPH only)	Once per preparatory batch	Naphthalene in aliphatic fraction must be less than 5% of the concentration in aromatic fraction.	Re-fractionate batch	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
Results between DL and LOQ	NA	Apply “J” qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method QC Acceptance Limits.

Note:

Specifications on this table are as per DoD QSM v. 4.2.

Matrix: Soil/Groundwater

Analytical Group: Metals (arsenic only for soil; lead, iron and manganese only for waters)

Analytical Method/SOP Reference: SW846 6010C/GCAL SOP MET-010

QC Sample	Frequency & Number	Method / SOP Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per preparatory batch	No analytes detected > ½ LOQ. For common laboratory contaminants, no analytes detected > LOQ.	Correct problem; reanalyze any sample associated with a blank that fails criteria, except when the sample analysis resulted in a non-detect.	Analyst, Supervisor, QA Manager	Bias Contamination	Same as Method QC Acceptance Limits.
LCS	One LCS per preparatory batch	80% - 120%	Reanalyze and/or reprep all associated samples unless recoveries are high with no detection of analytes.	Analyst, Supervisor, QA Manager	Accuracy Bias	Same as Method QC Acceptance Limits.
MS/MSD	One per preparatory batch per matrix	Same criteria as LCS, RPD ≤ 20%; see SAP Worksheet #10	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when appropriate.	Analyst, Supervisor, QA Manager	Accuracy Bias	Same as Method QC Acceptance Limits.
ICP Serial Dilution	One per preparatory batch	Five-fold dilution must agree within ± 10% of the original measurement for samples with concentrations > 50 x LOQ	Perform Post Digestion Spike	Analyst, Supervisor, QA Manager	Accuracy Bias	Same as Method QC Acceptance Limits.
ICP Post Digestion Spike	When dilution test fails or analyte concentration in all samples < 50 x LOD	Recovery 75-125%	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when appropriate.	Analyst, Supervisor, QA Manager	Accuracy Bias	Same as Method QC Acceptance Limits.
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method QC Acceptance Limits.

Note:

Specifications on this table are as per DoD QSM v. 4.2.

Matrix: Groundwater

Analytical Group: Anions (nitrate, nitrite, sulfate)

Analytical Method/SOP Reference: EPA 300.0 / GCAL SOP WL-042

QC Sample	Frequency & Number	Method / SOP Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per batch of 20 or fewer samples	No analytes detected > ½ LOQ.	Correct problem; reanalyze any sample associated with a blank that fails criteria, except when the sample analysis resulted in a non-detect.	Analyst, Supervisor, QA Manager	Bias/ Contamination	Same as Method QC Acceptance Limits.
LCS	One per batch of 20 or fewer samples	Recovery of 80-120%	Reanalyze all associated samples unless recoveries are high with no detection of analytes.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
MS/MSD	One per batch of 20 or fewer samples	Same as LCS	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when appropriate.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
Lab duplicate	One per 20 samples, sample dup is not required if MSD is performed	RPD ≤ 20%, applicable when concentration is 5X greater than LOQ	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when appropriate.	Analyst, Supervisor, QA Manager	Precision	Same as Method QC Acceptance Limits.
Results between DL and LOQ	NA	Apply “J” qualifier to results between DL and LOQ.	NA	Analyst, Supervisor, QA Manager	Accuracy	Same as Method QC Acceptance Limits.

Note:

Specifications on this table are as per DoD QSM v. 4.2.

Matrix: Groundwater

Analytical Group: Sulfide

Analytical Method/SOP Reference: SM 4500S2-D / GCAL SOP WL-051

QC Sample	Frequency & Number	Method / SOP Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per batch of 20 or fewer samples	No analytes detected > ½ LOQ.	Correct problem; reanalyze any sample associated with a blank that fails criteria, except when the sample analysis resulted in a non-detect.	Analyst, Supervisor, QA Manager	Bias/ Contamination	Same as Method QC Acceptance Limits.
LCS	One per batch of 20 or fewer samples	LCS recovery 80-120%	Reanalyze and/or reprep all associated samples unless recoveries are high with no detection of analytes.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
MS	One per batch of 20 or fewer samples	MS recovery 80-120%	Evaluate the data to determine if failure is due to sample matrix or laboratory error. Reanalyze if lab error suspected. Reanalyze all associated samples at a dilution if recoveries are less than 30%.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
Sample Duplicate	One per batch of 20 or fewer samples	RPD $\leq$25% for concentrations > 5 times the LOQ.	Evaluate the data to determine if failure is due to lab error or sample.	Analyst, Supervisor, QA Manager	Precision	Same as Method QC Acceptance Limits.
Results between DL and LOQ	NA	Apply “J” qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method QC Acceptance Limits.

Note:

Specifications on this table are as per DoD QSM v. 4.2.

Matrix: Groundwater

Analytical Group: TDS

Analytical Method/SOP Reference: SM 2540C / GCAL SOP WL-076

QC Sample	Frequency & Number	Method / SOP Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per batch of 20 or fewer samples	No analytes detected > LOQ or 1/10 the amount in any sample, whichever is greater.	Correct problem; reanalyze any sample associated with a blank that fails criteria, except when the sample analysis resulted in a non-detect.	Analyst, Supervisor, QA Manager	Bias/ Contamination	Same as Method QC Acceptance Limits.
LCS	One per batch of 20 or fewer samples	Recovery of 80-120%	Reanalyze all associated samples unless recoveries are high with no detection of analytes.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
Sample Duplicate	One per 10 samples	RPD≤5%, applicable when concentration is 10X greater than LOQ	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when appropriate.	Analyst, Supervisor, QA Manager	Precision	Same as Method QC Acceptance Limits.
Results between DL and LOQ	NA	Apply “J” qualifier to results between DL and LOQ.	NA	Analyst, Supervisor, QA Manager	Accuracy	Same as Method QC Acceptance Limits.

Note:

Specifications on this table are as per DoD QSM v. 4.2.

Matrix: Groundwater

Analytical Group: TIC

Analytical Method/SOP Reference: SM 5310B / GCAL SOP WL-043

QC Sample	Frequency & Number	Method / SOP Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per batch of 20 or fewer samples	No analytes detected > ½ LOQ.	Correct problem; reanalyze any sample associated with a blank that fails criteria, except when the sample analysis resulted in a non-detect.	Analyst, Supervisor, QA Manager	Bias/Contamination	Same as Method QC Acceptance Limits.
LCS	One per batch of 20 or fewer samples	Recovery of 80-120%	Reanalyze all associated samples unless recoveries are high with no detection of analytes.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
MS/MSD	One per batch of 20 or fewer samples	Same as LCS	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when appropriate.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
Sample Duplicate	One per 20 samples, sample dup is not required if MSD is performed	RPD ≤ 25%, applicable when concentration is 5X greater than LOQ	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when appropriate.	Analyst, Supervisor, QA Manager	Precision	Same as Method QC Acceptance Limits.
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method QC Acceptance Limits.

Note:

Specifications on this table are as per DoD QSM v. 4.2.

Matrix: Groundwater

Analytical Group: Methane

Analytical Method/SOP Reference: RSK-175 / GCAL SOP GC-024

QC Sample	Frequency & Number	Method / SOP Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per batch of 20 or fewer samples	No analytes detected > ½ LOQ.	Correct problem; reanalyze any sample associated with a blank that fails criteria, except when the sample analysis resulted in a non-detect.	Analyst, Supervisor, QA Manager	Bias/ Contamination	Same as Method QC Acceptance Limits.
LCS	One per batch of 20 or fewer samples	Recovery of 38-147%	Reanalyze all associated samples unless recoveries are high with no detection of analytes.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
MS/MSD	One per batch of 20 or fewer samples	Same as LCS; RPD ≤ 40%	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when appropriate.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
Surrogate	All field and QC samples	Recovery 40-143%	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when appropriate.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Same as Method QC Acceptance Limits.
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Analyst/Supervisor	Accuracy	Same as Method QC Acceptance Limits.

Note:

Specifications on this table are as per DoD QSM v. 4.2.

This page intentionally left blank.

13 Data Verification and Validation (Steps I and IIa/IIb) Process Table

(UFP-QAPP Manual Section 5.2.1, UFP-QAPP Manual Section 5.2.2, Figure 37 UFP-QAPP Manual, Table 9 UFP-QAPP Manual – Worksheets #34, 35, 36)

Data will be collected and reviewed for quality and completeness as detailed below.

Data Verification and Validation (Steps I and IIa/IIb)[1] Process Table

Data Review Input	Description	Responsible for Verification (name, organization)	Internal/ External
Field Notebooks	Field notebooks will be reviewed internally and placed into the project file for archival at project closeout	AGVIQ or CH2M HILL / FTL	Internal
Chain-of-Custody and Shipping Forms	Chain-of-custody forms and shipping documentation will be reviewed internally upon their completion and verified against the packed sample coolers they represent. The shipper's signature on the chain-of-custody will be initialed by the reviewer, a copy of the chain-of-custody retained in the site file, and the original and remaining copies taped inside the cooler for shipment.	AGVIQ or CH2M HILL / FTL	Internal
Sample Condition upon Receipt	Any discrepancies, missing, or broken containers will be communicated to the project chemist in the form of laboratory logins.	Brenda Martinez / GCAL	External
Sample Chronology	Holding times from collection to extraction or analysis and from extraction to analysis will be considered by the data validator during the data validation process.	Camden Robinson / CH2M HILL	Internal
Documentation of Laboratory Method Deviations	Laboratory method deviations will be discussed and approved by the project chemist. Documentation will be incorporated into the case narrative which becomes part of the final hardcopy data package.	Brenda Martinez / GCAL	External
Electronic Data Deliverables	Electronic data deliverables will be compared against hardcopy laboratory results.	Kama White / CH2M HILL	Internal
Case Narrative	Case narratives will be reviewed by the data validator during the data validation process.	Camden Robinson / CH2M HILL	Internal
Laboratory Data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. All received data packages will be verified by the project chemist.	Brenda Martinez / GCAL Camden Robinson / CH2M HILL	Internal and External

Data Verification and Validation Table (Steps I and IIa/IIb) Process Table (continued)

Data Review Input	Description	Responsible for Verification (name, organization)	Internal/ External
Audit Reports	Upon report completion, a copy of all audit reports will be placed in the site file. If corrective actions are required, a copy of the documented corrective action taken will be attached to the appropriate audit report in the QA site file. Periodically, and at the completion of site work, site file audit reports and corrective action forms will be reviewed internally to ensure that all appropriate corrective actions have been taken and that corrective action reports are attached. If corrective actions have not been taken, the site manager will be notified to ensure action is taken.	Project Manager: Amy Twitty / CH2M HILL Program QA/QC Manager: Taylor Sword/AGVIQ	Internal
Corrective Action Reports	Corrective action reports will be reviewed by the project chemist or project manager and placed into the project file for archival at project closeout.	Project Chemist: Camden Robinson / CH2M HILL Project Manager: Amy Twitty / CH2M HILL	Internal
Onsite Screening	Ensure that all field data meet SAP requirements for completeness and accuracy based on the field calibration records.	AGVIQ or CH2M HILL / FTL	Internal
SOPs	Ensure that all sampling and analytical SOPs were followed.	AGVIQ or CH2M HILL / FTL	Internal
Method QC Results	Ensure that all required QC samples were run and met method and/or project required limits.	Camden Robinson / CH2M HILL	Internal
SAP QC Sample Results	Ensure that all required SAP QC samples were run and met required limits.	Camden Robinson / CH2M HILL	Internal
Analyte List	Ensure the laboratory reported all analytes from each analysis group as per Worksheet 10.	Camden Robinson / CH2M HILL	Internal
Field Duplicates	Calculate and compare field duplicate results. If %RPD (as defined in this SAP) exceedances are noted, recommend how the data should be used.	Camden Robinson / CH2M HILL	Internal
QLs	Ensure all sample results met the project quantification limit specified in the SAP.	Camden Robinson / CH2M HILL	Internal
Raw Data	Review all raw data to confirm laboratory calculations.	Camden Robinson / CH2M HILL	Internal

Data Verification and Validation (Steps I and IIa/IIb) Process Table (continued)

Step IIa/IIb	Matrix	Analytical Group	Validation Criteria	Data Validator
IIa	Groundwater	PPL VOCs, EDB, Low Level Polycyclic Aromatic Hydrocarbon (PAH), Total Recoverable Petroleum Hydrocarbon (TRPH) by FL-PRO, Metals-Lead only, Metals-Iron and Manganese (total & dissolved), Nitrate, Chloride, Sulfate, Sulfide, TDS, TIC, and Methane	Analytical methods and laboratory SOPs as presented in this UFP-QAPP will be used to evaluate compliance against QA/QC criteria (see worksheets 10 and 12). Should adherence to QA/QC criteria yield deficiencies, data may be qualified. Guidance and data qualifiers that may be used are those presented in EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (June 2008), and Inorganic Data Review (January 2010), "Data Validation Standard Operating Procedure for Organic Analysis"; EPA Region 4; Rev. 3.1; August, 2008, "Data qualifiers Standard Operating Procedure for Inorganic Analysis; EPA Region 4; Rev. 2.0, September 2, 2011, in addition to DOD QSM - Version 4.2.	Camden Robinson / CH2M HILL
IIa	Groundwater	PPL VOCs, EDB, PAHs, TRPH by FL-PRO, Metals-Lead only, Metals-Iron and Manganese (total & dissolved), Nitrate, Chloride, Sulfate, Sulfide, TDS, TIC, and Methane	Data will be reviewed against the analytical methods for outstanding QA/QC issues and anomalies by the laboratory. Issues will be summarized in the case narrative. CH2M HILL chemist and project manager will review the analytical results and case narrative before the data is loaded to ensure no major problems exist.	Brenda Martinez / GCAL Camden Robinson / CH2M HILL Amy Twitty / CH2M HILL
IIb	Groundwater	PPL VOCs, EDB, PAHs, TRPH by FL-PRO, Metals-Lead only, Metals-Iron and Manganese (total & dissolved), Nitrate, Chloride, Sulfate, Sulfide, TDS, TIC, and Methane	Results will be compared to PALs in Worksheet #10	Camden Robinson / CH2M HILL Amy Twitty / CH2M HILL
IIa	Soil	PAHs, Metals-Arsenic only, TPH Speciation, and TRPH (if needed)	Analytical methods and laboratory SOPs as presented in this UFP-QAPP will be used to evaluate compliance against QA/QC criteria (see worksheets 10 and 12). Should adherence to QA/QC criteria yield deficiencies, data may be qualified. Guidance and data qualifiers that may be used are those presented in EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (June 2008), "Data Validation Standard Operating Procedure for Organic Analysis"; USEPA Region 4; Rev. 3.1; August, 2008, in addition to DOD QSM - Version 4.2.	Camden Robinson / CH2M HILL
IIa	Soil	PAHs, Metals-Arsenic only, TPH Speciation, and TRPH (if needed)	Data will be reviewed against the analytical methods for outstanding QA/QC issues and anomalies by the laboratory. Issues will be summarized in the case narrative. CH2M HILL chemist and project manager will review the analytical results and case narrative before the data is loaded to ensure no major problems exist.	Brenda Martinez / GCAL Camden Robinson / CH2M HILL Amy Twitty / CH2M HILL

Step IIa/IIb	Matrix	Analytical Group	Validation Criteria	Data Validator
IIb	Soil	PAHs, Metals-Arsenic only, TPH Speciation, and TRPH (if needed)	Results will be compared to PALs in Worksheet #10	Camden Robinson / CH2M HILL Amy Twitty / CH2M HILL

Notes:
IIa = compliance with methods, procedures, and contracts
IIb = comparison with measurement performance criteria in the SAP

A Level IV data package is required for this project. One-hundred percent of the data generated will undergo Level IV analytical data validation. For a Level IV data package, chromatograms are included before and after each of the manual integrations. Manual integrations are evaluated based on the following process:

Manual integrations are an integral part of the chromatographic analysis process and will be used only as a CA measure. Examples of instances where manual integration would be warranted include, but are not limited to, co-eluting compounds resulting in poor-peak resolution, a misidentified peak, an incorrect retention time, or a problematic baseline.

