DRAFT FIELD SAMPLING PLAN HILLCREST COMMUNITY ENVIRONMENTAL INVESTIGATION

Phase II: Groundwater and Subsurface Soil Sampling

CORPUS CHRISTI, TEXAS

Prepared in cooperation with the Hillcrest Community by
Texas Commission on Environmental Quality
Austin, Texas

September 2010

To be implemented under the direction and oversight of TCEQ and the Hillcrest
Community by:

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Approved by:

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TCEQ Project Manager	Project Sponsor

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Contractor Acknowledgement

I am responsible for some or all of the contracted activities conducted under this field sampling plan (FSP). I have reviewed this Hillcrest Community Environmental Investigation (HCEI) Phase II FSP and the TCEQ Quality Assurance Project Plan (QAPP) for the Petroleum Storage Tank (PST) Program (Document No. 201009.0). I understand this FSP and the QAPP together constitute the sampling and analysis plan for the site, and I understand that the terms of the current Petroleum Storage Tank Site Activities Contract apply. I understand the project objectives and acknowledge receipt of the plan.

_____	_____
Suzanne Green (date)	Taryn Scholz (date)
Project Manager	Quality Assurance Specialist
Geo Strata Environmental	QAA

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Laboratory Acknowledgement

I am responsible for some or all of the contracted activities conducted under this field sampling plan (FSP). I have reviewed this Hillcrest Community Environmental Investigation (HCEI) Phase II FSP and the TCEQ QAPP for the PST Program (Document No. 201009.0). I understand the FSP and the QAPP together constitute the sampling and analysis plan for the site, and I understand that the terms of the current Petroleum Storage Tank Site Activities Contract apply. I understand the project objectives and acknowledge receipt of the plan.

_____

To be determined (date)
Laboratory Manager
To be determined

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Table of Contents

List of Figures 7
List of Tables 7
List of Appendices 7
List of Acronyms 8

1.0 Introduction 9
1.1 Purpose 9
1.2 Project Organization 9

2.0 Site and Project Summary 12
2.1 Site Description and History 12
2.2 Previous Investigations 12
2.3 Chemicals of Concern 13
2.4 Schedule of Activities 14

3.0 Analytical Requirements and Data Quality Objectives 16
3.1 Analytical Requirements and Data Review Requirements 16
3.1.1 Analytical Requirements 18
3.1.2 Data Review and Validation 24
3.1.2.1 Data Review and Validation Memorandum 24
3.1.2.2 Data Usability Summary 25
3.2 Human Health Effects 25

4.0 Sampling Plan Design 26
4.1 Sampling Locations and Rationale 26
4.2 Sample Analysis 27
4.3 Field Quality Control Samples 28
4.4 Oversight 29
5.0 Sampling Methods and Sample Handling 29
5.1 Field Sampling Procedures 29
5.1.1 Sample Collection 30
5.1.1.1 Soil Samples 30
5.1.1.2 Groundwater Samples 33
5.1.1.2.1 Groundwater Samples from a Monitoring Well 33
5.2 Sample Containers, Sample Preservation, and Holding Time 34
5.3 Chain of Custody Procedures 34

6.0 Field Survey and Measurements 36
6.1 Property Access 36
6.2 GPS Information 36
6.3 Water Well Survey 37

DRAFT

7.0 Additional Field Activities 37
7.1 Sample Identification and Documentation of Field Activities37
7.2 Equipment Decontamination 39
7.3 Investigation-derived Waste 40
7.4 Site Restoration 40
7.5 Health and Safety 41
7.6 Deviations, Modifications, and/or Departures from the FSP or QAPP 27.....41

8.0 Exceptions, Additions, and Changes to the TCEQ PST Program QAPP 42

DRAFT

List of Figures

Figure Title

1 Project Organization Chart..... 11
2 Site Location Map.....
3 Phase I Results Map.....
4 Monitor Well Location Map.....

List of Tables

Table Title

3.1 Levels of required performance..... 13
4.1 Sample rationale, locations, and analyses 16
4.2 Frequency of collection of field QC samples 17
5.1 Nonstandard sampling methods 21

List of Appendices

Appendix Title

A TCEQ SOPs.....28

1.3 Site Restoration
1.4 Management of Investigative Derived Waste
1.5 Decontamination
6.1 Field Activity Documentation and Reporting
6.3 Collection of VOC Samples
6.4 Sample Handling and Custody
6.5 Collection of QA/QC Samples

7.3 Purging a Monitoring Well with a Pump
7.5 Measurement of Field Parameters
7.8 Groundwater Sampling Using a Low-flow Technique
10.1 Soil Sampling Using a Trowel
10.2 Soil Sampling Using a Split Barrel Sampler

17.1 GPS Data Collection and Submission

DRAFT

List of Acronyms

BGL	Below ground level
COC	Chemical of concern
DQO	Data quality objectives
DUS	Data usability summary
EDD	Electronic data deliverable
EPA	U. S. Environmental Protection Agency
FB	Field blank
FD	Field duplicate
FSP	Field sampling plan
GPS	Global positioning system
HASP	Health and safety plan
HRS	Hazard Ranking System
H&SO	Health and Safety Officer
IDW	Investigation derived waste
IRA	Immediate removal
MCL	Maximum contaminant level
MDL	Method detection limit
MQL	Method quantitation limit
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MS/MSD	Matrix spike/matrix spike duplicate
PCL	Protective concentration limit
PM	Project manager
ppb	Parts per billion
ppm	Parts per million
PST	Petroleum Storage Tank
PWS	Public water system
QAPP	TCEQ Quality Assurance Project Plan for the PST Program
QA	Quality assurance
QC	Quality control
RCRA	Resource Conservation and Recovery Act
SDL	Sample detection limit
SAP	Sampling and analysis plan
SOP	Standard operating procedure
SSDAP	Superfund Site Discovery and Assessment Program
TPH	Total Petroleum hydrocarbon
TCEQ	Texas Commission on Environmental Quality
TRRP	Texas Risk Reduction Program
VOA	Volatile organic analysis
VOC	Volatile organic compound
WO	Work order

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1.0 Introduction

This site-specific field sampling plan (FSP) and the TCEQ Quality Assurance Project Plan (QAPP) for the PST Program (Document No. 201009.0) constitute the sampling and analysis plan (SAP) for TCEQ-directed sampling activities proposed during Phase II of the Hillcrest Community Environmental Investigation (HCEI). This SAP shall function as a stand-alone project document for Phase II of the HCEI. The work associated with this FSP is being conducted under PST Contract No. 582-9-91033. A PST contract is being used as the chemicals of concern (COC) of this investigation most closely resemble those of PST projects.

1.1 Purpose

During the initial phase (Phase I) of the HCEI, a passive soil gas (PSG) survey was performed to obtain passive soil gas data to screen the Hillcrest Subdivision and areas adjacent to known refinery sector subsurface releases for potential volatile organic compound (VOC) impacts to groundwater. The soil gas data collected during Phase I (displayed in Figure 3) will be utilized during Phase II to select suitable locations for installation of monitor wells, for collection and analysis of soil and groundwater samples. The purpose of Phase II is to determine whether COCs have impacted soil and/or groundwater within the Hillcrest Community and adjacent areas.

1.2 Project Organization

The project team for the HCEI comprises the TCEQ's project sponsor, project manager (PM) and project toxicologist, and the contractor's PM, QA specialist, health and safety officer (H&SO), and its subcontracted analytical testing laboratory. The lines of authority and communication for the project are presented in the project organization chart in Figure 1.

