D R A F T

FIELD SAMPLING PLAN

HILLCREST COMMUNITY ENVIRONMENTAL INVESTIGATION

PHASE I: SOIL GAS SURVEY

CORPUS CHRISTI, TEXAS

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

Project No: TBD

FEBRUARY, 2010

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

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APPROVAL PAGE
FIELD SAMPLING PLAN
for
PHASE I: SOIL GAS SURVEY
Hillcrest Community Environmental Investigation
Houston, Texas

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[Proposed Prime Contractor: Geo Strata Consultants]

[Name] Date
Project QA Manager
[Subcontractor]

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[Selected Primary Laboratory]

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

List of Acronyms and Abbreviations

AL	Assessment Level
°C	Degrees Celsius
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C-O-C	Chain-of-Custody
COC	Chemical of Concern
DCRP	Dry Cleaners Remediation Program
DOT	Department of Transportation
DQO	Data Quality Objective
DUR	Data Usability Review
DUS	Data Usability Summary
ELS	Environmental Laboratory Services
EPA	Environmental Protection Agency
ER	Exception Report
FM	Farm to Market Road
FSP	Field Sampling Plan
G	glass
GeoStrata	Geostrata Environmental Consultants, Inc.
HCL	hydrochloric acid
HDPE	high-density polyethylene
LCRA	Lower Colorado River Authority
LORP	Level of Required Performance
LRC	Laboratory Review Checklist
µg/kg	micrograms per kilogram
mg/kg	milligram per kilogram
mg/L	milligram per liter
MQL	Method Quantitation Limit
MS/MSD	matrix spike/matrix spike duplicate
O&M	Operation and Maintenance
PCL	Protective Concentration Levels
ppm	parts per million
PM	Project Manager
PST	Petroleum Storage Tank
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RBEL	Risk Based Exposure Level
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SPLP	Synthetic Precipitation Leaching Procedure
SQL	Sample Quantitation Limit
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TNRCC	Texas Natural Resource Conservation Commission
TRRP	Texas Risk Reduction Program

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1.0 INTRODUCTION

1.1 BACKGROUND

Texas A&M University Health Science Center scientists and the Citizens for Environmental Justice conducted a pilot study in 2008 that detected benzene in the blood of some residents in the Hillcrest Community in Corpus Christi, Texas. In response to the results of this study and at the request of the Hillcrest community at the December 1, 2009, neighborhood meeting, the Texas Commission on Environmental Quality (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.

TCEQ is undertaking a Soil Gas Survey in the Hillcrest Community. TCEQ, in cooperation with the Hillcrest Community, shall direct and oversee GeoStrata Environmental Consultants, Inc. (GeoStrata) in the performance of sampling activities at the site under Work Order (WO) No.172-TBN, in accordance with the TCEQ Contract No. 582-6-79632. TCEQ has drafted this project-specific Field Sampling Plan (FSP), incorporating community input, for use in Phase I of the HCEI.

1.2 PURPOSE

This draft FSP presents the requirements and procedures for collecting soil gas samples from the site. This project-specific draft FSP has been prepared to ensure that:

- Field sampling protocols are documented and performed in a consistent manner; and
- Data is collected in a scientifically valid and legally defensible manner; and
- Data quality and data integrity are preserved throughout all phases of the investigation.

This project-specific draft FSP and the TCEQ Quality Assurance Project Plan (QAPP) for the Petroleum Storage Tank (PST) Program (Document No. 201009.0), hereafter referred to as the QAPP, will constitute, by definition, a Sampling and Analysis Plan (SAP) for characterization of the site. The FSP is required reading for all staff participating in the work effort. The FSP will be in the possession of the field teams at all times during its implementation.

1.3 REFERENCE DOCUMENTS

General guidelines followed in the preparation of this FSP are set out in the following documents:

- Data Quality Objectives Process for Hazardous Waste Site Investigations (U.S.

Environmental Protection Agency [EPA], June 1999); and

- Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (U.S. EPA, October 1988).