When manual integrations are used, the following procedures will be implemented for documenting the event and for consistency in performing the manual integration:

- A laboratory SOP will be followed for manual integrations. This SOP will specify: (1) when automated integrations by the instrument are likely to be unreliable; (2) what constitutes an unacceptable automated integration; (3) how the problems should be resolved by the analyst; and (4) the procedures for the analyst to follow in documenting any required manual integrations.
- Raw data records will include a complete audit trail for those manipulations, including: (1) results of both the automated and manual integrations; (2) notation of the cause and justification for performing the manual integrations; (3) date; and (4) signature or initials of person performing the manual operations.
- All manual integrations must be reviewed and approved by the section supervisor and/or the QA officer.

Usability Assessment

The data usability assessment is an evaluation based on the results of data verification and validation in the context of the overall project decisions or objectives. Both the sampling and analytical activities must be considered, with the ultimate goal of assessing whether the final, qualified results support the decisions to be made with the data.

The following sections summarize the processes to determine whether the collected data are of the right type, quality, and quantity to support the environmental decision-making for the project, and describes how data quality issues will be addressed and how limitations of the use of the data will be handled.

Summary of Usability Assessment Processes

Data gaps may be present if: 1) a sample is not collected; 2) a sample is not analyzed for the requested parameters; or 3) the data are determined to be unusable. The need for further investigation will be determined on a case-by-case basis, depending on whether data can be extrapolated from adjacent sample locations, and whether the data are needed based on the results from adjacent sample locations.

The CH2M HILL project chemist and the laboratory will ensure that the collected data meet the DLs, LODs, LOQ and laboratory QC limits specified in this SAP. During the data validation assessment, non-conformances will be documented, and data will be qualified accordingly. The CH2M HILL project chemist will determine whether the data are usable based on the requirements of this SAP.

All data are usable as qualified by the CH2M HILL project chemist, with the exception of rejected data. Estimated and/or biased results are usable. Potential outliers, if present, can be addressed on a case-by-case basis. Non-detected site contaminants will be evaluated to ensure that project-required QLs in Worksheet #10 were achieved. If project QLs were achieved and the verification and validation steps yielded acceptable data, then the data are considered usable. During verification and validation steps, data may be qualified as estimated with the following qualifiers: J, UJ, B, or JB. These qualifiers represent minor QC deficiencies which will not affect the usability of the data. When major QC deficiencies are encountered, data will be qualified with an R or UR and, in most cases, is not considered usable for project decisions. For statistical comparisons non-detect values will be represented by a concentration equal to one-half the sample reporting limit. For duplicate sample results, the most conservative value will be used for project decisions. Analytical data will be checked to ensure the values

and any qualifiers are appropriately transferred to the electronic database. These checks include comparison of hard copy data and qualifiers to the electronic data deliverable. Once the data have been uploaded into the electronic database, another check will be performed to ensure all results were loaded accurately. Field and laboratory precision will be compared as RPD between the two results. Deviations from the sampling and analysis plan will be reviewed to assess whether CA is warranted and to assess impacts on achievement of PQOs.

Evaluative Procedures to Assess Project-Specific Overall Measurement Error

Overall measurement error is normally associated with both sampling design and quality and quantitative measures performed in both the field and laboratory. In-depth assessment will be performed during the data validation process to assess conformance with the field SOPs, analytical SOPs, and objectives of this SAP. Qualifiers will be used to indicate overall usability of the data.

Personnel Responsible for Performing Usability Assessment

The following personnel are responsible for performing usability assessments:

- Camden Robinson/CH2M HILL
- Amy Twitty/CH2M HILL

Usability Assessment Documentation

All the results will be reported for an overall quality assessment in the QARM. The QARM will identify precision and accuracy exceedances with respect to the laboratory performance for each batch of samples, as well as comparability of field and laboratory duplicates. Discussion will cover precision, accuracy, representativeness, comparability, and completeness. Completeness is defined as the percentage of measurements that are judged to be available compared to the total number of measurements made. Data tables will be produced to reflect detected and non-detected site contaminants and geochemical parameters. Data qualifiers will be reflected in the tables and discussed in the data quality evaluation.

14 References

ABB Environmental Services, Inc. (ABB). 1996. Contamination Assessment Report. Trumbo Point Fuel Farm. Naval Air Station Key West, Trumbo Point Annex, Key West, Florida. October.

AGVIQ-CH2M HILL. 2011. Supplemental Site Assessment Report of Findings and Natural Attenuation Monitoring Plan, Trumbo Point Tank Farm, Naval Air Station Key West, Key West, Florida. December.

American Society for Testing and Materials (ASTM). 2010. Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers (D5092-04e1).

CH2M HILL Constructors, Inc. (CH2M HILL). 2003. Petroleum Free Product Recovery Program Work Plan, Truman Annex Building 102/103 and Trumbo Point Fuel Farm, Naval Air Station Key West, Key West, Florida, Revision 00. Contract N62467-01-D-0331, CTO 0008. July.

CH2M HILL Constructors, Inc. (CH2M HILL). 2005. Annual Status Report – Petroleum Product Recovery Program December 2003 to December 2004, Trumbo Point Fuel Farm and Truman Annex Buildings 102 and 103. May.

CH2M HILL Constructors, Inc. (CH2M HILL). 2009. Project Execution Plan, Trumbo Point Fuel Farm, Naval Air Station Key West, Key West, Florida. April.

CH2M HILL Constructors, Inc. (CH2M HILL). 2010. Work Plan Assessment of In Situ LNAPL Distribution Trumbo Point Tank Farm, Revision No. 00. Naval Air Station Key West, Florida. April.

Department of Defense Quality Systems Manual - Version 4.2 Final, DoD, October 25, 2010 (Based On NELAC Voted Version – 5 June 2003).

Eco-Care, Inc. 1997. Tank Closure Assessment Report, Naval Air Station Trumbo Point Fuel Farm Tank D-4, Key West, Florida. Constr. Control No. N62467-96-C-0793. May.

Florida Department of Environmental Protection (FDEP). 2005a. Final Technical Report: Development of Cleanup Target Levels (CTLs) for Chapter 62-777, FAC. February.

Florida Department of Environmental Protection (FDEP). 2005b. Petroleum Contamination Site Cleanup Criteria for Chapter 62-770, FAC. April.

Florida Department of Environmental Protection (FDEP). 2005c. Design, Installation, and Placement of Monitoring Wells, Standard Operating Procedures PCS-006, May 2.

Florida Department of Environmental Protection (FDEP). 2008. *Draft Guidance for the Evaluation of Low Yield/ Poor Quality Criteria*.

Florida Department of Environmental Protection (FDEP). 2009. Chapter 62-520 Ground Water Classes, Standards, and Exemptions. Effective July 12, 2009.

Harding Lawson Associates (HLA). 1999. Remedial Action Plan. Trumbo Point Fuel Farm. Naval Air Station Key West, Trumbo Point Annex, Key West, Florida. December.

Intergovernmental Data Quality Task Force. 2005. *EPA*, *Uniform Federal Policy for Quality Assurance Project Plans*.

U.S. Environmental Protection Agency (EPA). 2002. *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS*.

U.S. Environmental Protection Agency (EPA). 2008a. *CLP National Functional Guidelines for Organic Data Review.* EPA540 / R-08 / 01. June.

U.S. Environmental Protection Agency (EPA). 2008b. Data *Validation Standard Operating Procedures for Organic Analysis, Rev. 3.1.* Region IV. August.

U.S. Environmental Protection Agency (EPA). 2009. Region 4 Field Branches Quality System and Technical Procedures. May 8.

U.S. Environmental Protection Agency (EPA). 2011. Data *Validation Standard Operating Procedures for Inorganic Analysis (ICP-AES, ICP-MS, and Mercury), Rev. 2.0,* Region IV. September.