In addition to the roles and responsibilities set forth in Element A.4 of the QAPP, the following additional responsibilities are assigned:

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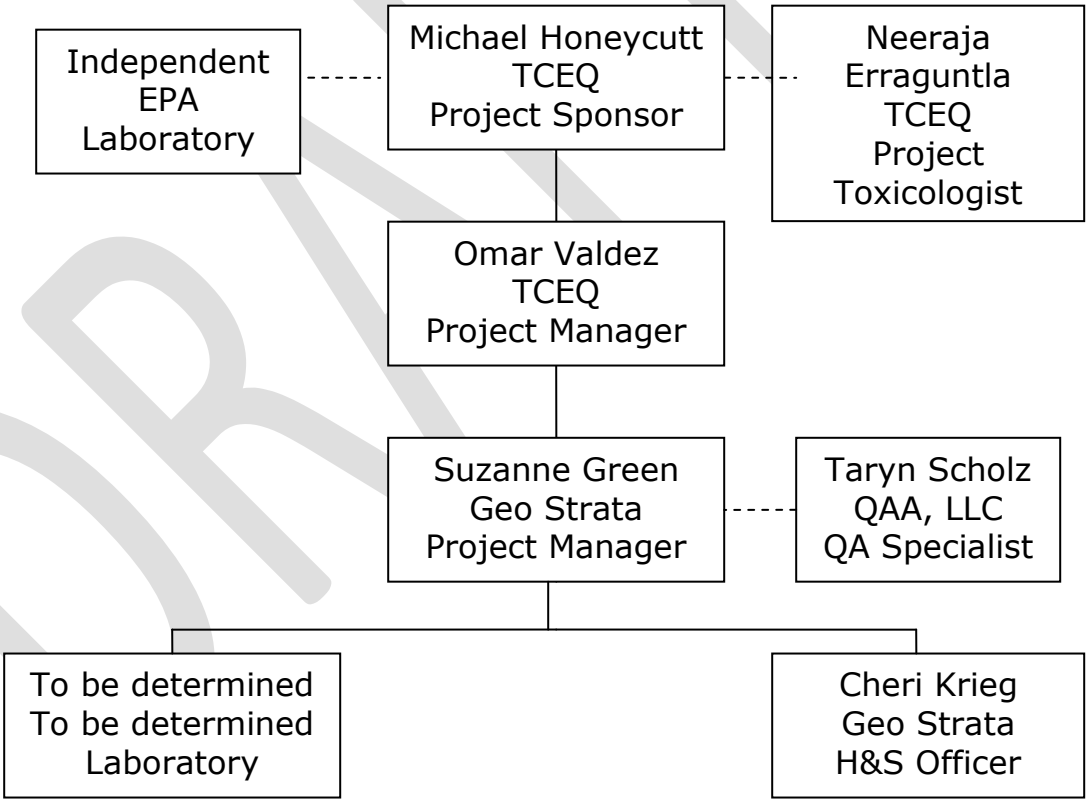
Figure 1: Project Organization Chart



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TCEQ Project Sponsor – Dr. Michael Honeycutt

The TCEQ Project Sponsor is Dr. Michael Honeycutt. Dr. Honeycutt has the primary role of defining the project objectives, establish project policies and procedures to address the specific needs of the project as a whole.

TCEQ Project Manager – Mr. Omar Valdez

The TCEQ PM for the project is Mr. Omar Valdez. He has oversight responsibility for all aspects of the project including direction of GeoStrata, technical review of work products, issues affecting data quality, and all contractual aspects of the project. Mr. Valdez will be the primary advisor of the Project Sponsor, advising him of technical progress, program needs, challenges, and recommended solutions.

TCEQ Project Toxicologist- Dr. Neeraja Erraguntla

The TCEQ Project Toxicologist is Dr. Neeraja Erraguntla. She has responsibility for all aspects of performing health assessments on project data.

GeoStrata Project Manager – Ms. Suzanne Green:

Suzanne Green of GeoStrata is the prime contractor's Project Manager (PM). Ms. Green has responsibility for the contractual aspects of the project as the prime contractor and for the quality of all project deliverables. Ms. Green has the primary responsibility for FSP implementation and communication with TCEQ. GeoStrata through Ms. Green will arrange, monitor, direct, and control staff and other resources needed to execute the FSP within budget and scheduled restraints and establish clear lines of communication with TCEQ. Ms. Green is responsible for ensuring that the technical activities have appropriate planning and oversight for assurance of overall quality in data collection and report production to meet or exceed project requirements.

GeoStrata GeoScientist – Ms. Cheri Krieg:

Cheri Krieg of GeoStrata will also serve as the Field Manager and H&SO and is responsible for the implementation of the FSP. As Field Manager, she will direct all fieldwork, communicate any difficulties encountered in the field to project management, and stop fieldwork if safety or data quality are significantly affected by site operations.

QAA, Quality Assurance Specialist – Ms. Taryn Scholz:

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Taryn Scholz will have the overall responsibility to independently assure that the planning, implementation, and reporting fulfill the objectives for data use. This includes QAPP adherence and documentation of deviations from the QAPP. Ms. Scholz will also oversee the review and validation of all analytical data and will prepare a Data Usability Summary on all project data. The QA Specialist must have reporting responsibility outside of the project organization to assure independent evaluation of project data.

2.0 Site and Project Summary

2.1 Site Description and Background

The Hillcrest community (Site) is located in a residential neighborhood, consisting of single family residences on the north side of Corpus Christi, Nueces County, Texas. The Hillcrest Community is bounded by the refinery sector to the west and north. Nueces Bay Street borders the community to the west, Broadway Street to the north, Port Road to the east, and Interstate 37 to the south. A Site Location Map is presented as Figure 2. The topography at the Site is relatively flat, with a slight gradient to the north and to the east. The surrounding area is utilized for residential, light industry, and refinery purposes. Groundwater is encountered locally at a depth of approximately 15 to 20 feet below ground surface (BGS) and is not normally used as a potable source. The known or suspected sources of COCs are typically those encountered in the petroleum refining industry (i.e., hydrocarbons). The contaminant migration pathways of concern are groundwater and utility easements with Hillcrest residents representing potential receptors.

2.2 Previous Investigations

Texas A&M University Health Science Center scientists and the Citizens for Environmental Justice (CFEJ) conducted a pilot study in 2008 that detected benzene in the blood of some Hillcrest community residents. In response to the results of this study and at the request of the Hillcrest community at the December 1, 2009, neighborhood meeting, the TCEQ is planning an investigation, the Hillcrest Community Environmental Investigation (HCEI). The HCEI will attempt to determine whether there are environmental impacts from volatile organic compounds (VOCs) to soil, groundwater, or ambient air.

The initial phase (Phase I) of the HCEI was performance of a passive soil gas (PSG) survey, to obtain passive soil gas data to screen the Hillcrest Community and areas adjacent to the refinery sector for potential VOC impacts to groundwater. The TCEQ contracted with Geo Strata to assist with the Phase I activities.

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Geo Strata team members completed the passive soil gas survey between April 28 and April 30, 2010. The PSG sampler grid GPS coordinates were provided to Geo Strata by TCEQ and consisted of a fine sampler grid within the HCEI areas adjacent to the refinery sector to the west, north, and east and a coarser grid in the interior of the Hillcrest Community.

Results of the Beacon laboratory analysis of 208 PSG samplers, 22 field duplicates, 11 matrix spike/matrix spike duplicates (MS/MSDs) and two ambient field blanks were reported by Beacon in laboratory report #2315. According to the Beacon report:

- Naphthalene concentrations greater than the standard reporting limit of 25 nanograms (ng) were observed in four PSG samplers, AW-41 (1,574 ng), I-50 (64 ng), I-35 (606 ng) and AE-29 (300 ng);

- A cumulative BTEX (Benzene, Toluene, Xylene, and Ethylbenzene) concentration of 25 ng was observed in one PSG sampler, AW-10 (37 ng); and

- Total petroleum hydrocarbons (TPH) concentrations, comprised of C5 to C9 aliphatic hydrocarbons, specifically not including BTEX compounds, were identified above the standard reporting limit of 2,500 ng primarily in the northwestern and western portions of the project area. The highest concentration was observed in PSG sampler AW-50 (12,834 ng).

The soil gas data collected during Phase I will be utilized during Phase II to select suitable locations for installation of monitor wells, and for collection and analysis of soil and groundwater samples.

2.3 Chemicals of Concern

Based on the results of the Phase I investigation, as well as the 2008 Texas A&M University Health Science Center/ CFEJ study, the primary COCs are considered to be benzene, toluene, ethylbenzene, xylene, naphthalene, and TPH. Nonetheless, the full suite of VOCs and polycyclic aromatic hydrocarbons (PAHs) as listed in Section 3.1 will be analyzed in all soil and groundwater samples collected.

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2.4 Schedule of Activities

The sampling event will follow the schedule given in the WO. If additional work is added by the TCEQ beyond the proposed scope, then the due dates of the project tasks listed in the WO will be modified accordingly in the amended WO. Preliminary estimates anticipate that the monitor wells will be installed mid to late October, 2010. The six monitor wells will take approximately three days to install, and the groundwater sampling will take an additional two days. The tasks related to the collection of environmental samples are:

2.4.1 Securing access to the locations of the proposed soil borings/monitor wells

The TCEQ will be responsible for securing access to the locations for the proposed soil borings/monitor wells.

2.4.2 Line clearance of all soil boring/monitor well locations

At least 48-hours prior to mobilizing to the site (excluding weekends and holidays), Texas One-Call ("Dig Tess") will be notified of the impending excavation activities (i.e., installation of soil borings/monitor wells), to provide an opportunity for its members to locate and mark utilities in the area of assessment. Additionally, a commercial firm specializing in locating underground utilities will be contracted to confirm utilities identified by Texas One-Call members as well as any others not identified by Texas One-Call members.