Additional reference documents used in the preparation of this FSP included the following:

- TCEQ QAPP for the PST Program;
- TCEQ Standard Operating Procedures, PST/DCRP Section, Remediation Division;
- Guidance For Data Usability in Risk Assessment (Part A) Final (U.S. EPA, April 1992);
- American Society of Testing and Materials (ASTM) Standard Guide for Monitoring in the Vadose Zone, Designation: D 5314-92 (reapproved 2006);
- United States Environmental Protection Agency, Office of Underground Storage Tanks, OSWER, Expedited Site Assessment Tools for Underground Storage Tank Sites, A Guide for Regulators, Chapter IV, Soil-Gas Surveys, March 1997;
- GORE™ Soil Gas Sampling-Storage, Installation and Retrieval Guideline;
- BEACON Environmental Services, Inc., Field Kit for Passive Soil-Gas Investigations.

1.4 DOCUMENT CONTROL

Controlled distribution of the FSP will be implemented to ensure that project personnel always use the final, approved version. A sequential numbering system will be used to identify controlled copies of the FSP. Controlled copies will be provided to all parties identified in the Approval Page and to representatives of the Hillcrest Community. A community comment period will be extended after every revision to allow for community input. Whenever revisions are made or addenda added to the FSP, a document control system will be put into place to ensure that:

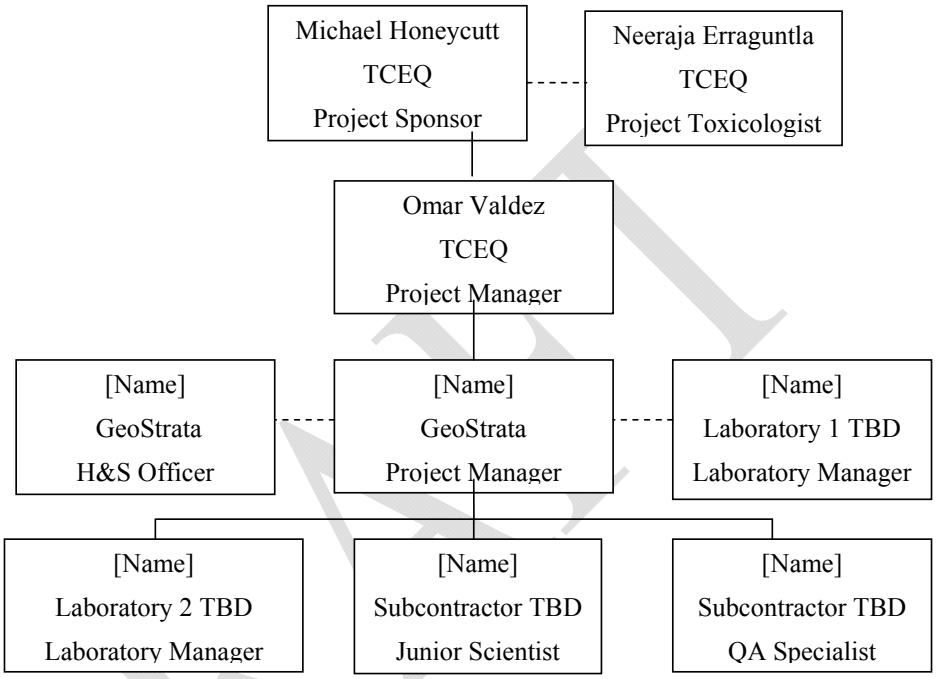
- All parties holding a controlled copy of the FSP receive any revisions or addenda; and
- Outdated material is removed from circulation.

The document control system does not preclude making and using copies of the FSP; however, the holders of controlled copies are responsible for distributing additional material to update any copies within their organizations. TCEQ will maintain the distribution list for controlled copies.

1.5 PROJECT TEAM AND RESPONSIBILITIES

The project team and task leaders and their responsibilities are listed in Table 1.

Table 1: Project Organization Chart



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 and establishing the 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. Dr. Erraguntla has

responsibility for all aspects of performing health assessments on project data. She will also assist the Project Sponsor and the PM on defining the project objectives and on designing subsequent phases of the investigation, based on an evaluation of the Phase I results.