Figures

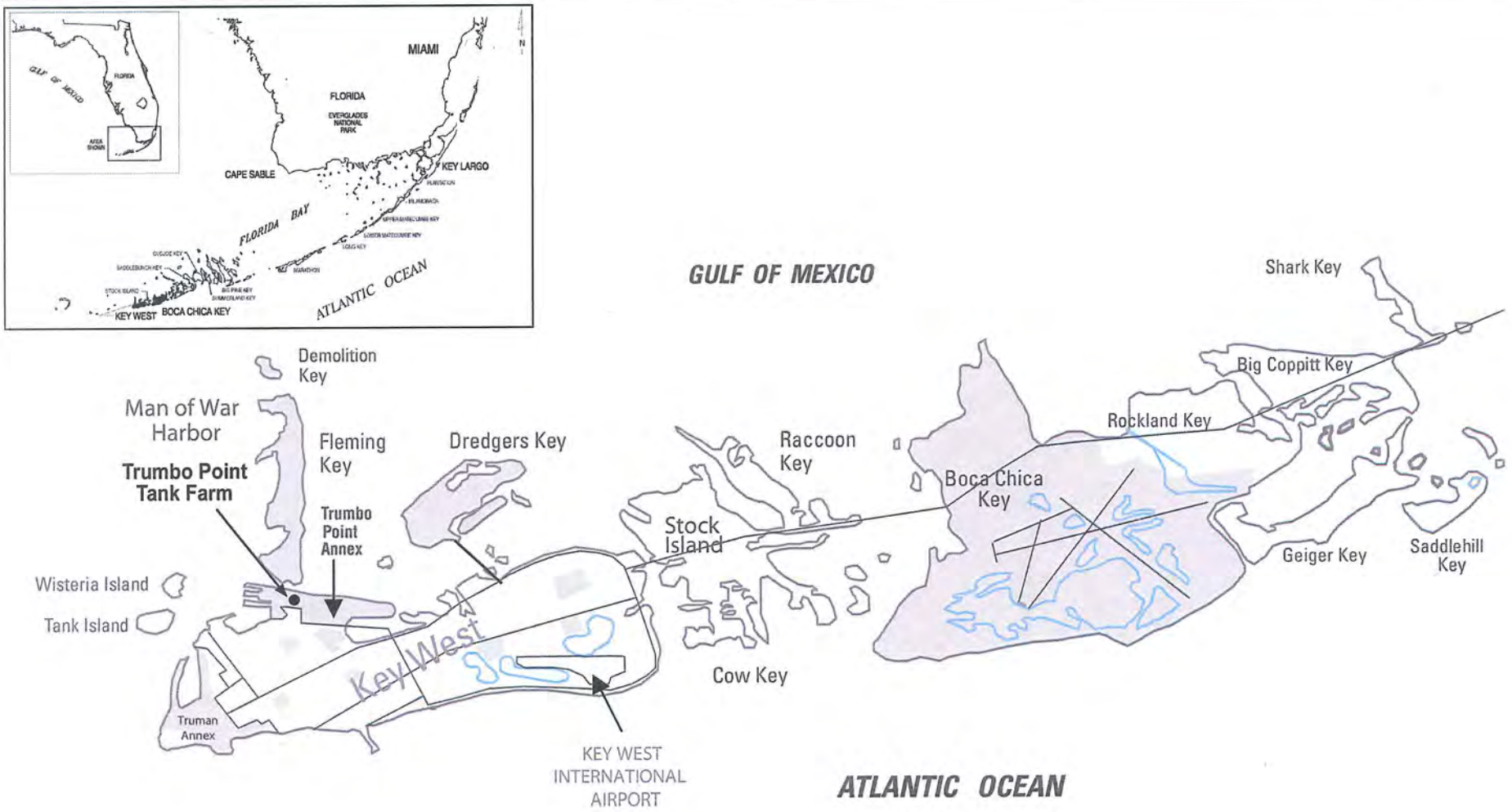


FIGURE 1
Site Location Map
Trumbo Point Tank Farm
NAS Key West
Key West, Florida

CG092008001ATL KeyWest103.ai

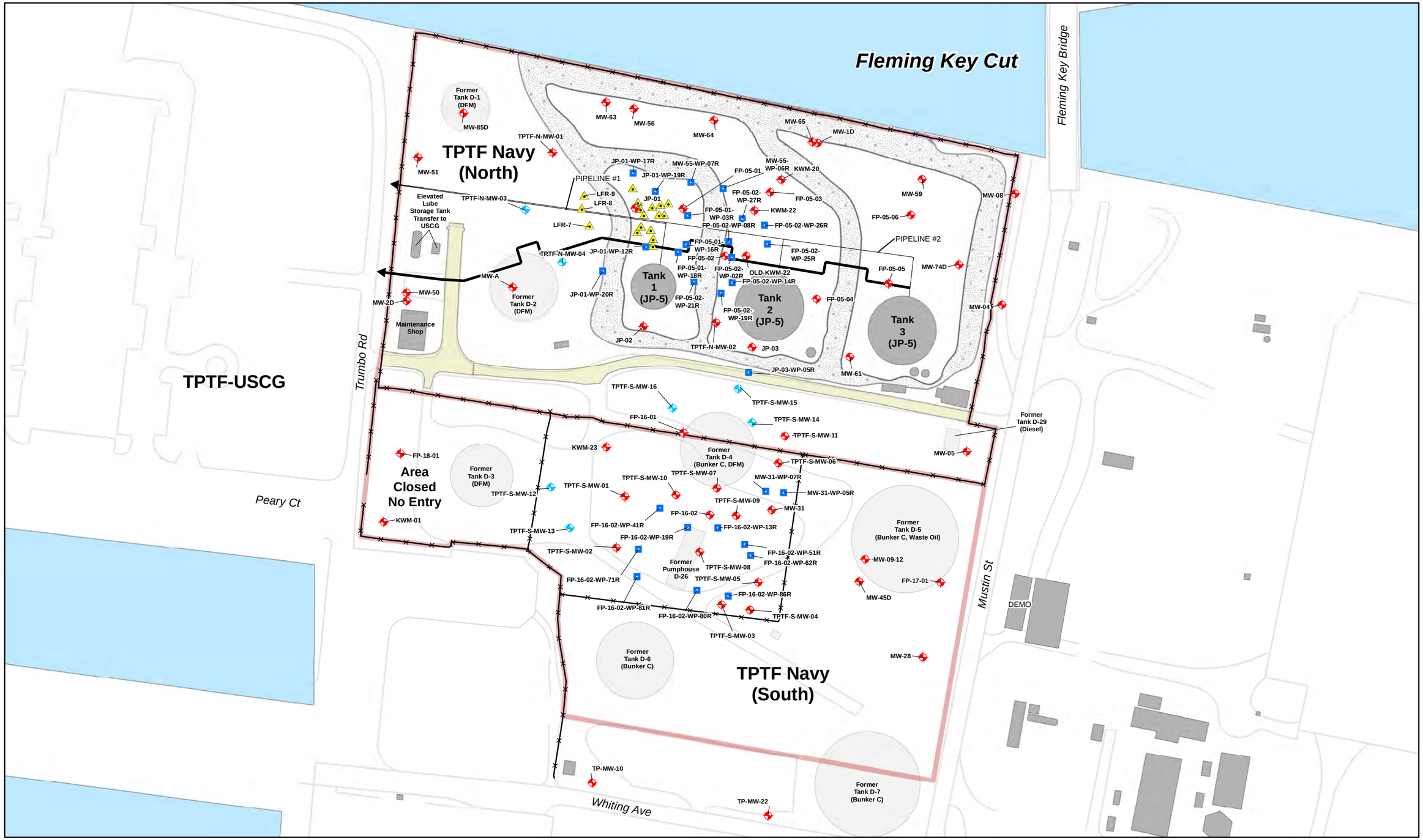
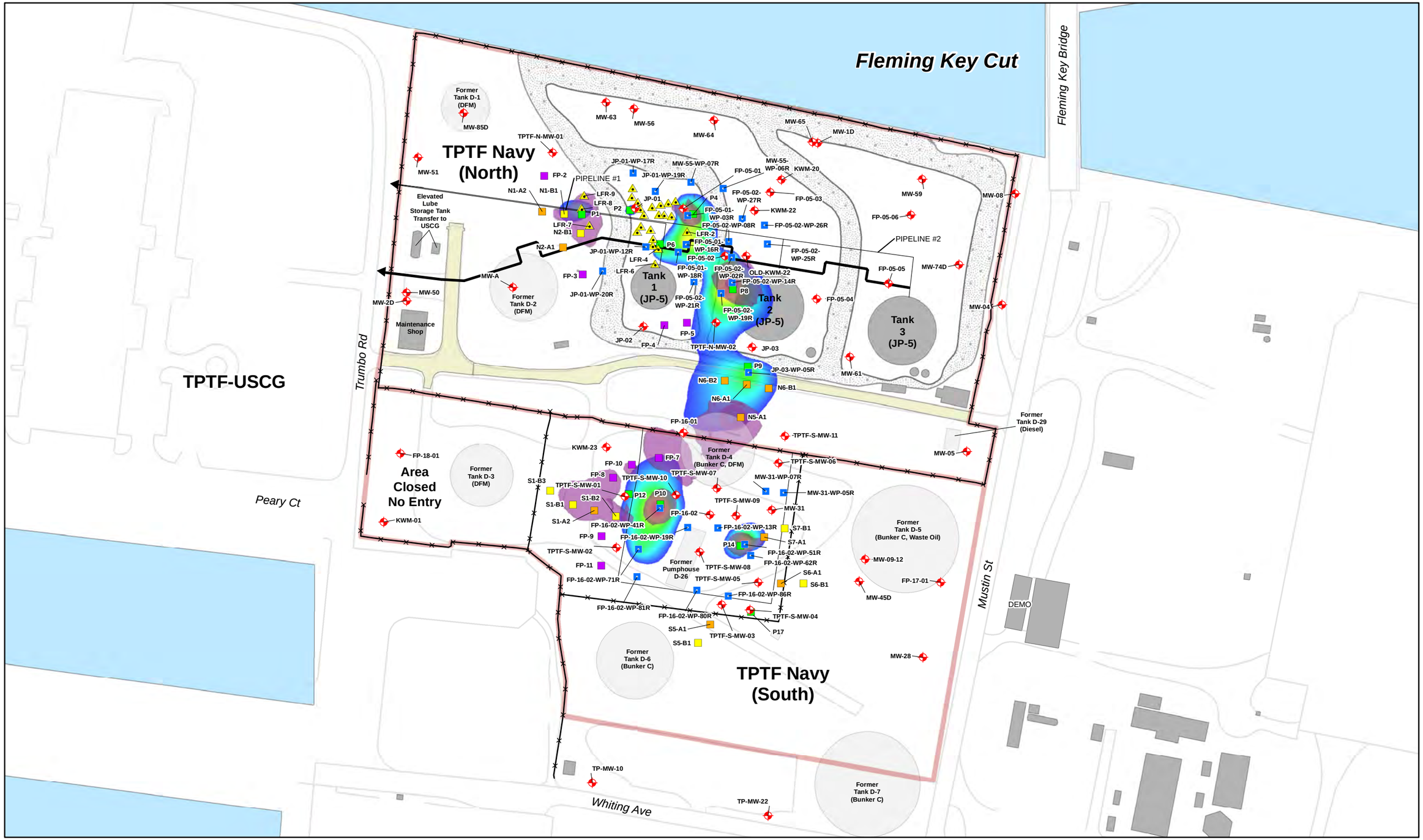


FIGURE 2
TPTF-Navy Site Map
Trumbo Point Tank Farm
NAS Key West
Key West, Florida

AGVIQ

ATL \\GALILEO\PROJ\KEY_WEST\MAPFILES\2011\FIGURE1_2WELLLOCATIONS_20111223.MXD DHERR 2/11/2014 9:20:41 AM



- Initial LIF Extent Point
- B Alternative Points
- LNAPL Thickness Comparison Point
- Final Points between LIF Lines
- Piezometer
- Monitoring Well
- Temporary Monitoring Point
- Fence
- Former Underground Pipeline
- New Aboveground Pipeline
- Former Structures
- Existing Structures

Notes:
1. Free Product extent gauged in July 2010
2. Purple areas represent laser induced flourescence (LIF) reflectance above 75%

FP Thickness

3 ft | 1 ft | 0.3 ft | 0.1 ft | 0.03 ft | 0.01 ft

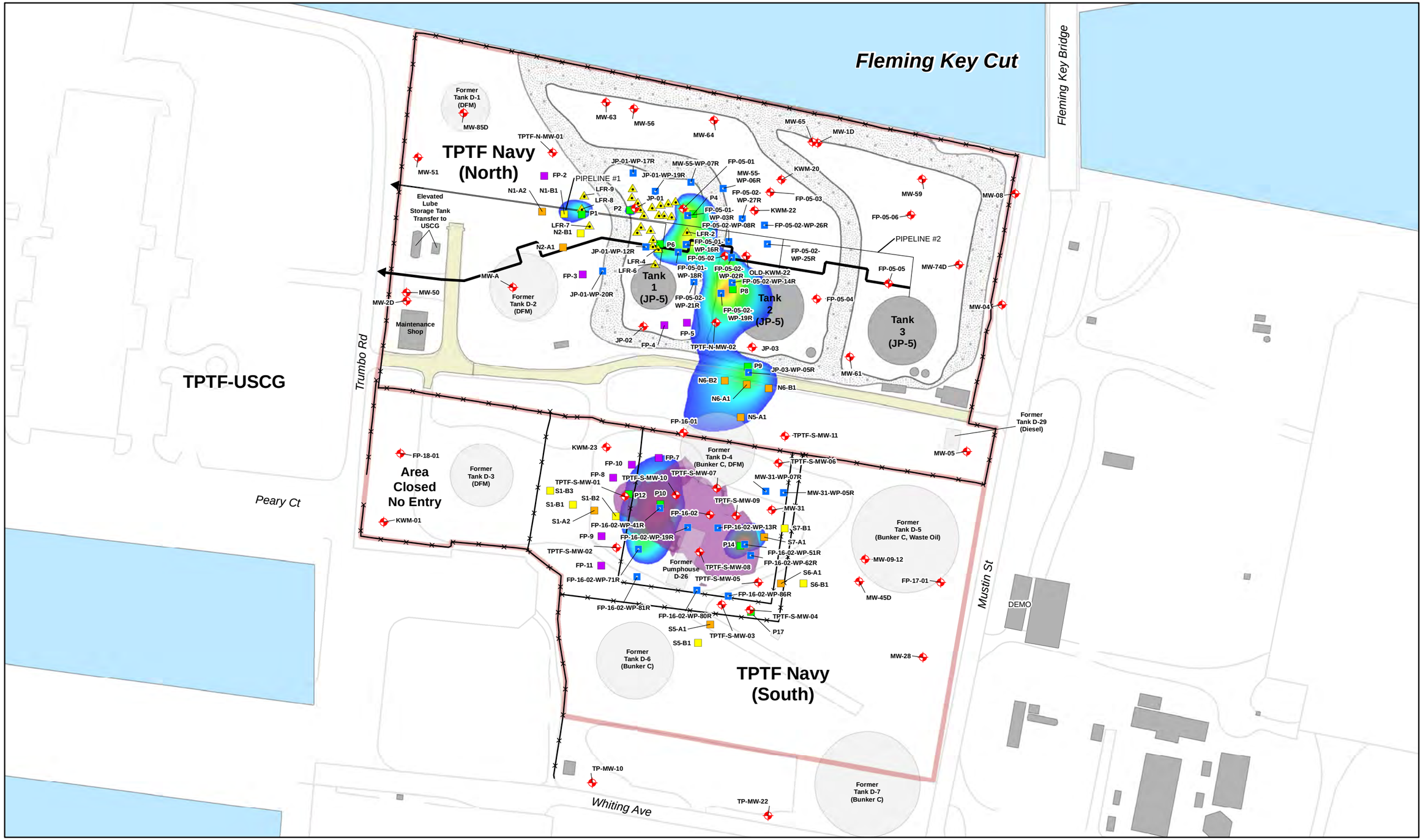
N W E S

0 50 100 200 Feet

FIGURE 3
Product Extent and LIF Reflectance (0 to 10 ft bgs) – July 2010
Trumbo Point Tank Farm
NAS Key West
Key West, Florida

AGVIQ

\\GALILEO\PROJ\KEY_WEST\MAPFILES\2010\PRODUCTEXTENTANDLIFREFLECTANCE_ABOVE.MXD JCARR3 1/24/2011 15:47:46



- Initial LIF Extent Point
- B Alternative Points
- LNAPL Thickness Comparison Point
- Final Points between LIF Lines
- Piezometer
- Monitoring Well
- Temporary Monitoring Point
- Fence
- Former Underground Pipeline
- New Aboveground Pipeline
- Former Structures
- Existing Structures

Notes:
1. Free Product extent gauged in July 2010
2. Purple areas represent laser induced flourescence (LIF) reflectance above 75%

FP Thickness

3 ft | 1 ft | 0.3 ft | 0.1 ft | 0.03 ft | 0.01 ft

N W E S

0 50 100 200 Feet

FIGURE 4
Product Extent and LIF Reflectance (10 to 20 ft bgs) – July 2010
Trumbo Point Tank Farm
NAS Key West
Key West, Florida