2.4.3 Construction of centralized decontamination area

Prior to installation of the proposed soil borings/monitor wells, a centralized decontamination area will be constructed within Hillcrest Park (Dempsey Street and Peabody Avenue). The decontamination area will be lined with heavy gauge plastic sheeting and designed with a collection system to capture all decontamination fluids.

2.4.4 Initial decontamination of all sampling equipment

All sampling equipment shall be decontaminated prior to sampling as outlined in Section 7.2
.

2.4.5 Installation and soil sampling of six (6) soil boring/monitoring wells

Six (6) soil borings will be advanced in locations selected by the TCEQ and the Hillcrest community as presented in Figure 4. The proposed soil borings

will be drilled using a drilling rig equipped with hollow stem augers. Based on previously obtained assessment data, and the anticipated depth to groundwater of 15 to 20 feet below ground surface (BGS), the proposed soil borings will be drilled to a maximum depth of 30 feet BGS, depending on field conditions/observations. Soil samples to be collected for laboratory analyses are fully described in Section 4.1 and collection procedures are detailed in Section 5.1.1.

Each soil boring will be converted into a 2-inch diameter monitor well to assess potential groundwater impacts. The newly converted monitor wells will be completed between 24-inches and 3.5-feet above the surface grade with a protective steel casing and locking cover. The wells will be sealed at the ground surface with 2500 PSI concrete and surrounded by three (3) equidistant metal stanchions to provide protection from traffic and other hazards. Following the installation of the monitor wells, a top of casing survey will be conducted and global positioning system (GPS) coordinates will be collected for each monitor well location utilizing sub meter precision.

Once the monitor wells have been completed, the wells will be developed until the fluids recovered from the well are observed to be clear and free of sediment.

Soil samples and equipment rinsate blanks will be transported to the overnight delivery office for shipment to the analytical testing laboratory.

2.4.6 Groundwater sampling of six (6) monitor wells

A minimum of 48-hours following the conversion of the six (6) soil borings to monitor wells and associated well development, the monitor wells will be gauged, purged, and sampled as outlined in Section 5.1.1.2.1

2.4.7 Waste management

Soil cuttings, Personal Protective Equipment (PPE), and monitor well development, purge, and decontamination fluids will be stored in sealed 55-gallon drums and managed in accordance with Section 7.3.

2.4.8 Site restoration

Upon completion of field activities, each soil boring/monitor well location, the centralized decontamination area, and the TCEQ storage area will be repaired to its original condition as outlined in Section 7.4 and SOP 1.3 (Site Remediation).

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3.0 Data Quality Objectives

3.1 Data Quality Objectives Process

Data Quality Objectives (DQOs) are qualitative and quantitative statements that translate non-technical project goals into technical project-specific decision goals. The seven-step DQO Process as described in Data Quality Objectives Process for Hazardous Waste Site Investigations (EPA, 1999) (G-4HW) was formally completed for this project. That is, outputs for each of the seven steps of the DQO Process were developed in the format suggested in G-4HW by the Project Team, in consultation with the Hillcrest community and other stakeholders, through communications and meetings, incorporating existing data whenever possible. The results of the DQO Process are discussed in the sections below and in Section 4 concerning the design of the sampling plan.

Step 1: State the Problem

Potential impacts to groundwater and subsurface soils in the Hillcrest Community from known subsurface releases are unknown.

Step 2: Identify the Decision

The necessity to perform health assessments and the appropriateness of implementing Phase IV (Indoor Air Assessment) must be determined as part of the HCEI.

Step 3: Identify Inputs to the Decision

VOC, PAH and TPH concentrations in groundwater and subsurface soils of the Hillcrest Community must be determined.

Step 4: Define the Boundaries of the Study

Phase II of the HCEI will focus on the Hillcrest Community as it is bounded by Nueces Bay Street to the west, Broadway Street to the north, Port Road to the east, and Interstate 37 to the south. The permanent monitor well locations and thus the sample locations for Phase II are displayed in Figure 4 of this FSP. All soil and groundwater samples will be analyzed by EPA SW-846 methods of TPH by TX 1005, VOC by EPA 8260, and PAH by EPA 8270

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with sufficient analytical sensitivity to serve project objectives. Data reviews performed by the Quality Assurance Specialist will be conducted in accordance with TCEQ's *Review and Reporting of COC Concentration Data* (RG-366/TRRP-13 December 2002).

Step 5: Develop a Decision Rule

If COC concentrations in groundwater or subsurface soils exceed appropriate health based benchmarks in Phase II, Phase IV of the HCEI will be implemented to perform a limited assessment of indoor air, where appropriate.

Step 6: Specify Limits on Decision Errors

The analytical results obtained in the investigation will be reviewed to support the decision rule; therefore, the analytical data obtained must be of sufficient completeness and quality. Random and/or systematic errors may be introduced during sample collection, sample handling and storage, sample analysis, data reduction, and data reporting. The Quality Control (QC) measures specified in the PST QAPP and the procedures outlined in this FSP will be followed to aid in the establishment of analytical quality and to minimize errors. Each member of the field team must follow the same procedures in order to minimize field errors. EPA-approved analytical methods will be employed to ensure sufficient analytical sensitivity. Field QC samples, including field duplicates, ambient field blanks, equipment rinsate blanks, trip blanks, and splits will be collected to monitor the precision of the field sampling event and the controlled conditions of the sampling and shipping environment. These QC samples are discussed in 4.3. The Quality Assurance Specialist will review all analytical data generated based on review criteria and limits presented in TRRP-13 to determine if the data meets project DQOs. Based on a comparison of analytical data to these criteria results may be qualified to indicate the limitations of the data. In cases where the data is deemed of insufficient quality to satisfy project DQOs, the data will be rejected and will not be used to support project decisions. Data validation is discussed further in 3.1.2.

Step 7: Optimize the Design

The number and location of the permanent monitor well locations have been selected to optimize the capture of potential COCs in soils and groundwater by using Phase I soil-gas screening data, considering the known groundwater gradient, and accounting for known groundwater contamination in adjacent facilities. Hollow stem auger technology is the selected drilling

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method as it is a low impact drilling approach that facilitates sampling for VOCs in soils. Encore samplers will be used for their minimal VOC loss properties during sample collection.

3.1.1 Analytical Requirements

As mentioned in Section 2.3, the primary COCs are considered to be benzene, toluene, ethylbenzene, xylene, naphthalene and TPH. Nonetheless, the full suite of VOCs and polycyclic aromatic hydrocarbons (PAHs) as listed in Table 3.1 will be analyzed in all soil and groundwater samples collected. The selected laboratory's method quantitation limit (MQL) and method detection limit (MDL) for each analyte will also be provided in the tables (TBD).

The Level of Required Performance (LORP) is a phrase used in TRRP to specify the lowest concentration of interest during chemical analyses. Health-based benchmarks yet to be determined in the final version of this FSP shall be the LORP for each analyte reported. Per the TRRP-13, the unadjusted MQLs should be below the LORPs for purposes of assessments as well as demonstration of conformance with critical PCLs. In order to show that "clean" or "not detected" samples were adequately analyzed, the MQL shall serve as the baseline for establishing the presence of VOCs in the sample media. Estimated concentrations that are below the MQL but exceed the method detection limit (MDL), and that meet the qualitative identification criteria of the method used, must be reported as detected results by the laboratory for the COC in the sample analyzed. As specified in the PST QAPP, non-detected results must be reported as less than the value of the SDL. The SDL is defined as the MDL adjusted to reflect sample-specific actions, such as dilution or use of smaller aliquot sizes than prescribed in the analytical method, and takes into account sample characteristics, sample preparation, and analytical adjustments. The SDL is that value below which the COC cannot be reliably detected. Additionally, the laboratory must routinely check the MDL for reasonableness to verify the laboratory's ability to reliably detect the COC at the MDL used for reporting detected results and for calculating non-detected results. This check can be demonstrated by analyzing a detectability check sample (DCS). A DCS is a reagent matrix spiked by the laboratory with the COC near, or within two to three times, the calculated MDL and carried through the sample preparation procedures for the analysis.