GeoStrata Project Manager – TBD:

[Name] of GeoStrata is the prime contractor's Project Manager (PM). [Name] has responsibility for the contractual aspects of the project as the prime contractor and for the quality of all project deliverables. [Name] has the primary responsibility for FSP implementation and communication with TCEQ. GeoStrata through [Name] 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. [Name] 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 Field Team Leader/Lead Technician – [Name]:

[Name] of GeoStrata will also serve as the Field Manager and is responsible for the implementation of the FSP. As Field Manager, he 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.

Subcontractor TBD Quality Assurance Specialist – [Name]:

[Name] 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. [Name] 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.

Laboratory QA Manager – [Name]:

[Name] will oversee all aspects of sample analysis and have responsibility for implementing laboratory QA procedures. [Name] will assure that the laboratory data packages will be provided in a timely manner to satisfy the project objectives.

Subcontractor Junior Scientist – [Name]:

[Name] will be responsible for implementing the Data Integrity component of this FSP. Specifically, [Name] will implement the split sampling scheme prescribed in this FSP and direct and oversee the performance of Laboratory 2.

2.0 SITE AND PROJECT SUMMARY

2.1 PROJECT SCOPE AND PURPOSE

Soil gas surveys are defined as the collection, analysis, and interpretation of soil gas data. A soil gas survey provides information on the soil atmosphere in the vadose zone that can aid in assessing the presence, composition, source, and distribution of contaminants. Soil gas surveys are generally used to screen for VOCs emanating from groundwater. There are two basic types of soil gas surveys. The first type is the active soil gas survey in which a volume of soil gas is pumped out of the vadose zone into a sample collection device for analysis. The second type is a passive soil gas survey in which a sorbent material is left in the ground so that contaminant vapors can be selectively adsorbed over time using ambient flow of soil gas. The primary goal of Phase I of the HCEI project is to perform a passive soil gas survey in the Hillcrest Community to screen for VOC impacts to groundwater and air in the Hillcrest Community.

2.2 SITE DESCRIPTION AND HISTORY

The Hillcrest Community is bounded by the refinery sector to the west and north. It is bounded by a mixed use light industrial sector to the south and east. 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 in Figure 1.

3.0 DATA QUALITY OBJECTIVES

3.1 GENERAL

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. 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 other environmental media in the Hillcrest Community from subsurface releases are unknown.

Step 2: Identify the Decision

The primary goal for Phase I of this project is to obtain passive soil gas data to screen the Hillcrest Community for VOC impacts to groundwater and use soil gas data to select the optimal locations for permanent monitor wells.

Step 3: Identify Inputs to the Decision

Historical information and data obtained from corrective actions in progress in the refinery sector adjacent to the Hillcrest Community and requests from the community to verify whether their groundwater is impacted have led to the decision to screen for VOC impacts to groundwater via passive soil-gas sampling and analysis.

Step 4: Define the Boundaries of the Study

Phase I 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. A finer sample grid will be established within the areas adjacent to the refinery sector to the west, north, and east. A courser grid will be established in the interior of the Hillcrest community. The approximate sample locations selected are displayed in Figure 2. Soil gas samples will be analyzed by EPA SW-846 method 8260B to provide sufficient analytical sensitivity. Data reviews performed by [Subcontractor Name] Quality Assurance Specialist will be conducted in accordance with EPA's *National Functional Guidelines for Organic Data Review.*

Step 5: Develop a Decision Rule

Permanent monitor well locations and other environmental assessment work will be selected in subsequent phases of the HCEI based on the masses of VOCs in the soil gas measured in Phase I.

Step 6: Specify Limits on Decision Errors

The analytical results obtained in the investigation will be reviewed to support the decision rule of the soil gas survey; 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 the FSP will be followed to aid in the establishment of analytical quality and to minimize these errors. Each member of the field team must follow the same procedures in order to minimize field errors. Appropriate EPA-approved analytical methods will be used to ensure sufficient analytical sensitivity. Field QC samples, including field duplicates, split samples, and trip blanks, 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 4.4. The Quality Assurance Specialist will review all analytical data obtained by GeoStrata and [Subcontracor Name] based on review criteria and limits presented in the EPA's *National Functional Guidelines* 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 3.9.