AGVIQ

\\GALILEO\PROJ\KEY_WEST\MAPFILES\2010\PRODUCTEXTENTANDLIFREFLECTANCE_BELOW.MXD JCARR3 1/24/2011 15:51:40

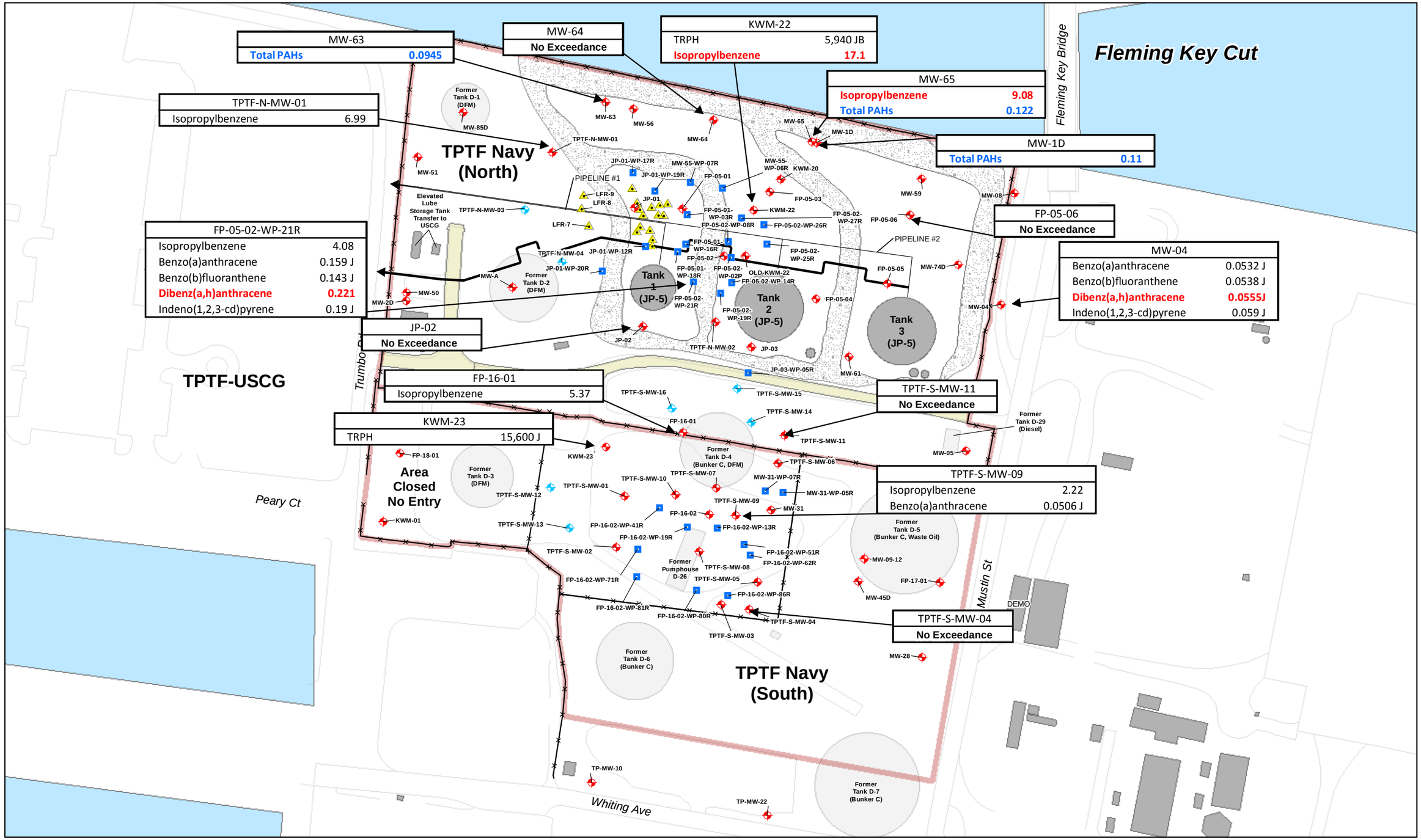


FIGURE 5
Groundwater Criteria Exceedances (August 2011)
Trumbo Point Tank Farm
NAS Key West
Key West, Florida

AGVIQ

ES012714023142ATL Fig5_GW_criteria_exceedance-Aug2011_r1 24Jun2014 pfwe

Fleming Key Cut

Fleming Key Bridge

TPTF-USCG

TPTF Navy (North)

TPTF Navy (South)

Trumbo Rd

Peary Ct

Whiting Ave

Mustin St

SS-01	
0 - 0.5ft	
BEQs	0.11

SS-04
No Exceedances

SS-02	
0 - 0.5 ft	
BEQs	0.31
0.5 - 2 ft	
BEQs	0.16

SS-03	
0 - 0.5 ft	
TRPH	567
BEQs	0.12
0.5 - 2 ft	
TRPH	18,100
1-Methylnaphthalene	38.7
BEQs	0.23

SS-05	
0 - 0.5 ft	
BEQs	0.22

SS-06	
0.5 - 2 ft	
BEQs	0.11

SS-07	
0 - 0.5 ft	
BEQs	0.11
0.5 - 2 ft	
TRPH	699

SS-08	
0.5 - 2 ft	
TRPH	1,580 J

SS-09	
0 - 0.5 ft	
BEQs	0.39
0.5 - 2 ft	
BEQs	1.13

SS-10	
0.5 - 2 ft	
BEQs	0.19
TRPH	5,180

Notes:
1. Results in mg/kg
2. Black font exceeds residential, Red font exceeds industrial, and Blue font exceeds leachability.

Soil Boring Locations
2011 Wells
Piezometer
Monitoring Well
Temporary Monitoring Point
Fence
Former Underground Pipeline
New Aboveground Pipeline
Former Structures
Existing Structures

	TPTF-Navy (North) SCTL (Industrial)	Leachability (LY/PQ)		TPTF-Navy (South) SCTL (Residential)	Leachability (LY/PQ)
TRPH	2,700	3,400	TRPH	460	3,400
1-Methylnaphthalene	1,800	31	BEQ	0.1	---

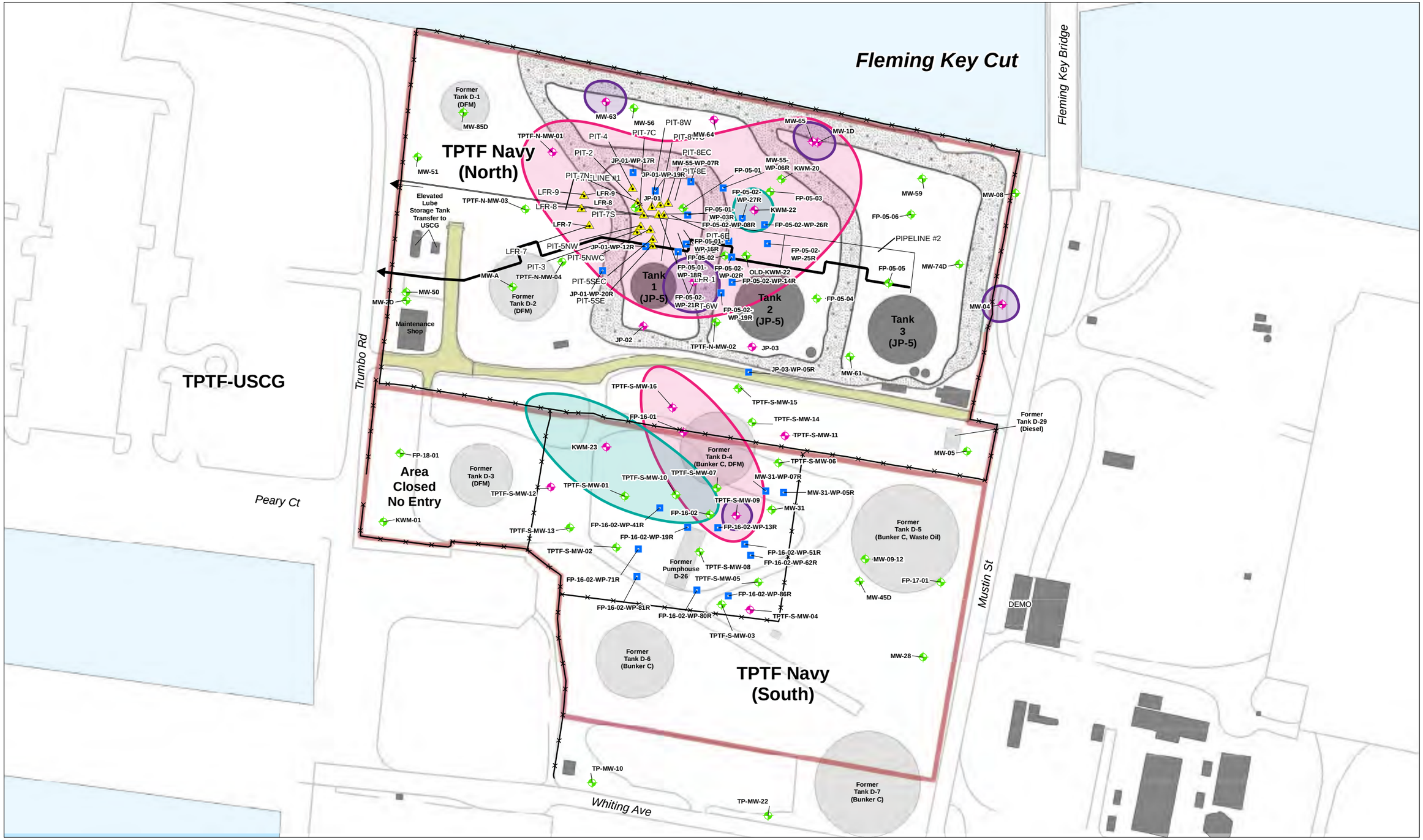
N W E S

0 50 100 200 Feet

FIGURE 6
Soil Criteria Exceedances (August 2011)
Trumbo Point Tank Farm
NAS Key West
Key West, Florida

AGVIQ

ES012714023142ATL Fig6_Soil_criteria_exceedance-Aug2011_r0 26Jun2014 pfwe



Groundwater Sampling Plan Location
Monitoring Well
Piezometer
Temporary Monitoring Point

Fence
Former Underground Pipeline
New Aboveground Pipeline
Former Structures
Existing Structures

Approximate Extent of Criteria Exceedances:
PAHs
Isopropylbenzene
TRPH

N
W E
S
0 50 100 200 Feet

FIGURE 7
Groundwater Sampling Plan Map
Trumbo Point Tank Farm
NAS Key West
Key West, Florida

AGVIQ

ES012714023142ATL Fig7_GW_sampling_plan_map_r0 20Jun2014 pfwe

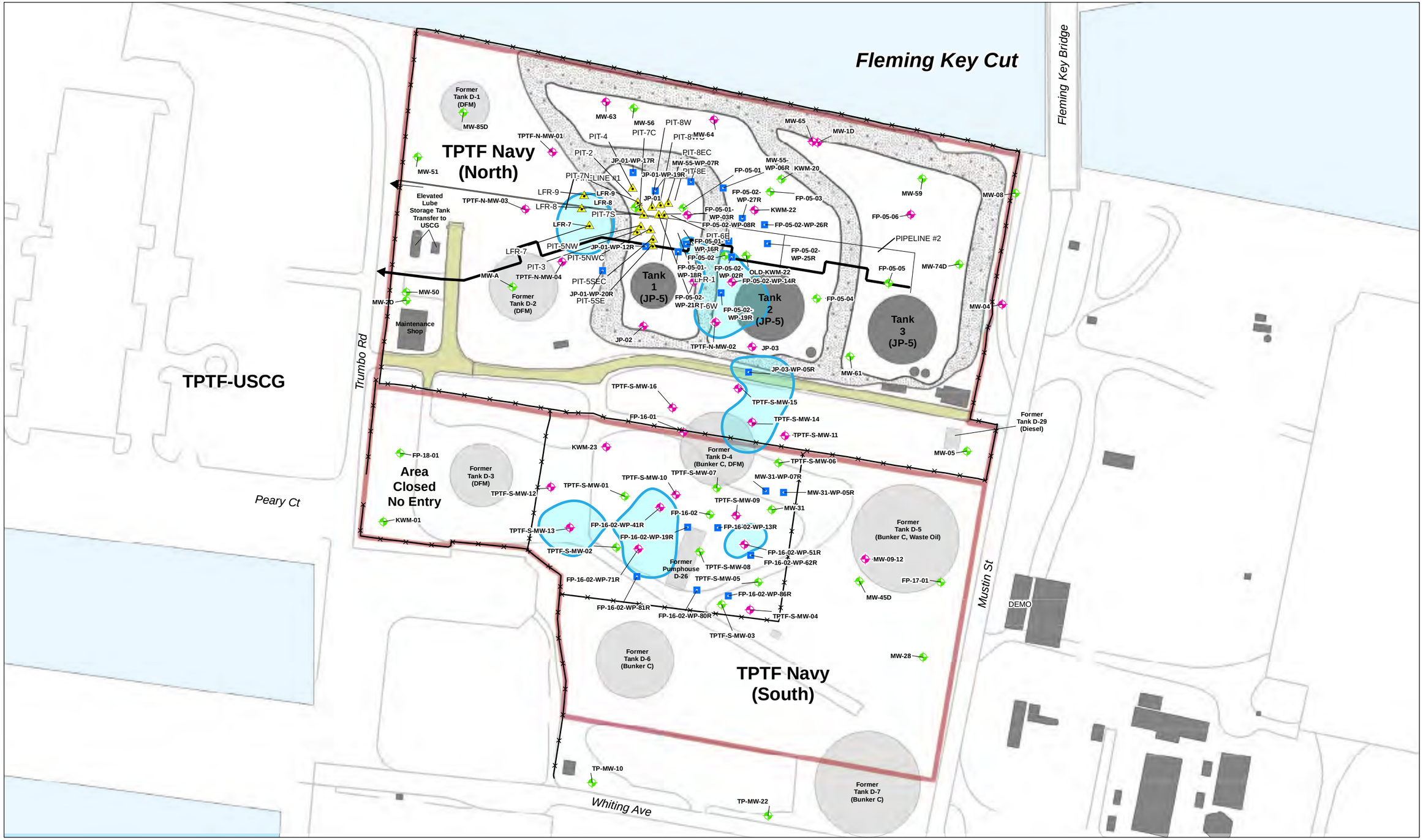


FIGURE 8
Water Level and LNAPL Gauging Plan Map
Trumbo Point Tank Farm
NAS Key West
Key West, Florida

AGVIQ

ES012714023142ATL Fig8_Gauging_plan_map_r1 24Jun2014 pfwe

Legend

- Proposed Arsenic Background Sample
- Original Arsenic Background Sample
- Excavated Surface Soil Sample
- Surface Soil Sample (> applicable arsenic SCTL)
- Surface Soil Sample (< applicable arsenic SCTL)
- Step Out Sample (> applicable arsenic SCTL)
- Step Out Sample (< applicable arsenic SCTL)
- 247 = Sample Number
- (6.0) = Arsenic Concentration in mg/kg

Notes:

1. Orginal background samples collected in April 1999.
2. Original background concentration was 6.9 mg/kg.
3. Applicable arsenic SCTL for TPTF Navy (South) is 2.1 mg/kg (residential).
4. Applicable arsenic SCTL for TPTF Navy (North) and TPTF-USCG is 12 mg/kg (industrial).