Table 3.1a Levels of required performance for VOCs in Soil

COC	Laboratory MQL (mg/Kg)	Laboratory MDL* (mg/Kg)	Health-based Benchmark (TBD)
Acetone	TBD	TBD	TBD
Benzene	TBD	TBD	TBD
Bromobenzene	TBD	TBD	TBD
Bromochloromethane	TBD	TBD	TBD
Bromodichloromethane	TBD	TBD	TBD
Bromoform	TBD	TBD	TBD
Bromomethane	TBD	TBD	TBD
2-Butanone	TBD	TBD	TBD
n-Butylbenzene	TBD	TBD	TBD
sec-Butylbenzene	TBD	TBD	TBD
tert-Butylbenzene	TBD	TBD	TBD
Carbon disulfide	TBD	TBD	TBD
Carbon tetrachloride	TBD	TBD	TBD
Chlorobenzene	TBD	TBD	TBD
Chlorodibromomethane	TBD	TBD	TBD
Chloroethane	TBD	TBD	TBD
Chloroform	TBD	TBD	TBD
Chloromethane	TBD	TBD	TBD
2-Chlorotoluene	TBD	TBD	TBD
4-Chlorotoluene	TBD	TBD	TBD
1,2-Dibromo-3-chloropropane	TBD	TBD	TBD
1,2-Dibromoethane	TBD	TBD	TBD
Dibromomethane	TBD	TBD	TBD
1,2-Dichlorobenzene	TBD	TBD	TBD
1,3-Dichlorobenzene	TBD	TBD	TBD
1,4-Dichlorobenzene	TBD	TBD	TBD
Dichlorodifluoromethane	TBD	TBD	TBD
1,1-Dichloroethane	TBD	TBD	TBD
1,2-Dichloroethane	TBD	TBD	TBD
1,1-Dichloroethene	TBD	TBD	TBD
cis-1,2-Dichloroethene	TBD	TBD	TBD
trans-1,2-Dichloroethene	TBD	TBD	TBD
1,2-Dichloropropane	TBD	TBD	TBD
1,3-Dichloropropane	TBD	TBD	TBD
2,2-Dichloropropane	TBD	TBD	TBD
1,1-Dichloropropene	TBD	TBD	TBD

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cis-1,3-Dichloropropene	TBD	TBD	TBD
trans-1,3-Dichloropropene	TBD	TBD	TBD
Ethylbenzene	TBD	TBD	TBD
2-Hexanone	TBD	TBD	TBD
Hexachlorobutadiene	TBD	TBD	TBD
Isopropylbenzene	TBD	TBD	TBD
p-Isopropyltoluene	TBD	TBD	TBD
Methylene Chloride	TBD	TBD	TBD
4-Methyl-2-pentanone	TBD	TBD	TBD
Methyl tert-butyl Ether	TBD	TBD	TBD
n-Propylbenzene	TBD	TBD	TBD
Styrene	TBD	TBD	TBD
1,1,1,2-Tetrachloroethane	TBD	TBD	TBD
1,1,2,2-Tetrachloroethane	TBD	TBD	TBD
Tetrachloroethene	TBD	TBD	TBD
Toluene	TBD	TBD	TBD
1,2,3-Trichlorobenzene	TBD	TBD	TBD
1,2,4-Trichlorobenzene	TBD	TBD	TBD
1,1,1-Trichloroethane	TBD	TBD	TBD
1,1,2-Trichloroethane	TBD	TBD	TBD
Trichloroethene	TBD	TBD	TBD
Trichlorofluoromethane	TBD	TBD	TBD
1,2,3-Trichloropropane	TBD	TBD	TBD
1,2,4-Trimethylbenzene	TBD	TBD	TBD
1,3,5-Trimethylbenzene	TBD	TBD	TBD
Vinyl Chloride	TBD	TBD	TBD
o-Xylene	TBD	TBD	TBD
m,p-Xylene	TBD	TBD	TBD
4-Bromofluorobenzene	TBD	TBD	
Dibromofluoromethane	TBD	TBD	TBD
1,2-Dichloroethane-d_4	TBD	TBD	TBD
Toluene-d_8	TBD	TBD	

Table 3.1b Levels of required performance for PAHs in Soil			
COC	Laboratory MQL	Laboratory MDL*	Health-based Benchmark

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	(mg/Kg)	(mg/Kg)	
Acenaphthene	TBD	TBD	TBD
Acenaphthylene	TBD	TBD	TBD
Anthracene	TBD	TBD	TBD
Benz[a]anthracene	TBD	TBD	TBD
Benzo[b]fluoranthene	TBD	TBD	TBD
Benzo[k]fluoranthene	TBD	TBD	TBD
Benzo[g,h,I]perylene	TBD	TBD	TBD
Benzo[a]pyrene	TBD	TBD	TBD
Chrysene	TBD	TBD	TBD
Dibenz[a,h]anthracene	TBD	TBD	TBD
Fluoranthene	TBD	TBD	TBD
Fluorene	TBD	TBD	TBD
Indeno[1,2,3-cd]pyrene	TBD	TBD	TBD
1-Methylnaphthalene	TBD	TBD	TBD
2-Methylnaphthalene	TBD	TBD	TBD
Naphthalene	TBD	TBD	TBD
Phenanthrene	TBD	TBD	TBD
Pyrene	TBD	TBD	TBD

Table 3.1c Levels of required performance for TPH in Soil			
COC	Laboratory MQL (mg/Kg)	Laboratory MDL* (mg/Kg)	Health-based Benchmark
TPH [C_6-C_{12}]	TBD	TBD	TBD
TPH [C_{12}-C_{28}]	TBD	TBD	TBD
TPH [C_{28}-C_{35}]	TBD	TBD	TBD

Table 3.1d Levels of required performance for VOCs in Groundwater			
COC	Laboratory MQL (mg/L)	Laboratory MDL* (mg/L)	Health-based Benchmark
Acetone	TBD	TBD	TBD
Benzene	TBD	TBD	TBD
Bromobenzene	TBD	TBD	TBD
Bromochloromethane	TBD	TBD	TBD
Bromodichloromethane	TBD	TBD	TBD
Bromoform	TBD	TBD	TBD
Bromomethane	TBD	TBD	TBD
2-Butanone	TBD	TBD	TBD
n-Butylbenzene	TBD	TBD	TBD
sec-Butylbenzene	TBD	TBD	TBD
tert-Butylbenzene	TBD	TBD	TBD

DRAFT

Carbon disulfide	TBD	TBD	TBD
Carbon tetrachloride	TBD	TBD	TBD
Chlorobenzene	TBD	TBD	TBD
Chlorodibromomethane	TBD	TBD	TBD
Chloroethane	TBD	TBD	TBD
Chloroform	TBD	TBD	TBD
Chloromethane	TBD	TBD	TBD
2-Chlorotoluene	TBD	TBD	TBD
4-Chlorotoluene	TBD	TBD	TBD
1,2-Dibromo-3-chloropropane	TBD	TBD	TBD
1,2-Dibromoethane	TBD	TBD	TBD
Dibromomethane	TBD	TBD	TBD
1,2-Dichlorobenzene	TBD	TBD	TBD
1,3-Dichlorobenzene	TBD	TBD	TBD
1,4-Dichlorobenzene	TBD	TBD	TBD
Dichlorodifluoromethane	TBD	TBD	TBD
1,1-Dichloroethane	TBD	TBD	TBD
1,2-Dichloroethane	TBD	TBD	TBD
1,1-Dichloroethene	TBD	TBD	TBD
cis-1,2-Dichloroethene	TBD	TBD	TBD
trans-1,2-Dichloroethene	TBD	TBD	TBD
1,2-Dichloropropane	TBD	TBD	TBD
1,3-Dichloropropane	TBD	TBD	TBD
2,2-Dichloropropane	TBD	TBD	TBD
1,1-Dichloropropene	TBD	TBD	TBD
cis-1,3-Dichloropropene	TBD	TBD	TBD
trans-1,3-Dichloropropene	TBD	TBD	TBD
Ethylbenzene	TBD	TBD	TBD
2-Hexanone	TBD	TBD	TBD
Hexachlorobutadiene	TBD	TBD	TBD
Isopropylbenzene	TBD	TBD	TBD
p-Isopropyltoluene	TBD	TBD	TBD
Methylene Chloride	TBD	TBD	TBD
4-Methyl-2-pentanone	TBD	TBD	TBD
Methyl tert-butyl Ether	TBD	TBD	TBD
Naphthalene	TBD	TBD	TBD
n-Propylbenzene	TBD	TBD	TBD
Styrene	TBD	TBD	TBD
1,1,1,2-	TBD	TBD	TBD