Step 7: Optimize the Design

The number and location of soil gas samples collected and analyzed have been confined only to those necessary to satisfy project goals. A fine grid has been selected for the areas adjacent to the refinery sector where a higher likelihood of VOC impacts to groundwater exists. A courser grid has been selected for areas in the interior of the Hillcrest Community.

3.2 COCS AND ANALYTES

Considering the site history, and previous sampling and analyses, samples will be analyzed for VOCs using EPA 8260B method. All VOCs will be analyzed as "Target Analytes." The "Final COC list" will be determined from detected compounds after additional sampling and analysis in future phases of the HCEI.

3.3 TRRP ASSESSMENT LEVELS

The Assessment Level (AL) is the lowest of the applicable Protective Concentration Levels (PCLs) for a COC developed under the Texas Risk Reduction Rule (TRRP) Tier 1 Residential evaluation. The AL is used to determine the extent of contamination (or the "Affected Property" as this is termed in TRRP). However, the TCEQ does not typically evaluate soil gas, and the TRRP rule is not written to specifically address this exposure scenario. Additionally, passive soil gas sampling and analysis will not yield quantitative data that could be evaluated against TRRP risk-based exposure levels (RBELs). Therefore, the data generated from Phase I will not facilitate comparisons to any health based benchmarks.

3.4 ANALYTICAL METHODS

After a review of the available information regarding former site operations, COCs identified at the site, and field sampling methods, analytical method EPA Method 8260B for VOCs will be used.

Any site-specific exceptions, additions, or changes to the requirements of the QAPP are described in Section 8.0 of this FSP.

3.5 LABORATORY

[Name] has been selected to provide analytical services, and [Name] is the laboratory contact. [Name] has a quality assurance program, in place and implemented, which meets the requirement set forth by the EPA, National Environmental Laboratory Accreditation Conference (NELAC) or the International Organization for Standardization (ISO). [Name] has documented precision, bias, and Method Detection Limit (MDL) information demonstrating the laboratory's capability (as per NELAC) to meet the objectives specified by EPA. This information is on file and readily available upon request by the TCEQ or the Hillcrest Community. Additionally, GeoStrata will provide TCEQ and the Hillcrest Community with access to review the laboratory's procedures and activities that relate to this project, if requested.

Each of these analyses will be performed in accordance with the applicable published methods for extraction, cleanup, preparation, determination and will include all method-required and method-recommended quality control steps, including all QA/QC procedures specified in the laboratory's quality assurance manual. The QC acceptance criteria specified by the laboratory will be utilized.

3.6 LEVEL OF REQUIRED PERFORMANCE AND METHOD QUANTITATION LIMITS

The Level of Required Performance (LORP) is a phrase used in TRRP to specify the lowest concentration of interest during chemical analyses. Since passive soil gas

sampling and analysis will not yield quantitative data, the required performance emphasis shall be on the Method Quantitation Limit (MQL). 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.

3.7 METHOD QUANTITATION LIMITS

Laboratory specified MQLs for each analyte will be provided by [Name]. .

3.8 DATA REVIEW AND REPORTING

[Independent Quality Assurance Specialist Name] will perform laboratory review on the Reportable and Supporting Data for each analysis in accordance with the requirements listed in the PST QAPP. The laboratory will also complete the Laboratory Review Checklist (LRC) and necessary Exception Reports (ERs) as described in the PST QAPP. Submittals shall also meet the requirements of TRRP 13, which provides the procedures for review and reporting of COC concentration data.

3.9 INDEPENDENT DATA REVIEW

[Independent Quality Assurance Specialist Name] will perform an independent data review (IDR) as specified in the PST QAPP on each analytical batch. [Independent Quality Assurance Specialist Name] will perform full data validation of project data on a minimum of ten percent of the project analytical batches (or at least one analytical batch per sampling event if there are fewer than 10 batches) as described in the PST QAPP. [Independent Quality Assurance Specialist Name] will identify and report issues and concerns encountered during the IDR and will recommend corrective action as soon as possible. The results of analyses or Certificate of Analyses (a subset of the Reportable Data) will be flagged with the final data review qualifiers and qualifier and bias codes in accordance with the PST QAPP.