N

0 125 250 Feet

FIGURE 9
Arsenic Soil Results and Proposed Background Samples
Trumbo Point Tank Farm
NAS Key West
Key West, Florida

AGVIQ

Legend

▲ Proposed TPH Speciation Sample

Notes:

1. Results in mg/kg
2. Black font exceeds residential, **Red** font exceeds industrial
3. NE = no exceedances
4. J = estimated value

	SCTL (Residential)	SCTL (Industrial)	Leachability (LY/PQ)
TRPH	460	2,700	3,400

N

0 75 150 300 Feet

FIGURE 10
TRPH Exceedances (2011) and Proposed TPH Speciation Samples
Trumbo Point Tank Farm
NAS Key West
Key West, Florida

AGVIQ

GNV \\CYPRESS\PROJ\ENVIRONMENTAL\DRAWINGS\KEY_WEST\MXD\FIGURE2-3_TPH SPECIATION SAMPLES.MXD DHERR 2/13/2014 5:54:54 PM
ES012714023142ATL Fig10_TPH_speciation_samples_r1 20Jun2014 pfwe

Legend

- Soil Boring Location
- Proposed PAH Background Sample

Notes:

1. Results in mg/kg
2. Black font exceeds residential, **Red** font exceeds industrial, and **Blue** font exceeds leachability
3. NE = no exceedances

	SCTL (Residential)	SCTL (Industrial)	Leachability (LY/PQ)
1-Methylnaphthalene	200	1,800	31
BEQ	0.1	0.7	---

N

0 75 150 300 Feet

FIGURE 11
PAH Exceedances (2011) and Proposed PAH Background Samples
Trumbo Point Tank Farm
NAS Key West
Key West, Florida

AGVIQ

GNV \\CYPRESS\PROJ\ENVIRONMENTAL\DRAWINGS\KEY_WEST\MXD\FIGURE2-4_PAH BACKGROUND SAMPLES.MXD DHERR 2/13/2014 5:56:12 PM
ES012714023142ATL Fig11_PAH_background_samples_r2 20Jun2014 pfwe

Appendix A
Field Standard Operating Procedures

The following links have been provided to facilitate access to the appropriate standard operating procedures to project team members executing this work. It is expected that team members print hard copies for inclusion with field documents, read, and understand the SOPs for work implementation. If additional SOPs are cited, then they should be documented in a work plan revision.

1. 2014 FDEP SOPs (Effective 07-30-2014)
   http://www.dep.state.fl.us/water/sas/sop/sops.htm

2. Florida Department of Environmental Protection. Memorandum. Preapproval Program Backfill Quality Assurance Procedure for Sites Undergoing Excavation.
   http://www.dep.state.fl.us/waste/quick_topics/publications/pss/pcp/Backfill-memo_01Oct2010.pdf

3. Department of Environmental Protection Bureau of Petroleum Storage Systems Petroleum Cleanup Program. Standard Operating Procedures PCS-004. Soil Assessment and Sampling Methods for Florida Bureau of Petroleum Storage System Sites. (New and Effective October 1, 2001
   http://www.dep.state.fl.us/waste/quick_topics/publications/pss/pcp/a-soil-MEMO.pdf

4. Department of Environmental Protection Bureau of Petroleum Storage Systems Petroleum Cleanup Program. Standard Operating Procedures PCS-005. Groundwater Sampling Standards Standard Operating Procedures Variances and Clarifications for Bureau of Petroleum Storage System Sites (Effective May 2, 2005)
   http://www.dep.state.fl.us/waste/quick_topics/publications/pss/pcp/BPSSVariances-Final-May02-2005.pdf

5. Department of Environmental Protection Bureau of Petroleum Storage Systems Petroleum Cleanup Program. Standard Operating Procedures PCS-006. Design, Installation, and Placement of Monitoring Wells (Effective May 2, 2005)
   http://www.dep.state.fl.us/waste/quick_topics/publications/pss/pcp/MW-SOP-Final-Ap15.pdf

Appendix B
Laboratory DoD ELAP Certifications

PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820

(Hereinafter called the Organization) and hereby declares that Organization has met the requirements of ISO/IEC 17025:2005 "General Requirements for the competence of Testing and Calibration Laboratories" and the DoD Quality Systems Manual for Environmental Laboratories Version 5.0 July 2013 and is accredited is accordance with the:

United States Department of Defense
Environmental Laboratory Accreditation Program
(DoD-ELAP)

This accreditation demonstrates technical competence for the defined scope:

Environmental Testing

(As detailed in the supplement)

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Initial Accreditation Date:	*Issue Date:*	*Expiration Date:*
October 2, 2013	September 9, 2014	September 9, 2016

Accreditation No.:	*Certificate No.:*
74960	L14-243

Tracy Szerszen
President/Operations Manager

Perry Johnson Laboratory
Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjlabs.com

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820
Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 1664A	Gravimetric	Oil & Grease
Aqueous	EPA 200.8	ICP-MS	Aluminum
Aqueous	EPA 200.8	ICP-MS	Antimony
Aqueous	EPA 200.8	ICP-MS	Arsenic
Aqueous	EPA 200.8	ICP-MS	Barium
Aqueous	EPA 200.8	ICP-MS	Beryllium
Aqueous	EPA 200.8	ICP-MS	Cadmium
Aqueous	EPA 200.8	ICP-MS	Calcium
Aqueous	EPA 200.8	ICP-MS	Chromium
Aqueous	EPA 200.8	ICP-MS	Cobalt
Aqueous	EPA 200.8	ICP-MS	Copper
Aqueous	EPA 200.8	ICP-MS	Iron
Aqueous	EPA 200.8	ICP-MS	Lead
Aqueous	EPA 200.8	ICP-MS	Magnesium
Aqueous	EPA 200.8	ICP-MS	Manganese
Aqueous	EPA 200.8	ICP-MS	Molybdenum
Aqueous	EPA 200.8	ICP-MS	Nickel
Aqueous	EPA 200.8	ICP-MS	Potassium
Aqueous	EPA 200.8	ICP-MS	Selenium
Aqueous	EPA 200.8	ICP-MS	Silver
Aqueous	EPA 200.8	ICP-MS	Sodium
Aqueous	EPA 200.8	ICP-MS	Strontium
Aqueous	EPA 200.8	ICP-MS	Thallium
Aqueous	EPA 200.8	ICP-MS	Tin
Aqueous	EPA 200.8	ICP-MS	Titanium
Aqueous	EPA 200.8	ICP-MS	Total Hardness (as CaCO3)
Aqueous	EPA 200.8	ICP-MS	Vanadium
Aqueous	EPA 200.8	ICP-MS	Zinc
Aqueous	EPA 200.8	ICP-MS	Zirconium
Aqueous	EPA 245.2	CVAA	Mercury
Aqueous	EPA 300.0	IC	Bromide
Aqueous	EPA 300.0	IC	Chloride
Aqueous	EPA 300.0	IC	Fluoride
Aqueous	EPA 300.0	IC	Nitrate and Nitrite as N
Aqueous	EPA 300.0	IC	Nitrate as N
Aqueous	EPA 300.0	IC	Nitrite as N

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820

Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 300.0	IC	Sulfate
Aqueous	EPA 420.4	FIA	Total Phenolics (4AAP)
Aqueous	EPA 624	GC-MS	1,1,1,2-Tetrachloroethane
Aqueous	EPA 624	GC-MS	1,1,1-Trichloroethane
Aqueous	EPA 624	GC-MS	1,1,2,2-Tetrachloroethane
Aqueous	EPA 624	GC-MS	1,1,2-Trichloroethane
Aqueous	EPA 624	GC-MS	1,1-Dichloroethane
Aqueous	EPA 624	GC-MS	1,1-Dichloroethene
Aqueous	EPA 624	GC-MS	1,1-Dichloropropene
Aqueous	EPA 624	GC-MS	1,2 Dichlorobenzene
Aqueous	EPA 624	GC-MS	1,2 Dichloroethane
Aqueous	EPA 624	GC-MS	1,2,3-Trichlorobenzene
Aqueous	EPA 624	GC-MS	1,2,3-Trichloropropane
Aqueous	EPA 624	GC-MS	1,2,4-Trichlorobenzene
Aqueous	EPA 624	GC-MS	1,2,4-Trimethylbenzene
Aqueous	EPA 624	GC-MS	1,2-Dibromo-3-chloropropane (DBCP)
Aqueous	EPA 624	GC-MS	1,2-Dibromoethane (EDB)
Aqueous	EPA 624	GC-MS	1,2-Dichloropropane
Aqueous	EPA 624	GC-MS	1,3 Dichlorobenzene
Aqueous	EPA 624	GC-MS	1,3,5-Trimethylbenzene
Aqueous	EPA 624	GC-MS	1,3-Dichloropropane
Aqueous	EPA 624	GC-MS	1,4 Dichlorobenzene
Aqueous	EPA 624	GC-MS	2,2-Dichloropropane
Aqueous	EPA 624	GC-MS	2-Butanone (MEK)
Aqueous	EPA 624	GC-MS	2-Chloroethylvinylether
Aqueous	EPA 624	GC-MS	2-Chlorotoluene
Aqueous	EPA 624	GC-MS	2-Hexanone
Aqueous	EPA 624	GC-MS	4-Chlorotoluene
Aqueous	EPA 624	GC-MS	4-Methyl-2-pentanone (MIBK)
Aqueous	EPA 624	GC-MS	Acetone
Aqueous	EPA 624	GC-MS	Acetonitrile
Aqueous	EPA 624	GC-MS	Acrolein
Aqueous	EPA 624	GC-MS	Acrylonitrile
Aqueous	EPA 624	GC-MS	Benzene
Aqueous	EPA 624	GC-MS	Bromochloromethane

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820
Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 624	GC-MS	Bromodichloromethane
Aqueous	EPA 624	GC-MS	Bromoform
Aqueous	EPA 624	GC-MS	Bromomethane
Aqueous	EPA 624	GC-MS	Carbon disulfide
Aqueous	EPA 624	GC-MS	Carbon tetrachloride
Aqueous	EPA 624	GC-MS	Chlorobenzene
Aqueous	EPA 624	GC-MS	Chloroethane
Aqueous	EPA 624	GC-MS	Chloroform
Aqueous	EPA 624	GC-MS	Chloromethane
Aqueous	EPA 624	GC-MS	cis-1,2-Dichloroethene
Aqueous	EPA 624	GC-MS	cis-1,3-Dichloropropylene
Aqueous	EPA 624	GC-MS	Dibromochloromethane
Aqueous	EPA 624	GC-MS	Dibromomethane
Aqueous	EPA 624	GC-MS	Dichlorodifluoromethane
Aqueous	EPA 624	GC-MS	Ethylbenzene
Aqueous	EPA 624	GC-MS	Hexachlorobutadiene
Aqueous	EPA 624	GC-MS	Isopropylbenzene
Aqueous	EPA 624	GC-MS	m+p-Xylene
Aqueous	EPA 624	GC-MS	Methyl tert-butyl ether (MTBE)
Aqueous	EPA 624	GC-MS	Methylene Chloride
Aqueous	EPA 624	GC-MS	Naphthalene
Aqueous	EPA 624	GC-MS	n-Butylbenzene
Aqueous	EPA 624	GC-MS	n-Propylbenzene
Aqueous	EPA 624	GC-MS	o-Xylene
Aqueous	EPA 624	GC-MS	p-Isopropyltoluene
Aqueous	EPA 624	GC-MS	sec-Butylbenzene
Aqueous	EPA 624	GC-MS	Styrene
Aqueous	EPA 624	GC-MS	tert-Butylbenzene
Aqueous	EPA 624	GC-MS	Tetrachloroethene
Aqueous	EPA 624	GC-MS	Toluene
Aqueous	EPA 624	GC-MS	trans-1,2-Dichloroethene
Aqueous	EPA 624	GC-MS	trans-1,3-Dichloropropene
Aqueous	EPA 624	GC-MS	Trichloroethene
Aqueous	EPA 624	GC-MS	Trichlorofluoromethane
Aqueous	EPA 624	GC-MS	Vinyl acetate
Aqueous	EPA 624	GC-MS	Vinyl chloride

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820

Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 624	GC-MS	Xylenes, total
Aqueous	EPA 625	GC-MS	1,2,4,5-Tetrachlorobenzene
Aqueous	EPA 625	GC-MS	1,2,4-Trichlorobenzene
Aqueous	EPA 625	GC-MS	1-Methylnaphthalene
Aqueous	EPA 625	GC-MS	2,3,4,6-Tetrachlorophenol
Aqueous	EPA 625	GC-MS	2,4,5-Trichlorophenol
Aqueous	EPA 625	GC-MS	2,4,6-Trichlorophenol
Aqueous	EPA 625	GC-MS	2,4-Dichlorophenol
Aqueous	EPA 625	GC-MS	2,4-Dimethylphenol
Aqueous	EPA 625	GC-MS	2,4-Dinitrophenol
Aqueous	EPA 625	GC-MS	2,4-Dinitrotoluene
Aqueous	EPA 625	GC-MS	2,6-Dichlorophenol
Aqueous	EPA 625	GC-MS	2,6-Dinitrotoluene
Aqueous	EPA 625	GC-MS	2-Chloronaphthalene
Aqueous	EPA 625	GC-MS	2-Chlorophenol
Aqueous	EPA 625	GC-MS	2-Methyl-4,6-Dinitrophenol
Aqueous	EPA 625	GC-MS	2-Methylnaphthalene
Aqueous	EPA 625	GC-MS	2-Methylphenol
Aqueous	EPA 625	GC-MS	2-Nitroaniline
Aqueous	EPA 625	GC-MS	2-Nitrophenol
Aqueous	EPA 625	GC-MS	3,3'-Dichlorobenzidine
Aqueous	EPA 625	GC-MS	3-Nitroaniline
Aqueous	EPA 625	GC-MS	4-Bromophenyl-phenylether
Aqueous	EPA 625	GC-MS	4-Chloro-3-methylphenol
Aqueous	EPA 625	GC-MS	4-Chloroaniline
Aqueous	EPA 625	GC-MS	4-Chlorophenyl-phenylether
Aqueous	EPA 625	GC-MS	4-Methylphenol (and/or 3-Methylphenol)
Aqueous	EPA 625	GC-MS	4-Nitroaniline
Aqueous	EPA 625	GC-MS	4-Nitrophenol
Aqueous	EPA 625	GC-MS	Acenaphthene
Aqueous	EPA 625	GC-MS	Acenaphthylene
Aqueous	EPA 625	GC-MS	Aniline
Aqueous	EPA 625	GC-MS	Anthracene
Aqueous	EPA 625	GC-MS	Benzidine
Aqueous	EPA 625	GC-MS	Benzo(a)anthracene