DRAFT

Tetrachloroethane			
1,1,2,2-Tetrachloroethane	TBD	TBD	TBD
Tetrachloroethene	TBD	TBD	TBD
Toluene	TBD	TBD	TBD
1,2,3-Trichlorobenzene	TBD	TBD	TBD
1,2,4-Trichlorobenzene	TBD	TBD	TBD
1,1,1-Trichloroethane	TBD	TBD	TBD
1,1,2-Trichloroethane	TBD	TBD	TBD
Trichloroethene	TBD	TBD	TBD
Trichlorofluoromethane	TBD	TBD	TBD
1,2,3-Trichloropropane	TBD	TBD	TBD
1,2,4-Trimethylbenzene	TBD	TBD	TBD
1,3,5-Trimethylbenzene	TBD	TBD	TBD
Vinyl Chloride	TBD	TBD	TBD
o-Xylene	TBD	TBD	TBD
m,p-Xylene	TBD	TBD	TBD

Table 3.1e Levels of required performance for PAHs in Groundwater			
COC	Laboratory MQL (mg/L)	Laboratory MDL* (mg/L)	Health-based Benchmark
Acenaphthene	TBD	TBD	TBD
Acenaphthylene	TBD	TBD	TBD
Anthracene	TBD	TBD	TBD
Benz[a]anthracene	TBD	TBD	TBD
Benzo[b]fluoranthene	TBD	TBD	TBD
Benzo[k]fluoranthene	TBD	TBD	TBD
Benzo[g,h,I]perylene	TBD	TBD	TBD
Benzo[a]pyrene	TBD	TBD	TBD
Chrysene	TBD	TBD	TBD
Dibenz[a,h]anthracene	TBD	TBD	TBD
Fluoranthene	TBD	TBD	TBD
Fluorene	TBD	TBD	TBD
Indeno[1,2,3-cd]pyrene	TBD	TBD	TBD
1-Methylnaphthalene	TBD	TBD	TBD
2-Methylnaphthalene	TBD	TBD	TBD
Naphthalene	TBD	TBD	TBD
Phenanthrene	TBD	TBD	TBD
Pyrene	TBD	TBD	TBD

DRAFT

Table 3.1f Levels of required performance for TPH in Groundwater			
COC	Laboratory MQL (mg/L)	Laboratory MDL* (mg/L)	Health-based Benchmark
TPH [C_6-C_{12}]	TBD	TBD	TBD
TPH [C_{12}-C_{28}]	TBD	TBD	TBD
TPH [C_{28}-C_{35}]	TBD	TBD	TBD

* If the MQL exceeds either the PCL or a selected applicable benchmark, the laboratory will include the MDL supported by the detectability check sample (DCS).

** All MQLs and MDLs are typical of most NELAC laboratories; actual MQLs and MDLs to be determined with selection of analytical laboratory.

TBD To be determined upon selection of the laboratory.

3.1.2 Data Review and Validation

Laboratory submittals shall meet the requirements of TRRP-13, which provides the procedures for review and reporting of COC concentration data, and thus submittals shall include the Reportable Data for each analysis and the Laboratory Review Checklist (LRC) and necessary Exception Reports (ERs).

3.1.2.1 Independent Data Review

QAA, LLC will perform an independent data review as specified in TRRP-13 on each analytical batch using the following recommended review criteria:

- for organic analytes, percent recoveries between 60% and 140%, but not less than 10% or data will be rejected, and
- relative percent differences within 40% (if a result for the duplicate pair is greater than 5x the MQL) or an absolute difference within 2x the MQL (if results are less than 5x the MQL) are acceptable.

QAA, LLC will identify and report issues and concerns encountered during the data review and will recommend corrective action as soon as possible. The results of analyses will be flagged with the final data review qualifiers and qualifier and bias codes in accordance with TRRP-13.

DRAFT

3.1.2.2 Data Usability Summary

QAA, LLC will document the results of the independent review and data validation in the Data Usability Summary (DUS) prepared in accordance with the requirements specified in TRRP-13. The DUS will discuss what QC measures were reviewed, how these measures were reviewed, the evaluation criteria used in the review, all items identified as falling outside the evaluation criteria, the specific data potentially affected, and the potential effect on the quality of the associated data.

Upon completion of the independent review, data validation, and DUS, QAA, LLC will submit the DUS and a Laboratory Data Package consisting of: the Reportable Data; the LRCs; any applicable ERs; and the Laboratory Release Statement. The Laboratory Data Package shall be submitted for each analysis or group of analyses.

At the request of the TCEQ PM, the preliminary results of analyses or Certificate of Analyses will be communicated or conveyed to the TCEQ PM prior to the completion of the Laboratory Data Package or DUS.

3.2 Human Health Effects Assessment

Staff from the Toxicology Division (TD) will evaluate sample results from a health effects perspective by comparison to appropriate TRRP protective concentration levels (PCLs) A PCL is the regulatory standard for a concentration of a COC that must be achieved in the source medium (e.g., soil, groundwater, sediment) in order to protect a receptor at the point(s) of exposure to that COC. In other words, a PCL can be viewed as a "clean-up level". The PCLs are set based on equations in TRRP which incorporate the toxicity of the COC, exposure dose of the COC based on the reasonable maximum exposure scenarios of TRRP, and acceptable target risk and hazard levels. Human health PCLs are designed to be conservative based on a fairly intense level of long-term exposure. (e.g., 350 days per year for 30 years) that consider: the incidental ingestion of soil, dermal contact with soil, the inhalation of vapor/particulate emanating from soil, and the consumption of vegetables home-grown in the soil.

DRAFT

4.0 Sampling Plan Design

The sampling design is judgmental, i.e. not statistical. Sample locations are selected to determine concentrations of the COCs, in areas of known or suspected releases, in known or suspected migration pathways, and in known or suspected sources.

4.1 Sampling Locations and Rationale

The planned sample locations will be selected by TCEQ in consultation with the Hillcrest community and are indicated in Figure 4, Monitor Well Location Map. The rationale for each sample location is presented in Table 4.1. Because the sampling plan is based on judgment, all of the samples listed in Table 4.1 are critical by location.

Table 4.1 Sample rationale, locations, and analyses			
Sample ID	Sample Location (and depth if applicable)	Sample Rationale (including associated field QC samples)	Analysis[TB D]
Groundwater Samples			
GW-01 through GW-06	Monitor wells MW-1 through MW-6	Assess potential VOC, TPH and TPH impacts to groundwater	1,2,3
Soil Samples (depth)			
SO-MW1-01	Soil boring/monitor well MW1 at highest field screened concentration	Assess potential VOC, TPH and TPH impacts to soil.	1,2,3
SO-MW1-02	Soil boring/monitor well MW1 at soil/groundwater interface	Assess potential VOC, TPH and TPH impacts to soil.	1,2,3
SO-MW2-01	Soil boring/monitor well MW2 at highest field screened concentration	Assess potential VOC, TPH and TPH impacts to soil.	1,2,3
SO-MW2-02	Soil boring/monitor well MW2 at soil/groundwater interface	Assess potential VOC, TPH and TPH impacts to soil.	1,2,3
SO-MW3-01	Soil boring/monitor well MW3 at highest field screened concentration	Assess potential VOC, TPH and TPH impacts to soil.	1,2,3
SO-MW3-02	Soil boring/monitor well MW3 at soil/groundwater interface	Assess potential VOC, TPH and TPH impacts to soil.	1,2,3
SO-MW4-01	Soil boring/monitor well MW4 at highest field screened concentration	Assess potential VOC, TPH and TPH impacts to soil.	1,2,3
SO-MW4-02	Soil boring/monitor well MW4 at soil/groundwater interface	Assess potential VOC, TPH and TPH impacts to soil.	1,2,3

DRAFT

SO-MW5-01	Soil boring/monitor well MW5 at highest field screened concentration	Assess potential VOC, TPH and TPH impacts to soil.	1,2,3
SO-MW5-02	Soil boring/monitor well MW5 at soil/groundwater interface	Assess potential VOC, TPH and TPH impacts to soil.	1,2,3
SO-MW6-01	Soil boring/monitor well MW6 at highest field screened concentration	Assess potential VOC, TPH and TPH impacts to soil.	1,2,3
SO-MW6-02	Soil boring/monitor well MW6 at soil/groundwater interface	Assess potential VOC, TPH and TPH impacts to soil.	1,2,3
Field QC Samples			
GW-FB-1 and GW-FB-2	Soil boring/monitor well MW1	Field blank	2
GW-EB-01 through GW-EB-04	Centralized Decontamination Area	Equipment rinsate blank	1,2,3
Dup-1 Dup-2	Soil boring/monitor well MW1	Field Duplicate sample	1,2,3
GW-TB-1 through GW-TB-3	Ice chests	Trip blank	2

TBD Methods listed in Section 4.2 of this FSP.

DRAFT

4.2 Sample Analysis

The analyses noted for the samples listed in Table 4.1 are listed and described below.