[Independent Quality Assurance Specialist Name] will document the results of the IDR and data validation in the Data Usability Summary (DUS) prepared in accordance with the requirements specified in the PST QAPP. 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 laboratory review, IDR, data validation, and DUS, [Independent Quality Assurance Specialist Name] will submit the DUS and a Laboratory Data Package consisting of: the Reportable Data; the LRCs; any applicable ERs; and the Laboratory Release Statement (as specified in the PST QAPP). 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, DUR or DUS.

In addition to the Laboratory Data Package, [Independent Quality Assurance Specialist Name] will ensure that the Supporting Data (as specified in the PST QAPP) are on file and submitted to TCEQ within the contractually specified timeframe. A review of the supporting data by TCEQ will be warranted if a review of the Reportable Data indicates that a problem may exist with the data (if the problem was not identified and resolved by the laboratory), or if the data comes under scrutiny for legal evidentiary reasons. Furthermore, the Laboratory Data Package and the Supporting Data will be archived and retrievable for at least 10 years from the date of analysis.

3.10 BATCHING OF SAMPLES

GeoStrata will collect and deliver the samples to the laboratories in a manner that allows the laboratory to batch as many TCEQ project samples together as possible.

4.0 FIELD SAMPLING PLAN

4.1 GENERAL

This FSP provides the general requirements for implementation of the soil gas sample collection activities at the site. As discussed above, soil gas samples will be collected from XXXXX locations in the Hillcrest Community as described below. Sample locations and sample location intervals are based on proximity of a focus area to known hydrocarbon sources. Samples are expected to be collected during the week of [Date].

4.2 SAMPLING DESIGN

The soil gas sample locations will be determined by TCEQ based on historical information, data obtained from corrective actions in progress in the refinery sector adjacent to the Hillcrest Community, and a desire to identify any previously unknown sources of VOCs in soil gas in the Hillcrest Community. The soil gas samples will be collected using GORE^{TM} Modules or BEACON Environmental Services kits. Each GORE^{TM} Module or BEACON Environmental Services kit will be analyzed for VOCs using EPA Method 8260B. A finer sample grid will be established within the areas adjacent to the refinery sector to the west, north, and east and referred to as focus areas AW, AN, and AE respectively. A courser grid will be established in the interior of the Hillcrest community and referred to as focus area I. These approximate sample locations are displayed in Figure 2.

A sample grid based on 250 foot spacing [*optimum spacing scheme under development*] will be established in focus areas AW, AN, and AE. A sample grid based on 500 foot spacing [*optimum spacing scheme under development*] will be established in focus area I. Sampling locations will be located as close too the nodes of each grid cell as is possible depending on the field conditions. All sample locations will be recorded via GPS. Duplicate samples will be collected as described in Section 4.4.

Prior to implementation of this FSP, TCEQ will notify all the owners affected by the proposed sample locations by mail and obtain the access agreement from each owner, as appropriate. In situations where sampling at a particular location is not feasible, either due to physical limitations or an inability to obtain an access agreement, the sample location may be adjusted in the field, or legal staff may be consulted to determine the appropriate course of action.

4.3 LABELING OF SAMPLES

Each sample module will receive a sample label that includes information required per TCEQ SOP No. 6.4 (Sample Handling and Control). Sample labels will include the following information:

- Unique sample identification number,
- Sample type,
- Analytical method,
- Sampler's initials,
- Date and time deployed and collected, and
- Preservation method used.

Sample labels will be marked with indelible black ink and affixed to the sample modules.

4.4 QA/QC SAMPLING

QA/QC samples will consist of field duplicates, matrix spike (MS) and matrix spike duplicates (MSD), field blanks, split samples, and trip blanks.