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820

Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 625	GC-MS	Benzo(a)pyrene
Aqueous	EPA 625	GC-MS	Benzo(b)fluoranthene
Aqueous	EPA 625	GC-MS	Benzo(g,h,i)perylene
Aqueous	EPA 625	GC-MS	Benzo(k)fluoranthene
Aqueous	EPA 625	GC-MS	Benzoic acid
Aqueous	EPA 625	GC-MS	Benzyl alcohol
Aqueous	EPA 625	GC-MS	bis(2-Chloroethoxy)methane
Aqueous	EPA 625	GC-MS	bis(2-Chloroethyl)ether
Aqueous	EPA 625	GC-MS	bis(2-Chloroiospropyl) ether
Aqueous	EPA 625	GC-MS	bis(2-ethylhexyl) phthalate
Aqueous	EPA 625	GC-MS	Butyl benzyl phthalate
Aqueous	EPA 625	GC-MS	Carbazole
Aqueous	EPA 625	GC-MS	Chrysene
Aqueous	EPA 625	GC-MS	Dibenzo(a,h)anthracene
Aqueous	EPA 625	GC-MS	Dibenzofuran
Aqueous	EPA 625	GC-MS	Diethyl phthalate
Aqueous	EPA 625	GC-MS	Dimethyl phthalate
Aqueous	EPA 625	GC-MS	Di-n-butylphthalate
Aqueous	EPA 625	GC-MS	Di-n-octylphthalate
Aqueous	EPA 625	GC-MS	Fluoranthene
Aqueous	EPA 625	GC-MS	Fluorene
Aqueous	EPA 625	GC-MS	Hexachlorobenzene
Aqueous	EPA 625	GC-MS	Hexachlorocyclopentadiene
Aqueous	EPA 625	GC-MS	Indeno(1,2,3, cd)pyrene
Aqueous	EPA 625	GC-MS	Isophorone
Aqueous	EPA 625	GC-MS	Naphthalene
Aqueous	EPA 625	GC-MS	Nitrobenzene
Aqueous	EPA 625	GC-MS	N-Nitrosodiethylamine
Aqueous	EPA 625	GC-MS	N-Nitrosodimethylamine
Aqueous	EPA 625	GC-MS	N-Nitroso-di-n-propylamine
Aqueous	EPA 625	GC-MS	N-Nitrosodiphenylamine
Aqueous	EPA 625	GC-MS	o-Toluidine
Aqueous	EPA 625	GC-MS	Pentachlorobenzene
Aqueous	EPA 625	GC-MS	Pentachlorophenol
Aqueous	EPA 625	GC-MS	Phenanthrene
Aqueous	EPA 625	GC-MS	Phenol

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820

Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 625	GC-MS	Pyrene
Aqueous	EPA 625	GC-MS	Pyridine
Aqueous	EPA 7470A	CVAA	Mercury
Aqueous	EPA 8011	GC-ECD	1,2-Dibromo-3-chloropropane (DBCP)
Aqueous	EPA 8011	GC-ECD	1,2-Dibromoethane (EDB)
Aqueous	EPA 9040C	pH Meter	Corrosivity (pH)
Aqueous	HACH 8000	Spectrophotometer	COD
Aqueous	RSK-175	GC-FID	Acetylene
Aqueous	RSK-175	GC-FID	Butane
Aqueous	RSK-175	GC-TCD	Carbon Dioxide
Aqueous	RSK-175	GC-FID	Ethane
Aqueous	RSK-175	GC-FID	Ethene
Aqueous	RSK-175	GC-FID	Methane
Aqueous	RSK-175	GC-FID	Propane
Aqueous	SM 2130B	Turbidimetric	Turbidity
Aqueous	SM 2310B	Titration	Acidity(as CaCO3)
Aqueous	SM 2320B	Titration	Total Alkalinity(as CaCO3)
Aqueous	SM 2340 B	ICP-MS	Total Hardness (as CaCO3)
Aqueous	SM 2540B	Gravimetric	Total Solids
Aqueous	SM 2540C	Gravimetric	Total Dissolved Solids (TDS)
Aqueous	SM 2540D	Gravimetric	Non-Filterable Residue (TSS)
Aqueous	SM 3500 Fe B	Spectrophotometer	Ferrous Iron
Aqueous	SM 4500 Cl E	Autotitrator	Chloride
Aqueous	SM 4500 H+B	pH Meter	Corrosivity (pH)
Aqueous	SM 4500 H+B	pH Meter	pH
Aqueous	SM 4500 PE	Spectrophotometer	Orthophosphate as P
Aqueous	SM 4500 S2 D	Spectrophotometer	Sulfide
Aqueous	SM 4500 S2 F	Titration	Sulfide
Aqueous	SM 4500 SiO2 C	Spectrophotometer	Silica
Aqueous	SM 4500 SO4 E	IC	Sulfate
Aqueous	SM 5310B	TOC Analyzer	TOC
Aqueous	EPA 9020B	TOX Analyzer	Total Organic Halides
Solids	EPA 1030	N/A	Ignitability
Solids	EPA 7471B	CVAA	Mercury
Solids	EPA 9045D	pH Meter	Corrosivity (pH)

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820

Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Solids	EPA 9095B	N/A	Paint Filter Test
Solids	SM 2540G	Gravimetric	Percent Moisture
Solids	SM 2540G	Gravimetric	Total Solids
Aqueous/Solids	ASTM D-1385	Spectrophotometer	Hydrazine
Aqueous/Solids	EPA 1010A	Automated FP Analyzer	Ignitability
Aqueous/Solids	EPA 314.0	Spectrophotometer	Perchlorate
Aqueous/Solids	EPA 353.2	FIA	Nitrate and Nitrite as N
Aqueous/Solids	EPA 353.2	FIA	Nitrate as N
Aqueous/Solids	EPA 353.2	FIA	Nitrite as N
Aqueous/Solids	EPA 365.1	FIA	Total Phosphorous
Aqueous/Solids	EPA 6020A	ICP-MS	Aluminum
Aqueous/Solids	EPA 6020A	ICP-MS	Antimony
Aqueous/Solids	EPA 6020A	ICP-MS	Arsenic
Aqueous/Solids	EPA 6020A	ICP-MS	Barium
Aqueous/Solids	EPA 6020A	ICP-MS	Beryllium
Aqueous/Solids	EPA 6020A	ICP-MS	Cadmium
Aqueous/Solids	EPA 6020A	ICP-MS	Calcium
Aqueous/Solids	EPA 6020A	ICP-MS	Chromium
Aqueous/Solids	EPA 6020A	ICP-MS	Cobalt
Aqueous/Solids	EPA 6020A	ICP-MS	Copper
Aqueous/Solids	EPA 6020A	ICP-MS	Iron
Aqueous/Solids	EPA 6020A	ICP-MS	Lead
Aqueous/Solids	EPA 6020A	ICP-MS	Magnesium
Aqueous/Solids	EPA 6020A	ICP-MS	Manganese
Aqueous/Solids	EPA 6020A	ICP-MS	Molybdenum
Aqueous/Solids	EPA 6020A	ICP-MS	Nickel
Aqueous/Solids	EPA 6020A	ICP-MS	Potassium
Aqueous/Solids	EPA 6020A	ICP-MS	Selenium
Aqueous/Solids	EPA 6020A	ICP-MS	Silver
Aqueous/Solids	EPA 6020A	ICP-MS	Sodium
Aqueous/Solids	EPA 6020A	ICP-MS	Strontium
Aqueous/Solids	EPA 6020A	ICP-MS	Thallium
Aqueous/Solids	EPA 6020A	ICP-MS	Tin
Aqueous/Solids	EPA 6020A	ICP-MS	Titanium
Aqueous/Solids	EPA 6020A	ICP-MS	Vanadium

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820

Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 6020A	ICP-MS	Zinc
Aqueous/Solids	EPA 6020A	ICP-MS	Zirconium
Aqueous/Solids	EPA 7196A	Spectrophotometer	Chromium VI
Aqueous/Solids	EPA 8015C	GC-FID	Diesel
Aqueous/Solids	EPA 8015C	GC-FID	Diesel range organics (DRO)
Aqueous/Solids	EPA 8015C	GC-FID	Gasoline range organics (GRO)
Aqueous/Solids	EPA 8015C	GC-FID	Oil Range Organics (ORO)
Aqueous/Solids	EPA 8081B	GC-ECD	Aldrin
Aqueous/Solids	EPA 8081B	GC-ECD	alpha-BHC
Aqueous/Solids	EPA 8081B	GC-ECD	alpha-Chlordane
Aqueous/Solids	EPA 8081B	GC-ECD	beta-BHC
Aqueous/Solids	EPA 8081B	GC-ECD	Chlordane
Aqueous/Solids	EPA 8081B	GC-ECD	Chlordane (total)
Aqueous/Solids	EPA 8081B	GC-ECD	DDD (4,4')
Aqueous/Solids	EPA 8081B	GC-ECD	DDE (4,4')
Aqueous/Solids	EPA 8081B	GC-ECD	DDT (4,4')
Aqueous/Solids	EPA 8081B	GC-ECD	delta-BHC
Aqueous/Solids	EPA 8081B	GC-ECD	Dieldrin
Aqueous/Solids	EPA 8081B	GC-ECD	Endosulfan I
Aqueous/Solids	EPA 8081B	GC-ECD	Endosulfan II
Aqueous/Solids	EPA 8081B	GC-ECD	Endosulfan sulfate
Aqueous/Solids	EPA 8081B	GC-ECD	Endrin
Aqueous/Solids	EPA 8081B	GC-ECD	Endrin aldehyde
Aqueous/Solids	EPA 8081B	GC-ECD	Endrin ketone
Aqueous/Solids	EPA 8081B	GC-ECD	gamma-BHC (Lindane)
Aqueous/Solids	EPA 8081B	GC-ECD	gamma-Chlordane
Aqueous/Solids	EPA 8081B	GC-ECD	Heptachlor
Aqueous/Solids	EPA 8081B	GC-ECD	Heptachlor Epoxide (beta)
Aqueous/Solids	EPA 8081B	GC-ECD	Methoxychlor
Aqueous/Solids	EPA 8081B	GC-ECD	Toxaphene
Aqueous/Solids	EPA 8081B	GC-ECD	Toxaphene (total)
Aqueous/Solids	EPA 8082A	GC-ECD	Aroclor 1016
Aqueous/Solids	EPA 8082A	GC-ECD	Aroclor 1221
Aqueous/Solids	EPA 8082A	GC-ECD	Aroclor 1232
Aqueous/Solids	EPA 8082A	GC-ECD	Aroclor 1242
Aqueous/Solids	EPA 8082A	GC-ECD	Aroclor 1248

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820
Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8082A	GC-ECD	Aroclor 1254
Aqueous/Solids	EPA 8082A	GC-ECD	Aroclor 1260
Aqueous/Solids	EPA 8082A	GC-ECD	Aroclor 1262
Aqueous/Solids	EPA 8082A	GC –ECD	Aroclor 1268
Aqueous/Solids	EPA 8141B	GC-NPD	Azinphos-methyl (Guthion)
Aqueous/Solids	EPA 8141B	GC-NPD	Diazinon
Aqueous/Solids	EPA 8141B	GC-NPD	Disulfoton
Aqueous/Solids	EPA 8141B	GC-NPD	Malathion
Aqueous/Solids	EPA 8141B	GC-NPD	Parathion, ethyl
Aqueous/Solids	EPA 8141B	GC-NPD	Parathion, methyl
Aqueous/Solids	EPA 8141B	GC-NPD	Phorate
Aqueous/Solids	EPA 8141B	GC-NPD	Ronnel
Aqueous/Solids	EPA 8141B	GC-NPD	Stirophos
Aqueous/Solids	EPA 8151A	GC-ECD	2, 4, DB
Aqueous/Solids	EPA 8151A	GC-ECD	2, 4-D
Aqueous/Solids	EPA 8151A	GC-ECD	2,4,5-T
Aqueous/Solids	EPA 8151A	GC-ECD	2,4,5-TP (Silvex)
Aqueous/Solids	EPA 8151A	GC-ECD	2,4-DP (Dichlorprop)
Aqueous/Solids	EPA 8151A	GC-ECD	3,5-Dichlorobenzoic acid
Aqueous/Solids	EPA 8151A	GC-ECD	4-Nitrophenol
Aqueous/Solids	EPA 8151A	GC-ECD	Acifluorfen
Aqueous/Solids	EPA 8151A	GC-ECD	Bentazon
Aqueous/Solids	EPA 8151A	GC-ECD	Chloramben
Aqueous/Solids	EPA 8151A	GC-ECD	Dacthal (DCPA)
Aqueous/Solids	EPA 8151A	GC-ECD	Dalapon
Aqueous/Solids	EPA 8151A	GC-ECD	Dicamba
Aqueous/Solids	EPA 8151A	GC-ECD	Dinoseb
Aqueous/Solids	EPA 8151A	GC-ECD	MCPA
Aqueous/Solids	EPA 8151A	GC-ECD	MCPP
Aqueous/Solids	EPA 8151A	GC-ECD	Pentachlorophenol
Aqueous/Solids	EPA 8260B	GC-MS	1,1,1,2-Tetrachloroethane
Aqueous/Solids	EPA 8260B	GC-MS	1,1,1-Trichloroethane
Aqueous/Solids	EPA 8260B	GC-MS	1,1,2,2-Tetrachloroethane
Aqueous/Solids	EPA 8260B	GC-MS	1,1,2-trichloro-1,2,2-trifluoroethane
Aqueous/Solids	EPA 8260B	GC-MS	1,1,2-Trichloroethane