Analytical Method 1: TPH by TX 1005

Analytical Method 2: VOC by SW-846 EPA 8260

Analytical Method 3: PAH by SW-846 EPA 8270

4.3 Field Quality Control Samples

Field QC samples listed in Table 4.2 will be collected in accordance with SOP 6.5 (Collection of QA/QC Samples). SOP 6.5 Section 3.1.2 is modified to allow collection of field blanks for any analytical fraction, e.g., VOCs, TPHs. SOP 6.5 Sections 3.1.3.3.a and 3.1.3.3.b are modified to require complete filling of the sample container, and then complete filling of the duplicate sample container. This procedure is used for groundwater and soil samples.

Table 4.2 Frequency of Collection of Field Quality Control Samples	
Type of QC Sample	Frequency of Collection
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	1 sample of each matrix. Collect the MS/MSD at soil boring/monitor well MW-1. The actual sample interval will be determined by TCEQ.
Field Blank (FB)	1 per day for soil and groundwater. Collect the field blank from monitor well MW-1 before the soil and groundwater samples are collected. TCEQ will determine the locations of the remaining field blanks.
Equipment Rinsate Blank (ER)	Prior to the start of sample collection, all sampling equipment will be decontaminated as outlined in Section 7.2 and one (1) sample will be collected from that initial decontamination. Additionally, one sample will be collected at the end of each day for each matrix when non-dedicated sampling equipment is used.
Trip Blank (TB)	1 for each cooler containing VOC samples. The sample vials will be filled with reagent grade water before sample containers are transported to the field. If the containers are coming from the laboratory, the trip blanks are to be prepared by the laboratory.
Field Duplicates (FD)	Field duplicate samples will be collected at a frequency of 10% from soil samples collected from the vadose zone of each soil boring/monitor well, indicating impact based on FID field screening. Field Duplicates will be collected at a frequency of 10% from the groundwater samples. Special conditions concerning sample labeling are outlined in Section 7.1.
Split Samples	Split samples will be collected by the USEPA for each sample collected by the contractor. The

DRAFT

	contractor shall provide all necessary equipment (including PPE) to facilitate the collection of split samples by the USEPA.
Temperature Blank	1 per cooler.

4.4 Oversight

Oversight activities will be performed to determine whether the QC measures identified in the FSP and the PST QAPP are implemented and documented as required. Fieldwork assessment and oversight functions and responsibilities will be shared by all members of the project team and will be extended to the community and other stakeholders upon request to monitor conformance to this FSP. Oversight checks may address the questions:

- Is the FSP being adhered to?
- Is non-conformance being identified, resolved, and documented?
- Are identified deficiencies being corrected?
- Are sampling operations being performed as stated in the FSP?
- Are the sample labels being filled out completely and accurately?
- Are the C-O-C records complete and accurate?
- Are the field notebooks being filled out completely and accurately?
- Are the samples collected being handled and preserved as described in the QAPP?

Identification and documentation of any deviation from this FSP or the QAPP can be made independently by any member of the project team, citizen, or other stakeholder. The appropriate corrective action for any deviation will be determined by the project team and implemented as soon as possible to ensure data quality and data integrity. Oversight activities may include surveillance, inspection, peer review, management system review, performance evaluation, and data quality assessment. Observations made during oversight activities may be reported to the TCEQ PM, who will be responsible for ensuring that the corrective action response is completed, verified, and documented.

5.0 Sampling Methods and Sample Handling

5.1 Field Sampling Procedures

All samples will be collected in accordance with the QAPP, this FSP and the SOPs listed in this FSP, and all field activities, measurements, and field observations will be recorded in the field logbook. Sections 5.1.1.1 through

5.1.1.2 describe additional sampling procedures required for this sampling event.

Samples for VOC analysis will be collected first, in accordance with SOP No. 6.3 (Collection of VOC Samples) with the exception of the preservation specified in the SOP. Groundwater samples for VOC analysis are acid preserved, except when chemicals of concern could be affected by the acid or when the acid could chemically react with dissolved carbonate in the samples. The samples are handled as follows:

- Groundwater samples for VOC analysis that are not acid preserved must be thermally preserved in the field for transport and storage and analyzed within 7 days of collection.
- Groundwater samples for VOC analysis that are acid preserved must be thermally preserved in the field for transport and storage and analyzed within 14 days of collection.

After the VOC samples are collected, the samples for PAHs and TPH will be collected in that order. See Section 5.3 in this FSP regarding special custody procedures VOA sample vials.

The GPS location information will be taken and recorded for all sampled points during the sample event as specified in Section 6.2 of this FSP.

5.1.1 Sample Collection

The Geo Strata sampling crew will be accompanied by TCEQ staff during the entire sampling event. Field sampling personnel will wear non-lubricated nitrile disposable gloves, or other suitable disposable gloves, during the handling of all sampling equipment and during sampling. The disposable gloves will be changed between each sample location. Prior to sampling activities, sampling equipment shall be handled pursuant to SOP 1.5 (Decontamination), as modified in Section 7.2 of this FSP.

5.1.1.1 Soil Samples

The sample locations will be selected by the TCEQ PM based on the results of the Phase I passive soil gas survey. Soil samples will be collected continuously during drilling and field screening using a properly calibrated (per manufacturer's recommendations) flame ionization detector (FID). Two soil samples will be selected for analysis from each soil boring based on the

highest field screening reading with the FID, and the estimated water table interface. All field screening data should be recorded in the field log.

Soil samples will be collected using the methods described below and upon collection, the lid or cap will be tightened and a custody seal will be immediately wrapped around the lid or cap of the sample container:

SOP No. 10.2 (Soil Sampling Using a Split Barrel Sampler)

Sampling equipment such as stainless steel scoops and spoons, and shovels or spades must be decontaminated according to SOP No. 1.5 (Decontamination), as modified in Section 7.2 of this FSP, between sampling locations to avoid cross contamination. Since dedicated sampling equipment will not be used, equipment rinsate samples shall be collected as specified in Table 4.2 of this FSP. All soil sampling activities will be entered in the logbook.

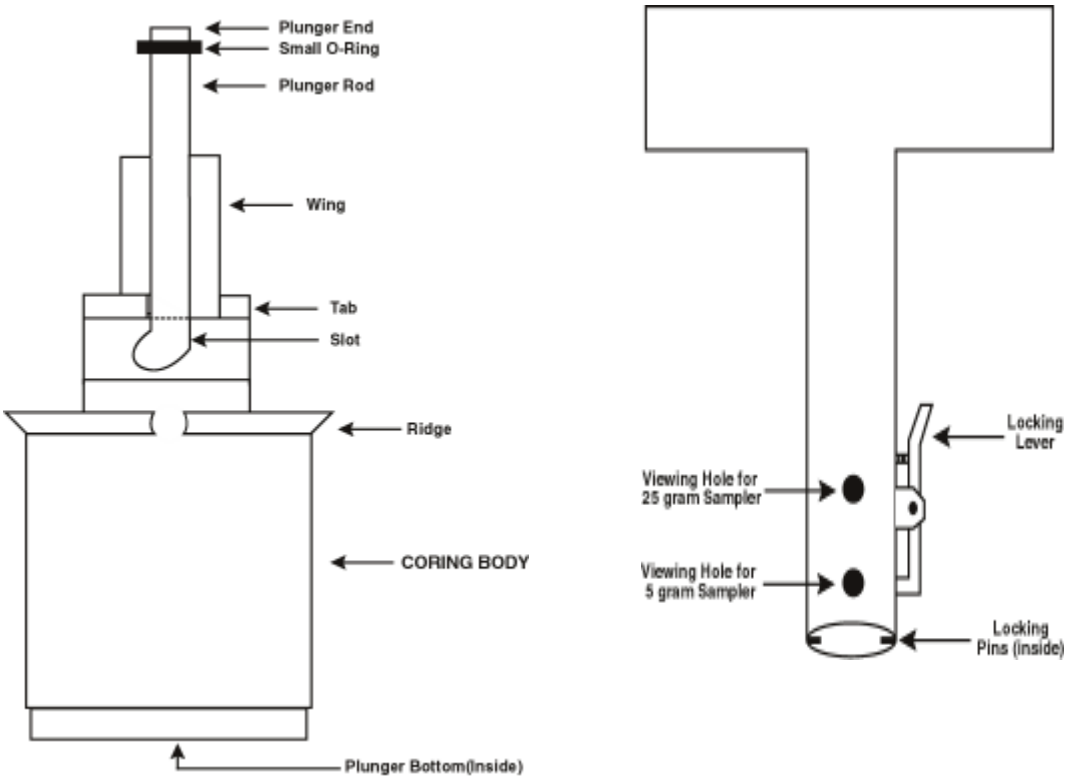
Per SW-846 and SOP No. 10.2, soil samples to be analyzed for VOCs will be collected first. Collection will be completed by implementation of Method 5035 (SW-846), and referred to as "the closed-system purge-and-trap and extraction method". Specifically, an EnCore® Sampler will be utilized to collect all VOC samples. The EnCore® Sampler is a disposable volumetric sampling device, developed to assist field personnel in taking soil samples with minimal handling and maximum accuracy. The EnCore® Sampler collects, stores and delivers soil samples, and the airtight sealing cap prevents the transfer of volatiles as the En Core® Sampler becomes its own self-contained package.