A field duplicate sample is a second sample collected at the same location as the original sample. Duplicate sample results are used to assess total precision, which includes variability associated with both the sample collection process and with laboratory analysis. Normally split duplicates are done in the field, but in this case the passive soil gas (PSG) samplers have two sets of absorbent cartridges in each sampler. By this approach, duplicate samples will be collected simultaneously or in immediate succession, using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis. The FSP will identify duplicate samples at a frequency of 10 percent in accordance with TCEQ SOP No. 6.5 (Collection of QA/QC Samples) and document as such in the field logbook and on the Chain of Custody (C-O-C) for analysis where both sets of absorbents will be analyzed. The precision of lab split duplicate results are calculated by relative percent difference (RPD) using the following equation:

$$RPD = (X1-X2)/ ((X1+X2)/2))$$

The field team leader is responsible for ensuring that the frequency requirements for field duplicate samples are met. There is no corrective action for the failure to achieve this goal; however, the information will be used to evaluate data quality.

At least two ambient field blanks will be collected during the installation of PSG samplers at the site. The ambient samples will be collected by taking a PSG sampler and opening it for approximately 15 seconds exposing the absorbent cartridges to the air. The samplers will then be capped, labeled, and logged onto the C-O-C and sent in with the rest of the samplers upon completion of sampler retrieval.

MS/MSD samples will be collected in accordance with TCEQ SOP No. 6.5 (Collection of QA/QC Samples). The sampler will identify the sample for MS/MSD analysis on the

C-O-C. The sampler will collect the MS/MSD samples as replicate samples but with three sets of samples (one original, one matrix spike sample, and one matrix spike duplicate). One set of MS/MSD samples will be collected for every 20 samples.

One field equipment blank will be collected per work day by pouring laboratory grade volatile organic free water over the borehole drilling equipment and collecting the water for analysis. Field blanks can be used to determine if the decontamination between boreholes is adequate to avoid cross contamination between samples.

Split samples are co-located samples collected by separate parties and analyzed by separate laboratories. Split samples are handled and preserved identically to primary project samples and analyzed by the same analytical laboratory method. Normally split samples are done in the field, but in this case the PSG samplers have two sets of absorbent cartridges in each sampler. By this approach, duplicate samples will be collected simultaneously or in immediate succession, using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis. The field team in cooperation with sampling event overseers will identify split samples at a frequency of 10 percent in accordance with TCEQ SOP No. 6.5 (Collection of QA/QC Samples) and document as such in the field logbook and on the COC for analysis where both sets of absorbents will be analyzed.

When VOC analyses are conducted, trip blank samples will be collected according to SOP 6.5 (Collection of QA/QC Samples). Trip blanks consist of a sealed GORE^{TM} Module sample container supplied by the laboratory, transported to the sampling site, handled like an environmental sample, and returned to the laboratory for analysis. Trip blanks are not opened in the field. Trip blanks are prepared only when VOC samples are taken and are analyzed only for VOC analytes. Trip blanks are used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. One trip blank shall accompany each shipment sent to the laboratory for analysis of VOCs. The trip blank will be identified as such on the C-O-C record.

4.5 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

5.1 GENERAL

Since the soil gas sample collection method and procedure are not specified in the TCEQ SOPs or the PST QAPP, the collection method and procedure described in the FSP follow the EPA (1997) and ASTM (2006) guidance. This section describes the procedures or methods that will be used to collect the soil gas samples.

5.2 STANDARD OPERATING PROCEDURES

The SOPs developed by TCEQ for environmental investigations will be used as part of field sampling at the site. The applicable SOPs and sampling procedures will include, but not be limited to, the following:

Table 3: SOPs Utilized

SOP Used	SOP #	SOP Title
■	1.3	Site Restoration
■	1.4	Management of Investigative Derived Waste
■	1.5	Decontamination
■	6.1	Documentation
■	6.4	Sample Handling and Control
■	6.5	Collection of QA/QC Samples

No TCEQ SOPs have been developed for passive soil gas surveys; therefore, the following guidance documents will be used in place of SOPs:

- ASTM Standard Guide for Soil Gas Monitoring in the Vadose Zone, Designation D 5314-92 (Reapproved 2006); and
- United States Environmental Protection Agency, Office of Underground Storage Tanks, OSWER, Expedited Site Assessment Tools for Underground Storage Tank Sites, A Guide for Regulators, Chapter IV, Soil-Gas Surveys, March 1997; and
- GORE^{TM} Soil Gas Sampling-Storage, Installation and Retrieval Guideline; and
- BEACON Environmental Services, Inc., Field Kit for Passive Soil-Gas Investigations.