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820

Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8260B	GC-MS	1,1-Dichloroethane
Aqueous/Solids	EPA 8260B	GC-MS	1,1-Dichloroethene
Aqueous/Solids	EPA 8260B	GC-MS	1,1-Dichloropropene
Aqueous/Solids	EPA 8260B	GC-MS	1,2 Dichlorobenzene
Aqueous/Solids	EPA 8260B	GC-MS	1,2 Dichloroethane
Aqueous/Solids	EPA 8260B	GC-MS	1,2,3-Trichlorobenzene
Aqueous/Solids	EPA 8260B	GC-MS	1,2,3-Trichloropropane
Aqueous/Solids	EPA 8260B	GC-MS	1,2,4,5-Tetrachlorobenzene
Aqueous/Solids	EPA 8260B	GC-MS	1,2,4-Trichlorobenzene
Aqueous/Solids	EPA 8260B	GC-MS	1,2,4-Trimethylbenzene
Aqueous/Solids	EPA 8260B	GC-MS	1,2-Dibromo-3-chloropropane (DBCP)
Aqueous/Solids	EPA 8260B	GC-MS	1,2-Dibromoethane (EDB)
Aqueous/Solids	EPA 8260B	GC-MS	1,2-Dichloropropane
Aqueous/Solids	EPA 8260B	GC-MS	1,3 Dichlorobenzene
Aqueous/Solids	EPA 8260B	GC-MS	1,3,5-Trimethylbenzene
Aqueous/Solids	EPA 8260B	GC-MS	1,3-Dichloropropane
Aqueous/Solids	EPA 8260B	GC-MS	1,4 Dichlorobenzene
Aqueous/Solids	EPA 8260B	GC-MS	1-Chlorohexane
Aqueous/Solids	EPA 8260B	GC-MS	2,2-Dichloropropane
Aqueous/Solids	EPA 8260B	GC-MS	2-Butanone (MEK)
Aqueous/Solids	EPA 8260B	GC-MS	2-Chloroethylvinylether
Aqueous/Solids	EPA 8260B	GC-MS	2-Chlorotoluene
Aqueous/Solids	EPA 8260B	GC-MS	2-Hexanone
Aqueous/Solids	EPA 8260B	GC-MS	4-Chlorotoluene
Aqueous/Solids	EPA 8260B	GC-MS	4-Methyl-2-pentanone (MIBK)
Aqueous/Solids	EPA 8260B	GC-MS	Acetone
Aqueous/Solids	EPA 8260B	GC-MS	Acetonitrile
Aqueous/Solids	EPA 8260B	GC-MS	Acrolein
Aqueous/Solids	EPA 8260B	GC-MS	Acrylonitrile
Aqueous/Solids	EPA 8260B	GC-MS	Benzene
Aqueous/Solids	EPA 8260B	GC-MS	Bromobenzene
Aqueous/Solids	EPA 8260B	GC-MS	Bromochloromethane
Aqueous/Solids	EPA 8260B	GC-MS	Bromodichloromethane
Aqueous/Solids	EPA 8260B	GC-MS	Bromoform
Aqueous/Solids	EPA 8260B	GC-MS	Bromomethane

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820
Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8260B	GC-MS	Carbon disulfide
Aqueous/Solids	EPA 8260B	GC-MS	Carbon tetrachloride
Aqueous/Solids	EPA 8260B	GC-MS	Chlorobenzene
Aqueous/Solids	EPA 8260B	GC-MS	Chloroethane
Aqueous/Solids	EPA 8260B	GC-MS	Chloroform
Aqueous/Solids	EPA 8260B	GC-MS	Chloromethane
Aqueous/Solids	EPA 8260B	GC-MS	cis-1,2-Dichloroethene
Aqueous/Solids	EPA 8260B	GC-MS	cis-1,3-Dichloropropylene
Aqueous/Solids	EPA 8260B	GC/MS VOC	Cyclohexane
Aqueous/Solids	EPA 8260B	GC-MS	Dibromochloromethane
Aqueous/Solids	EPA 8260B	GC-MS	Dibromomethane
Aqueous/Solids	EPA 8260B	GC-MS	Dichlorodifluoromethane
Aqueous/Solids	EPA 8260B	GC-MS	DIPE
Aqueous/Solids	EPA 8260B	GC-MS	ETBE
Aqueous/Solids	EPA 8260B	GC/MS VOC	Ethyl Acetate
Aqueous/Solids	EPA 8260B	GC-MS	Ethylbenzene
Aqueous/Solids	EPA 8260B	GC-MS	Hexachlorobutadiene
Aqueous/Solids	EPA 8260B	GC-MS	Isopropylbenzene
Aqueous/Solids	EPA 8260B	GC-MS	m+p-Xylene
Aqueous/Solids	EPA 8260B	GC-MS	Methyl tert-butyl ether (MTBE)
Aqueous/Solids	EPA 8260B	GC-MS	Methylcyclohexane
Aqueous/Solids	EPA 8260B	GC-MS	Methylene Chloride
Aqueous/Solids	EPA 8260B	GC-MS	Mrthyl Acetate
Aqueous/Solids	EPA 8260B	GC-MS	MTBE
Aqueous/Solids	EPA 8260B	GC-MS	Naphthalene
Aqueous/Solids	EPA 8260B	GC/MS VOC	n-Butanol
Aqueous/Solids	EPA 8260B	GC-MS	n-Butylbenzene
Aqueous/Solids	EPA 8260B	GC-MS	n-Propylbenzene
Aqueous/Solids	EPA 8260B	GC-MS	o-Xylene
Aqueous/Solids	EPA 8260B	GC-MS	p-Isopropyltoluene
Aqueous/Solids	EPA 8260B	GC-MS	sec-Butylbenzene
Aqueous/Solids	EPA 8260B	GC-MS	Styrene
Aqueous/Solids	EPA 8260B	GC-MS	TAME
Aqueous/Solids	EPA 8260B	GC-MS	tert-Butyl alcohol
Aqueous/Solids	EPA 8260B	GC-MS	tert-Butylbenzene
Aqueous/Solids	EPA 8260B	GC-MS	Tetrachloroethene

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820
Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8260B	GC-MS	Toluene
Aqueous/Solids	EPA 8260B	GC-MS	trans-1,2-Dichloroethene
Aqueous/Solids	EPA 8260B	GC-MS	trans-1,3-Dichloropropene
Aqueous/Solids	EPA 8260B	GC-MS	Trichloroethene
Aqueous/Solids	EPA 8260B	GC-MS	Trichlorofluoromethane
Aqueous/Solids	EPA 8260B	GC-MS	Vinyl acetate
Aqueous/Solids	EPA 8260B	GC-MS	Vinyl chloride
Aqueous/Solids	EPA 8260B	GC-MS	Xylenes, total
Aqueous/Solids	EPA 8270C	GC-MS	1,2 Dichlorobenzene
Aqueous/Solids	EPA 8270C	GC-MS	1,2,4,5-Tetrachlorobenzene
Aqueous/Solids	EPA 8270C	GC-MS	1,2,4-Trichlorobenzene
Aqueous/Solids	EPA 8270C	GC-MS	1,2-Diphenylhydrazine
Aqueous/Solids	EPA 8270C	GC-MS	1,3 Dichlorobenzene
Aqueous/Solids	EPA 8270C	GC-MS	1,4 Dichlorobenzene
Aqueous/Solids	EPA 8270C	GC-MS	1-Methylnaphthalene
Aqueous/Solids	EPA 8270C	GC-MS	2,3,4,6-Tetrachlorophenol
Aqueous/Solids	EPA 8270C	GC-MS	2,4,5-Trichlorophenol
Aqueous/Solids	EPA 8270C	GC-MS	2,4,6-Trichlorophenol
Aqueous/Solids	EPA 8270C	GC-MS	2,4-Dichlorophenol
Aqueous/Solids	EPA 8270C	GC-MS	2,4-Dimethylphenol
Aqueous/Solids	EPA 8270C	GC-MS	2,4-Dinitrophenol
Aqueous/Solids	EPA 8270C	GC-MS	2,4-Dinitrotoluene
Aqueous/Solids	EPA 8270C	GC-MS	2,6-Dichlorophenol
Aqueous/Solids	EPA 8270C	GC-MS	2,6-Dinitrotoluene
Aqueous/Solids	EPA 8270C	GC-MS	2-Chloronaphthalene
Aqueous/Solids	EPA 8270C	GC-MS	2-Chlorophenol
Aqueous/Solids	EPA 8270C	GC-MS	2-Methyl-4,6-Dinitrophenol
Aqueous/Solids	EPA 8270C	GC-MS	2-Methylnaphthalene
Aqueous/Solids	EPA 8270C	GC-MS	2-Methylphenol
Aqueous/Solids	EPA 8270C	GC-MS	2-Nitroaniline
Aqueous/Solids	EPA 8270C	GC-MS	2-Nitrophenol
Aqueous/Solids	EPA 8270C	GC-MS	3,3'-Dichlorobenzidine
Aqueous/Solids	EPA 8270C	GC-MS	3-Nitroaniline
Aqueous/Solids	EPA 8270C	GC-MS	4-Bromophenyl-phenylether
Aqueous/Solids	EPA 8270C	GC-MS	4-Chloro-3-methylphenol
Aqueous/Solids	EPA 8270C	GC-MS	4-Chloroaniline

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820

Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8270C	GC-MS	4-Chlorophenyl-phenylether
Aqueous/Solids	EPA 8270C	GC-MS	4-Methylphenol (and/or 3-Methylphenol)
Aqueous/Solids	EPA 8270C	GC-MS	4-Nitroaniline
Aqueous/Solids	EPA 8270C	GC-MS	4-Nitrophenol
Aqueous/Solids	EPA 8270C	GC-MS	Acenaphthene
Aqueous/Solids	EPA 8270C	GC-MS	Acenaphthylene
Aqueous/Solids	EPA 8270C	GC-MS	Acetophenone
Aqueous/Solids	EPA 8270C	GC-MS	Aniline
Aqueous/Solids	EPA 8270C	GC-MS	Anthracene
Aqueous/Solids	EPA 8270C	GC-MS	Atrazine
Aqueous/Solids	EPA 8270C	GC-MS	Benzaldehyde
Aqueous/Solids	EPA 8270C	GC-MS	Benzidine
Aqueous/Solids	EPA 8270C	GC-MS	Benzo(a)anthracene
Aqueous/Solids	EPA 8270C	GC-MS	Benzo(a)pyrene
Aqueous/Solids	EPA 8270C	GC-MS	Benzo(b)fluoranthene
Aqueous/Solids	EPA 8270C	GC-MS	Benzo(g,h,i)perylene
Aqueous/Solids	EPA 8270C	GC-MS	Benzo(k)fluoranthene
Aqueous/Solids	EPA 8270C	GC-MS	Benzoic acid
Aqueous/Solids	EPA 8270C	GC-MS	Benzyl alcohol
Aqueous/Solids	EPA 8270C	GC-MS	Biphenyl
Aqueous/Solids	EPA 8270C	GC-MS	bis(2-Chloroethoxy)methane
Aqueous/Solids	EPA 8270C	GC-MS	bis(2-Chloroethyl)ether
Aqueous/Solids	EPA 8270C	GC-MS	bis(2-Chloroiospropyl) ether
Aqueous/Solids	EPA 8270C	GC-MS	bis(2-ethylhexyl) phthalate
Aqueous/Solids	EPA 8270C	GC-MS	bis(2-ethylhexyl) phthalate
Aqueous/Solids	EPA 8270C	GC-MS	Butyl benzyl phthalate
Aqueous/Solids	EPA 8270C	GC-MS	Butyl benzyl phthalate
Aqueous/Solids	EPA 8270C	GC-MS	Caprolactom
Aqueous/Solids	EPA 8270C	GC-MS	Carbazole
Aqueous/Solids	EPA 8270C	GC-MS	Carbazole
Aqueous/Solids	EPA 8270C	GC-MS	Chrysene
Aqueous/Solids	EPA 8270C	GC-MS	Chrysene
Aqueous/Solids	EPA 8270C	GC-MS	Dibenzo(a,h)anthracene
Aqueous/Solids	EPA 8270C	GC-MS	Dibenzo(a,h)anthracene
Aqueous/Solids	EPA 8270C	GC-MS	Dibenzofuran

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820

Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8270C	GC-MS	Dibenzofuran
Aqueous/Solids	EPA 8270C	GC-MS	Diethyl phthalate
Aqueous/Solids	EPA 8270C	GC-MS	Diethyl phthalate
Aqueous/Solids	EPA 8270C	GC-MS	Dimethyl phthalate
Aqueous/Solids	EPA 8270C	GC-MS	Dimethyl phthalate
Aqueous/Solids	EPA 8270C	GC-MS	Di-n-butylphthalate
Aqueous/Solids	EPA 8270C	GC-MS	Di-n-butylphthalate
Aqueous/Solids	EPA 8270C	GC-MS	Di-n-octylphthalate
Aqueous/Solids	EPA 8270C	GC-MS	Di-n-octylphthalate
Aqueous/Solids	EPA 8270C	GC-MS	Fluoranthene
Aqueous/Solids	EPA 8270C	GC-MS	Fluoranthene
Aqueous/Solids	EPA 8270C	GC-MS	Fluorene
Aqueous/Solids	EPA 8270C	GC-MS	Fluorene
Aqueous/Solids	EPA 8270C	GC-MS	Hexachlorobenzene
Aqueous/Solids	EPA 8270C	GC-MS	Hexachlorobenzene
Aqueous/Solids	EPA 8270C	GC-MS	Hexachlorobutadiene
Aqueous/Solids	EPA 8270C	GC-MS	Hexachlorobutadiene
Aqueous/Solids	EPA 8270C	GC-MS	Hexachlorocyclopentadiene
Aqueous/Solids	EPA 8270C	GC-MS	Hexachloroethane
Aqueous/Solids	EPA 8270C	GC-MS	Indeno(1,2,3, cd)pyrene
Aqueous/Solids	EPA 8270C	GC-MS	Isophorone
Aqueous/Solids	EPA 8270C	GC-MS	Naphthalene
Aqueous/Solids	EPA 8270C	GC-MS	Nitrobenzene
Aqueous/Solids	EPA 8270C	GC-MS	N-Nitrosodiethylamine
Aqueous/Solids	EPA 8270C	GC-MS	N-Nitrosodimethylamine
Aqueous/Solids	EPA 8270C	GC-MS	N-Nitroso-di-n-propylamine
Aqueous/Solids	EPA 8270C	GC-MS	N-Nitrosodiphenylamine
Aqueous/Solids	EPA 8270C	GC-MS	o-Toluidine
Aqueous/Solids	EPA 8270C	GC-MS	p-Dioxane
Aqueous/Solids	EPA 8270C	GC-MS	Pentachlorobenzene
Aqueous/Solids	EPA 8270C	GC-MS	Pentachlorophenol
Aqueous/Solids	EPA 8270C	GC-MS	Phenanthrene
Aqueous/Solids	EPA 8270C	GC-MS	Phenol
Aqueous/Solids	EPA 8270C	GC-MS	Pyrene
Aqueous/Solids	EPA 8270C	GC-MS	Pyridine
Aqueous/Solids	EPA 8270C SIM	GC-MS	1-Methylnaphthalene