Prior to collecting the soil samples, one (1) Field Blank should be collected from soil boring/monitor well MW-1.

Using the EnCore® Sampler, three (3) (does not reflect "split samples" to be collected by USEPA) sample aliquots will be collected from the desired depth of the split spoon sample. The following section describes the sampling methodology that will be utilized during use of the EnCore® Sampler:

Prior to collecting each sample aliquot, hold the EnCore® coring body and push the plunger rod down until the small o-ring rests against the tabs. This will ensure that the plunger moves freely. Then, depress the locking lever on the EnCore® T-Handle. Place the coring body, plunger end first, into the open end of the T-Handle, aligning the two (2) slots on the coring body with the two (2) locking pins in the T-Handle. Twist the coring body clockwise to loch the pins in the slots. Check to ensure that the EnCore® Sampler is

ready to use. Turn the T-Handle with the T-up and coring body down. This positions the plunger bottom flush with the bottom of the coring body (ensuring that the plunger bottom is in position). Using the T-Handle, push the sampler into the soil until the coring body is completely full. When full, the small o-ring will be centered in the T-Handle viewing hole. Remove the sampler from the soil and wipe any excess soil from the coring body exterior. Cap the coring body while it is still on the T-Handle. Push the cap over the flat area of the ridge and push and twist cap to lock in place. Cap must be seated to seal the sampler.



Once sealed, each aliquot should be weighed. Use a portable balance to weight the sealed vial containing the sample to ensure that 5.0 ± 0.5 g of sample is collected. The balance should be calibrated in the field using an appropriate weight for the sample containers employed. Once the weight of each aliquot is recorded, the samples should be assigned a unique sample number, labeled and placed on ice for transport to the laboratory.

An additional soil sample should be collected from the split spoon sampler for PAH and TPH analyses. The sample should be collected from the depth

of interest and placed in a sealable, one-gallon sized, polyethylene bag. Once collected, the sample should be kneaded from the outside to create a representative sample for analyses. The bag should then be opened and a clean 4-ounce glass jar, fitted with a Teflon lid, should be inserted into the bag for sample transfer. The mouth of the glass jar should be fitted inside the bag opening, and the bag sealed around the mouth of the glass jar with hand pressure during sample transfer. Fill the sample jar to top and eliminate any head space in the jar. Once filled, remove the jar and fit the Teflon lid on tightly. The sample jar should be assigned a unique sample number, labeled, have a custody seal placed around the lid seal, and placed on ice for transport to the analytical laboratory.

Duplicate soil samples will be collected for QA/QC purposes. Duplicate soil samples will be collected at a frequency of 10% (i.e. 2 soil samples for this event). All duplicate samples will be selected based on FID detections in the vadose zone of each soil boring/monitor well. Each ice chest used to store and transport the soil samples to be analyzed for VOCs should have a Trip Blank and Temperature Blank included. The Trip Blank should be analyzed for VOCs. Each ice chest used to store and transport soil samples to be analyzed for TPH and/or PAH should have a Temperature Blank included.

5.1.1.2 Groundwater Samples

The sampling objective is to obtain a representative sample of the groundwater bearing zone of interest without mixing the sample with stagnant (standing) water in the well casing.

5.1.1.2.1 Groundwater Samples from a Monitoring Well

To meet the sampling objective, the wells shall be purged according to SOPs check marked below with the following exception:

An unfiltered sample will be collected from each well and analyzed by the laboratory.

Six (6) soil borings/monitor wells are to be installed at the project site. All six (6) soil borings/monitor wells will be purged and sampled utilizing Low-Flow Techniques.

SOP 7.8 (Groundwater Sampling Using a Low-flow Technique) will be used on all wells.

A minimum of three well volumes, including casing volume, shall be pumped from each monitoring well utilizing "low flow" techniques. Initially, the static water in the pump and delivery tubing will be removed, and then continuous pumping and monitoring will occur until the chemical parameters have stabilized. The monitoring measurements will be made using a multi-parameter probe installed in a flow cell connected to the outlet of the well pump. All instrumentation will be pre-calibrated and re-checked prior to field use. Parameter stabilization will be confirmed as:

pH:	± 0.5 pH units
Conductivity:	± 10% of reading
Temperature:	± 1°C

The measurements will be recorded in accordance with SOP No. 7.5 (Measurement of Field Parameters). When purging is complete, representative samples will be withdrawn. Groundwater samples will be obtained directly from the well pump outlet and not from the flow cell outlet. The pump rate used for purging will also be used for sample collection. The groundwater samples will be collected such that analysis of the most sensitive parameters are collected first and any samples that require filtration, last.

For wells pumped to dryness with the sampling equipment, the well shall be evacuated and allowed to recover to 85 percent of the original water volume before sample withdrawal. In the event the well has not recovered to 85 percent after 24 hours, the volume recovered will be recorded into the field logbook and a sample shall be drawn from the well.

5.2 Sample Containers, Sample Preservation, and Holding Time

Soil and groundwater sample preservation requirements and holding times are specified in Tables 4 and 5 of Appendix III (TCEQ RG-411) of the QAPP.

5.3 Chain-of-Custody Procedures

The following is applicable to all environmental and field QC samples collected under this SAP. When the sample is introduced into the sample container, the lid or cap shall be tightened onto the container, and a custody

seal shall be immediately wrapped around the lid or cap of the sampling container with the following exception:

- VOA sample vials from the same groundwater sample location will be filled, capped tightly, wrapped in protective wrapping to avoid breakage, and bagged together in a re-sealable storage bag, e.g., a disposable plastic bag with a zipper-type closure. The bag will then be closed and a custody seal placed across the closure.

Custody seals will be affixed to every sample jar or container (except as noted above), and to every sample shipping cooler. The custody seals shall not be broken until received by the laboratory. Custody documentation will be maintained using a chain-of-custody form that lists each sample and the individuals performing the sample collection, shipment, and receipt. A sample is considered in custody if one of the following conditions is met:

- In the actual possession of a member of the sampling team;
- In the view of a member of the sampling team, after being in physical possession;
- Locked so that no one can tamper with it, after having been in physical possession, or;
- In a secured area, restricted to authorized personnel.

The field sampling team will use the chain-of-custody records to document the collection, shipping, and delivery of the samples to the laboratory. The individual who has custody of the sample(s) in their possession will sign the chain-of-custody form relinquishing custody to the laboratory. The laboratory will immediately contact the contractor's PM if the chain-of-custody is not complete for samples received by the laboratory. The laboratory will keep the original chain-of-custody form in the project files at the laboratory and send a copy of the completed form in the data packages issued to the contractor.

The chain-of-custody form will include the following:

- The unique identification number of each sample;
- The time and date of collection of each sample;
- The number and type of containers of each sample;
- The matrix of each sample;
- The methods of preservation of each sample;

- The analytical methods to be used by the laboratory for each sample;
- A note identifying samples suspected of containing high concentrations of chemicals;
- If a common carrier is used to transport the sample cooler to the laboratory, the air bill number and the time and date custody of the samples was relinquished by the field personnel and the signature of that personnel;
- If a courier is used to transport the sample cooler to the laboratory, the time and date custody of the samples was relinquished to and accepted by the courier, the time and date the courier relinquishes custody to the laboratory and the signature of the courier;
- The time and date the laboratory accepts custody of the samples and the signature of the laboratory personnel accepting that custody; and
- The temperature of the temperature blank measured by the laboratory upon receipt.

6.0 Field Survey and Measurements

6.1 Property Access

Access agreements between landowners and TCEQ will be obtained prior to initiation of sample collection activities. Form TCEQ-10452 will be used to obtain written access agreements between landowners and TCEQ. In the event the TCEQ is unable to secure a written access agreement from a property owner, verbal agreement of granted access will be documented in the project field notes. If the property is abandoned or the owner cannot be reached, TCEQ Legal Division will determine the appropriate course of action to document access. Copies of the access agreements will be placed in the project file.