5.3 FIELD MEASUREMENT PARAMETERS

Field measurement parameters will not be measured as they are not required for this sample collection methodology.

5.4 EQUIPMENT CALIBRATION AND QUALITY CONTROL

No equipment calibrations will be required as no field measurements will be required for this sample collection methodology.

5.5 SAMPLING PROCEDURES

The GORE™ Modules are shipped as a kit and include the actual GORE™ Module, an insertion rod, cord, and a cork with screw eye.

- At each sample location a narrow diameter hole (approximately ½ to 1-inch) will be drilled using a hammer drill to a depth of three (3) feet below the ground surface.
- Wearing clean surgical/nitrile gloves, remove the module from the numbered jar and re-seal the jar. Verify that the barcode on the jar lid corresponds with the serial number on the module.
- Attach the cord and cork to the module by passing the looped cord through the loop on the module and pull the cord/cork back through itself.
- Place the insertion rod into the pre-cut pocket at the base of the module and lower it into the hole. If resistance is encountered remove the module and ream the hole and re-insert the module.
- Once deployed to the desired depth, press the insertion rod against the side of the hole and twist slightly to release the module. Remove the rod and push any excess cord into the hole and plug it with the cork. The cork will create an air tight seal to prevent ambient air from entering the hole.
- A survey pin flag will be placed at each sample location which will identify each sample/module number. To prevent vandalism or accidental disturbance, a metal washer or nut will be placed on top of the cork and covered with dirt. A metal detector will be used to locate the modules for retrieval should the pin flag be lost or tampered with.
- The module number, date and time of installation and any pertinent comments will be indicated on the installation/retrieval log. Write the module serial number on the site map adjacent to the appropriate map location.

- Each module will be left in place for sample exposure through adsorption for 8 to 10 days, as specified by GORE™.

- Following the module exposure period the cork will be removed with a penknife or corkscrew. The cord will be pulled from the sample hole and the cord and cork will be cut and discarded. The entire module will be placed in its labeled jar and secured with the lid. The module ID number will be verified prior to placement in the jar.

- Caution will be used when screwing down the lid on the sample jars. Any soil/debris on the jar and lid threads will be cleaned, and care will be taken to make sure no part of the module is pinched between the jar and lid. The seal will be tight but overtightning may cause breakage.

- A custody seal will be affixed to the side of the jar and jar lid. Do not cover the barcode with the seal.

- The jar will be placed in the supplied partitioned box and the module retrieval date/time on the Installation/Retrieval log will be completed.

- The sampler will also take a photograph of the sample collection and retrieval activities at each sample location.

5.6 SAMPLE VOLUMES, CONTAINER TYPES, AND PRESERVATION REQUIREMENTS

The GORE™ Modules are manufactured by GORE™ and are pre-packaged in laboratory supplied jars from their facility, with no preservatives. No special requirements for containers, preservation, sample volumes, or holding times are required.

5.7 SAMPLE HANDLING AND ANALYSIS

The field task leader will ensure that the lids on module jars are tight and that each individual sample container has a custody seal. The custody seal should not cover the barcode. Caution will be used when screwing down the lid on the sample jars. Any soil/debris on the jar and lid threads will be cleaned, and care will be taken to make sure no part of the module is pinched between the jar and lid. The seal will be tight but not overtightened as this may cause breakage. The modules will be placed back into their shipping box and into the supplied outer shipping container using appropriate packing materials to protect fragile contents. Styrofoam peanuts will not be used as packing material, bubble packing is acceptable. The boxes will be labeled to indicate fragile contents. There is no need to return the shipment in coolers with ice. The modules will be returned to GORE™ along with the insertion rod and the chain-of-custody by overnight courier to:

[Selected Laboratory 1]
[Address]
Phone: (XXX) XXX-XXXX
Attn: NOTIFY LAB IMMEDIATELY UPON DELIVERY!!