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820

Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8270C SIM	GC-MS	2-Methylnaphthalene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Acenaphthene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Acenaphthylene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Anthracene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Benzo(a)anthracene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Benzo(a)pyrene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Benzo(b)fluoranthene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Benzo(g,h,i)perylene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Benzo(k)fluoranthene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Chrysene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Dibenz(a,h) anthracene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Fluoranthene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Fluorene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Indeno(1,2,3-cd) pyrene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Naphthalene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Phenanthrene
Aqueous/Solids	EPA 8270C SIM	GC-MS	Pyrene
Aqueous/Solids	EPA 8270D	GC-MS	1,2 Dichlorobenzene
Aqueous/Solids	EPA 8270D	GC-MS	1,2,4,5-Tetrachlorobenzene
Aqueous/Solids	EPA 8270D	GC-MS	1,2,4-Trichlorobenzene
Aqueous/Solids	EPA 8270D	GC-MS	1,2-Diphenylhydrazine
Aqueous/Solids	EPA 8270D	GC-MS	1,3 Dichlorobenzene
Aqueous/Solids	EPA 8270D	GC-MS	1,4 Dichlorobenzene
Aqueous/Solids	EPA 8270D	GC-MS	1-Methylnaphthalene
Aqueous/Solids	EPA 8270D	GC-MS	2,3,4,6-Tetrachlorophenol
Aqueous/Solids	EPA 8270D	GC-MS	2,4,5-Trichlorophenol
Aqueous/Solids	EPA 8270D	GC-MS	2,4,6-Trichlorophenol
Aqueous/Solids	EPA 8270D	GC-MS	2,4-Dichlorophenol
Aqueous/Solids	EPA 8270D	GC-MS	2,4-Dimethylphenol
Aqueous/Solids	EPA 8270D	GC-MS	2,4-Dinitrophenol
Aqueous/Solids	EPA 8270D	GC-MS	2,4-Dinitrotoluene
Aqueous/Solids	EPA 8270D	GC-MS	2,6-Dichlorophenol
Aqueous/Solids	EPA 8270D	GC-MS	2,6-Dinitrotoluene
Aqueous/Solids	EPA 8270D	GC-MS	2-Chloronaphthalene
Aqueous/Solids	EPA 8270D	GC-MS	2-Chlorophenol
Aqueous/Solids	EPA 8270D	GC-MS	2-Methyl-4,6-Dinitrophenol

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820

Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8270D	GC-MS	2-Methylnaphthalene
Aqueous/Solids	EPA 8270D	GC-MS	2-Methylphenol
Aqueous/Solids	EPA 8270D	GC-MS	2-Nitroaniline
Aqueous/Solids	EPA 8270D	GC-MS	2-Nitrophenol
Aqueous/Solids	EPA 8270D	GC-MS	3,3'-Dichlorobenzidine
Aqueous/Solids	EPA 8270D	GC-MS	3-Nitroaniline
Aqueous/Solids	EPA 8270D	GC-MS	4-Bromophenyl-phenylether
Aqueous/Solids	EPA 8270D	GC-MS	4-Chloro-3-methylphenol
Aqueous/Solids	EPA 8270D	GC-MS	4-Chloroaniline
Aqueous/Solids	EPA 8270D	GC-MS	4-Chlorophenyl-phenylether
Aqueous/Solids	EPA 8270D	GC-MS	4-Methylphenol (and/or 3-Methylphenol)
Aqueous/Solids	EPA 8270D	GC-MS	4-Nitroaniline
Aqueous/Solids	EPA 8270D	GC-MS	4-Nitrophenol
Aqueous/Solids	EPA 8270D	GC-MS	Acenaphthene
Aqueous/Solids	EPA 8270D	GC-MS	Acenaphthylene
Aqueous/Solids	EPA 8270D	GC-MS	Aniline
Aqueous/Solids	EPA 8270D	GC-MS	Anthracene
Aqueous/Solids	EPA 8270D	GC-MS	Atrazine
Aqueous/Solids	EPA 8270D	GC-MS	Benzidine
Aqueous/Solids	EPA 8270D	GC-MS	Benzo(a)anthracene
Aqueous/Solids	EPA 8270D	GC-MS	Benzo(a)pyrene
Aqueous/Solids	EPA 8270D	GC-MS	Benzo(b)fluoranthene
Aqueous/Solids	EPA 8270D	GC-MS	Benzo(g,h,i)perylene
Aqueous/Solids	EPA 8270D	GC-MS	Benzo(k)fluoranthene
Aqueous/Solids	EPA 8270D	GC-MS	Benzoic acid
Aqueous/Solids	EPA 8270D	GC-MS	Benzyl alcohol
Aqueous/Solids	EPA 8270D	GC-MS	bis(2-Chloroethoxy)methane
Aqueous/Solids	EPA 8270D	GC-MS	bis(2-Chloroethyl)ether
Aqueous/Solids	EPA 8270D	GC-MS	bis(2-Chloroiospropyl) ether
Aqueous/Solids	EPA 8270D	GC-MS	bis(2-ethylhexyl) phthalate
Aqueous/Solids	EPA 8270D	GC-MS	Butyl benzyl phthalate
Aqueous/Solids	EPA 8270D	GC-MS	Caprolactom
Aqueous/Solids	EPA 8270D	GC-MS	Carbazole
Aqueous/Solids	EPA 8270D	GC-MS	Chrysene
Aqueous/Solids	EPA 8270D	GC-MS	Dibenzo(a,h)anthracene

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820

Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8270D	GC-MS	Dibenzofuran
Aqueous/Solids	EPA 8270D	GC-MS	Diethyl phthalate
Aqueous/Solids	EPA 8270D	GC-MS	Dimethyl phthalate
Aqueous/Solids	EPA 8270D	GC-MS	Di-n-butylphthalate
Aqueous/Solids	EPA 8270D	GC-MS	Di-n-octylphthalate
Aqueous/Solids	EPA 8270D	GC-MS	Fluoranthene
Aqueous/Solids	EPA 8270D	GC-MS	Fluorene
Aqueous/Solids	EPA 8270D	GC-MS	Hexachlorobenzene
Aqueous/Solids	EPA 8270D	GC-MS	Hexachlorobutadiene
Aqueous/Solids	EPA 8270D	GC-MS	Hexachlorocyclopentadiene
Aqueous/Solids	EPA 8270D	GC-MS	Hexachloroethane
Aqueous/Solids	EPA 8270D	GC-MS	Indeno(1,2,3, cd)pyrene
Aqueous/Solids	EPA 8270D	GC-MS	Isophorone
Aqueous/Solids	EPA 8270D	GC-MS	Naphthalene
Aqueous/Solids	EPA 8270D	GC-MS	Nitrobenzene
Aqueous/Solids	EPA 8270D	GC-MS	N-Nitrosodiethylamine
Aqueous/Solids	EPA 8270D	GC-MS	N-Nitrosodimethylamine
Aqueous/Solids	EPA 8270D	GC-MS	N-Nitroso-di-n-propylamine
Aqueous/Solids	EPA 8270D	GC-MS	N-Nitrosodiphenylamine
Aqueous/Solids	EPA 8270D	GC-MS	o-Toluidine
Aqueous/Solids	EPA 8270D	GC-MS	Pentachlorobenzene
Aqueous/Solids	EPA 8270D	GC-MS	Pentachlorophenol
Aqueous/Solids	EPA 8270D	GC-MS	Phenanthrene
Aqueous/Solids	EPA 8270D	GC-MS	Phenol
Aqueous/Solids	EPA 8270D	GC-MS	Pyrene
Aqueous/Solids	EPA 8270D	GC-MS	Pyridine
Aqueous/Solids	EPA 8270D SIM	GC-MS	1-Methylnaphthalene
Aqueous/Solids	EPA 8270D SIM	GC-MS	2-Methylnaphthalene
Aqueous/Solids	EPA 8270D SIM	GC-MS	Acenaphthene
Aqueous/Solids	EPA 8270D SIM	GC-MS	Acenaphthylene
Aqueous/Solids	EPA 8270D SIM	GC-MS	Anthracene
Aqueous/Solids	EPA 8270D SIM	GC-MS	Benzo(a)anthracene
Aqueous/Solids	EPA 8270D SIM	GC-MS	Benzo(a)pyrene
Aqueous/Solids	EPA 8270D SIM	GC-MS	Benzo(b)fluoranthene
Aqueous/Solids	EPA 8270D SIM	GC-MS	Benzo(g,h,i)perylene
Aqueous/Solids	EPA 8270D SIM	GC-MS	Benzo(k)fluoranthene

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820
Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8270D SIM	GC-MS	Chrysene
Aqueous/Solids	EPA 8270D SIM	GC-MS	Dibenz(a,h) anthracene
Aqueous/Solids	EPA 8270D SIM	GC-MS	Fluoranthene
Aqueous/Solids	EPA 8270D SIM	GC-MS	Fluorene
Aqueous/Solids	EPA 8270D SIM	GC-MS	Indeno(1,2,3-cd) pyrene
Aqueous/Solids	EPA 8270D SIM	GC-MS	Naphthalene
Aqueous/Solids	EPA 8270D SIM	GC-MS	Phenanthrene
Aqueous/Solids	EPA 8270D SIM	GC-MS	Pyrene
Aqueous/Solids	EPA 8330A	HPLC	1,3,5-Trinitrobenzene
Aqueous/Solids	EPA 8330A	HPLC	1,3-Dinitrobenzene
Aqueous/Solids	EPA 8330A	HPLC	2,4,6-Trinitrotoluene
Aqueous/Solids	EPA 8330A	HPLC	2,4-Dinitrotoluene
Aqueous/Solids	EPA 8330A	HPLC	2,6-Dinitrotoluene
Aqueous/Solids	EPA 8330A	HPLC	2-Amino-4,6-dinitrotoluene
Aqueous/Solids	EPA 8330A	HPLC	2-Nitrotoluene
Aqueous/Solids	EPA 8330A	HPLC	3,5-Dinitroaniline
Aqueous/Solids	EPA 8330A	HPLC	3-Nitrotoluene
Aqueous/Solids	EPA 8330A	HPLC	4-Amino-2,6-dinitrotoluene
Aqueous/Solids	EPA 8330A	HPLC	4-Nitrotoluene
Aqueous/Solids	EPA 8330A	HPLC	HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
Aqueous/Solids	EPA 8330A	HPLC	Nitrobenzene
Aqueous/Solids	EPA 8330A	HPLC	Nitroglycerin
Aqueous/Solids	EPA 8330A	HPLC	Pentaerythritoltetranitrate
Aqueous/Solids	EPA 8330A	HPLC	RDX (Hexahydro-1,3,5-trinitro-1,3,5-triazine)
Aqueous/Solids	EPA 8330A	HPLC	Tetryl (Methyl-2,4,6-trinitrophenylnitramine)
Aqueous/Solids	EPA 9012B	FIA	Total Cyanide
Aqueous/Solids	EPA 9038	Spectrophotometer	Sulfate
Aqueous/Solids	EPA 9056A	IC	Bromide
Aqueous/Solids	EPA 9056A	IC	Chloride
Aqueous/Solids	EPA 9056A	IC	Fluoride
Aqueous/Solids	EPA 9056A	IC	Nitrate and Nitrite as N
Aqueous/Solids	EPA 9056A	IC	Nitrate as N
Aqueous/Solids	EPA 9056A	IC	Nitrite as N
Aqueous/Solids	EPA 9056A	IC	Sulfate

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820

Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 9060A	TOC Analyzer	TOC
Aqueous/Solids	EPA 9066	FIA	Total Phenolics (4AAP)
Aqueous/Solids	EPA 9251	FIA	Chloride
Aqueous/Solids	Florida PRO	GC-FID	Petroleum Hydrocarbons
Aqueous/Solids	GCAL SOP WL-070	IC	Acetic Acid
Aqueous/Solids	GCAL SOP WL-070	IC	Butyric Acid
Aqueous/Solids	GCAL SOP WL-070	IC	Formic Acid
Aqueous/Solids	GCAL SOP WL-070	IC	Lactic Acid
Aqueous/Solids	GCAL SOP WL-070	IC	Propionic Acid
Aqueous/Solids	MADEP EPH	GC-FID	C11-C22 Aromatic Hydrocarbons
Aqueous/Solids	MADEP EPH	GC-FID	C19-C36 Aliphatic Hydrocarbons
Aqueous/Solids	MADEP EPH	GC-FID	C9-C18 Aliphatic Hydrocarbons
Aqueous/Solids	MADEP VPH	GC-FID	C5-C8 Aliphatic Hydrocarbons
Aqueous/Solids	MADEP VPH	GC-FID	C9-C10 Aromatic Hydrocarbons
Aqueous/Solids	MADEP VPH	GC-FID	C9-C12 Aliphatic Hydrocarbons
Aqueous/Solids	SM4500 NH3 B & C	Titration	Ammonia as N
Aqueous/Solids	SM4500 NH3 B & C	Titration	Kjeldahl Nitrogen
Aqueous/Solids	SM4500 NH3 B & D	ISE	Ammonia as N
Aqueous/Solids	SW846 Sec 7.3	FIA	Reactive Cyanide
Aqueous/Solids	SW846 Sec 7.3	Titration	Reactive sulfide
Aqueous/Solids	TNRCC 1005	GC-FID	GRO-aliphatic
Aqueous/Solids	TNRCC 1005	GC-FID	GRO-aromatic
Aqueous/Solids	TNRCC 1005	GC-FID	GRO-Total
Aqueous/Solids	TNRCC 1005	GC-FID	Total Petroleum Hydrocarbon
Aqueous/Solids	TNRCC 1006	GC-FID	DRO-aliphatic
Aqueous/Solids	TNRCC 1006	GC-FID	DRO-aromatic
Aqueous/Solids	TNRCC 1006	GC-FID	DRO-Total
Aqueous/Solids	TNRCC 1006	GC-FID	ORO-aliphatic
Aqueous/Solids	TNRCC 1006	GC-FID	ORO-aromatic
Aqueous/Solids	TNRCC 1006	GC-FID	ORO-Total
Aqueous/Solids	TNRCC 1006	GC-FID	Total Petroleum Hydrocarbon

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Gulf Coast Analytical Laboratories, LLC

7979 Innovation Park Drive, Baton Rouge, LA 70820
Randy Whittington Phone: 225-769-4900

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 3010A	Acid Digestion - Metals	Prep Method
Aqueous	EPA 3510C	Separatory Funnel	Prep Method
Aqueous	EPA 3535A	Solid Phase Extraction	Prep Method
Solids	EPA 3050B	Acid Digestion	Prep Method
Solids	EPA 3550C	Extraction - Sonication	Prep Method
Solids	EPA 5035	Purge and Trap	Prep Method
Aqueous/Solids	EPA 1311	TCLP	Prep Method
Aqueous/Solids	EPA 3540C	Extraction - Soxhlet	Prep Method
Aqueous/Solids	EPA 5030B	Purge and Trap	Prep Method