6.2 GPS Information

The contractor or TCEQ PM will record GPS locations of all sampling locations and other pertinent site features. The contractor will submit all GPS information to the TCEQ as specified in the WO. The GPS data shall be collected pursuant to SOP 17.1 (GPS Data Collection and Submission).

6.3 Water Well Survey

The contractor will not conduct a survey of drinking water wells as it is not required for this project. The entire Hillcrest subdivision is served by the City of Corpus Christi municipal water supply.

6.4 Equipment Calibration

The contractor shall execute the routine calibration of all field measurement equipment. The PID and water quality meter shall be calibrated at the start of each work day. The GPS unit shall operate with a current almanac database.

7.0 Additional Field Activities

7.1 Sample Identification and Documentation of Sampling Activities

Information regarding sample collection will be entered into the field logbook pursuant to SOP 6.1 (Field Activity Documentation and Reporting). The following information will be recorded in the TCEQ field logbook:

- Date and time of sample collection;
- Environmental matrix and sample type (e.g., soil composite or groundwater grab);
- Sample collection method;
- Sample preservation;
- Name of the person who collected the sample;
- Sample identification number and depth measured from surface of the environmental medium sampled;
- Field measurements made on the sample during and at the time of collection, e.g., flame ionization readings using a flame ionization detector (FID);
- When low-flow technology is used, the flow rate, e.g., mL/min, as sample was collected;
- GPS file number;
- Photograph number;
- Date and time of photograph with a description of the purpose of the photograph, e.g. "This photo documents the sample collected at location X of material released to soil from the corroded and leaking

drums in the drum storage area observed and documented in photos 2 & 3.";

- Name of the person who took the photograph and direction the person was facing when the photograph was taken;
- Relevant observations such as soil color, obvious staining, and weather conditions; and
- Deviations from the QAPP, FSP, or SOP.

Samples will be adequately marked for identification from the time of collection and packaging through shipping and storage. The sample identification scheme will include:

- Field sample ID;
- Project name and number;
- Sampling date and time;
- Name of the sample collector;
- Method of sample preservation; and
- Laboratory analyses required.

Sample identification will be as follows:

- **Groundwater Samples**: Groundwater samples will be identified using the prefix "GW" followed by a sequential number;
- **Soil Samples**: Soil samples will be identified using the prefix "SO" followed by a sequential number;
- **Field Duplicate Samples**: For quality assurance purposes, the identification of duplicate samples will not include any information that may reveal to the laboratory the identity of the primary samples. Duplicate samples will have a sample number randomly selected by the TCEQ PM. The primary samples and associated duplicate samples will be identified in the TCEQ PM's field notes. The duplicate sample collection time will be a random increment of time after the collection time of the primary sample. For example, sample GW-76 that has a 14:30 collection time on the chain of custody form is the duplicate of sample GW-15 that has a collection time of 14:05 on the chain of custody form. Information regarding the actual collection time, and the ID of the primary sample and the duplicate sample will be recorded in the field logbook;

- **Field Blanks and Equipment Rinsate Blanks**: For quality assurance purposes, these samples will be shown as groundwater (GW) samples on the chain–of-custody form; and
- **Trip Blanks:** Trip blanks will be identified using the prefix "TB" followed by a sequential number.

At each sampling location, the collection of the sample will be documented by photographing the sample collection point and by recording the location with certified GPS equipment operated by GPS certified TCEQ staff or contractor personnel. If certified GPS equipment is not available, the sample locations will be identified and method of identification and site sketch will be included in the field logbook.

7.2 Equipment Decontamination

Prior to beginning the installation of the proposed soil borings/monitor wells, all sampling equipment will be initially decontaminated in the centralized decontamination area. Decontamination procedures will occur prior to beginning each new soil boring/monitor well. Following the initial decontamination, but prior to installation of the first soil boring/monitor well, an equipment rinsate blank will be collected. Please note, decontamination procedures will occur prior to beginning each new soil boring/monitor well, and an equipment rinsate blank will be collected at the end of each work day during soil boring/monitor well installation. It is anticipated that a total of four (4) equipment rinsate blanks will be submitted for laboratory analyses of VOCs using EPA Method 8260, PAHs by Method SW 8270, and TPH by Method TX1005. Note: Equipment rinsate blanks will not be collected during the groundwater sampling phase in anticipation of using dedicated pumps. The equipment rinsate blank will be collected by pouring laboratory grade volatile organic free water over the split spoons, after decontamination and prior to drying and/or storage, and collecting the water for analysis. The TCEQ PM may modify the decontamination frequency if necessary. Decontamination of field equipment will be performed in accordance with SOP 1.5 (Decontamination), modified as follows:

Following Step 4 for large equipment and following Step 2 for small equipment in SOP 1.5 (Decontamination):

- Rinse all equipment with potable water;
- Clean equipment with a brush in a solution of laboratory grade detergent (Liquinox, Alconox, or equivalent);
- Rinse with potable water;

- Rinse with distilled or deionized water;
- Rinse with reagent grade isopropanol if analyzing for organic compounds;
- Rinse with deionized water;
- Allow equipment to completely dry, then collect an equipment rinsate sample using ultra-deionized water, seal the rinsate sample container with a custody seal, and place the sample in the shipment cooler;
- Place the equipment on clean plastic sheeting and allow to air dry; and
- If the equipment is not to be used immediately, place small equipment in plastic sealable bag and place a custody seal across the sealed opening of the bag.

7.3 Investigation Derived Waste

All investigation derived waste (IDW) will be handled in accordance with SOP 1.4 (Management of Investigation Derived Waste). The contractor will be responsible for collection, containerization and disposal of all IDW.

Soil cuttings and monitor well development, purge, and decontamination fluids will be stored in sealed 55-gallon drums and transported off-site to the TCEQ storage area at the end of each day. All drums containing project soil cuttings and fluids will be appropriately labeled. All Personal Protective Equipment (PPE) will be decontaminated such that it can be disposed of as Class 3 waste.

Fluid disposal will be conducted in conjunction with soil disposal activities, approximately three (3) weeks following the groundwater sampling event. Fluids will be vacuumed by truck and transported to the final disposal site. All soil cuttings stored in the 55-gallon drums, will be properly characterized and transported off-site for disposal in a landfill permitted to receive such wastes.

7.4 Site Restoration

The work site and sampling locations will be restored to their original condition in accordance with SOP 1.3 (Site Restoration). Efforts will be made to minimize impacts to work sites and sampling locations, particularly residential properties and those properties in or near sensitive environments.

7.5 Health and Safety

The contractor will develop a site-specific Health and Safety Plan (HASP) to meet the project objectives. During all sampling activities, contractor's personnel will adhere to the HASP to ensure that all sample collection and decontamination are done in a safe manner. The purpose of this HASP is to assign responsibilities, establish personnel protection standards, specify safe operating procedures, and provide for contingencies that may arise while conducting this investigation. TCEQ personnel will adhere to the HASP while on site.

Prior to commencement of field activities, the contractor's H&SO will conduct a safety briefing to inform all personnel of the possible chemical and physical hazards. All personnel will be required to read and sign the HASP, and it will be readily available in the field at all times. The H&SO will conduct a daily safety meeting prior to initiating field work each day to advise workers of ongoing and new health and safety concerns. During the daily safety meeting, the H&SO will identify all potential health and safety risks present at the Site. The H&SO will record the subjects covered during each daily safety briefing, as well as personnel in attendance. These records will become part of the project files. The H&SO will verify all field personnel have completed "OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120)" training before beginning fieldwork and will verify at least one on-site worker has training in first aid and CPR.

While on-site during field activities, no personnel will eat, drink, or smoke, and all personnel will minimize hand to mouth contact.

7.6 Deviations, Modifications, and/or Departures from the FSP or QAPP

Each deviation, modification, and/or departure from this approved FSP or QAPP will be recorded, with a discussion of the rationale for each, in the field logbook.

8.0 Exceptions, Additions, and Changes to the TCEQ Superfund QAPP

The following are exceptions, additions and changes to the QAPP:

Appendix A

Standard Operating Procedures

1.3 Site Restoration
1.4 Management of Investigative Derived Waste
1.5 Decontamination
6.1 Field Activity Documentation and Reporting
6.3 Collection of VOC Samples
6.4 Sample Handling and Custody
6.5 Collection of QA/QC Samples
7.3 Purging a Monitoring Well with a Pump
7.5 Measurement of Field Parameters
7.8 Groundwater Sampling Using a Low-flow Technique
10.2 Soil Sampling Using a Split Barrel Sampler
17.1 GPS Data Collection and Submission