[Selected Laboratory 2 (Split Samples)]
[Address]
Phone: (XXX) XXX-XXXX
Attn: NOTIFY LAB IMMEDIATELY UPON DELIVERY!!

IMPORTANT: Samples should not be shipped for weekend or holiday delivery without prior arrangement with the laboratories.

Strict C-O-C procedures will be followed during this project to track all samples collected and data transmitted, in accordance with TCEQ SOP No. 6.4 (Sample Handling and Control). Sample possession must be traceable from the time of collection until the results are verified and final disposition of the sample. The sample custody procedures provide a mechanism for documentation of all information related to sample collection and handling to achieve this objective.

The field task leader will be responsible for ensuring that proper custody and documentation procedures are followed. Preformatted COC records will be used as the primary documentation mechanism to ensure that information pertaining to each sample is recorded. In addition, field notebooks and a master sample log will be maintained for all samples collected. Copies of the COC records and the field logs will be retained in the project file.

5.8 EQUIPMENT DECONTAMINATION

All equipment potentially coming into contact with contaminated media, will be decontaminated according to Superfund SOP No. 1.5 (Decontamination). A centralized decontamination area will be provided for the equipment and the area prepared in accordance with Superfund SOP No. 1.2 (Preparation and Control). The decontamination area will be lined with heavy gauge plastic sheeting, and designed with a collection system to capture decontamination waters. IDW generated by decontamination procedures will be accumulated in 55-gallon drums for disposal. Smaller decontamination areas for personnel and portable equipment will be provided as necessary in accordance with the Health and Safety Plan (HASP). Decontamination areas will include basins to capture decontamination waters, which will be transferred to 55 gallon drums as necessary.

All disposable Personal Protective Equipment (PPE) will be decontaminated such that it can be disposed as Class 3 waste.

5.9 CHAIN-OF-CUSTODY

All offsite sample shipments will be accompanied by the C-O-C record, which identifies the contents of the shipment. The original COC record plus copies will accompany the shipment with one copy retained in the project file. Another copy will be returned to the project team with the analytical results.

GEOSTRATA will collect the samples and turn them over for subsequent shipping and analyses. GEOSTRATA will relinquish the samples to a representative of the analytical laboratories who will sign the COC to acknowledge receipt of the samples. Alternatively, the samples will be shipped to the laboratory via carrier service (e.g. Federal Express, United Parcel Service).

Preformatted COC records will be used as the primary documentation mechanism to ensure that information pertaining to each sample is recorded. In addition, field notebooks and a master sample log will be maintained for all samples collected. Copies of the COC records and the field logs will be retained in the project file.

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

GeoStrata 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 work order. The GPS data shall be collected pursuant to SOP 17.1 (GPS Data Collection and Submission).

7.0 ADDITIONAL FIELD ACTIVITIES

7.1 SAMPLE IDENTIFICATION AND DOCUMENTATION OF SAMLING 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 deployment and retrieval;
- Environmental matrix and sample type;
- Sample collection method;
- Name of the person who collected the sample;
- Sample identification number and depth measured from surface of the environmental medium sampled;
- 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:

Soil Gas Samples: Soil gas samples will be identified using the prefix "SG" followed by the focus area identification and the grid cell number (ex.: "SG-AW-1);

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 SG-76 that has a 14:30 collection time on the C-O-C form is the duplicate of sample SG-15 that has a collection time of 14:05 on the C-O-C 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: For quality assurance purposes, these samples will be shown as soil gas (SG) samples on the C-O-C form; and

Trip Blanks: Trip blanks will be identified using the prefix "TB" followed by a sequential number.

Split Samples: As an added measure for data integrity, split samples will be collected by a separate contractor [Subcontractor Name] and analyzed by a separate laboratory [Laboratory 2 Name].

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 INVESTIGATION-DERIVED WASTE

All investigative-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 from the sample bore holes will be managed according to guidance provided in SOP No. 1.4 (Management of Investigation Derived Waste) and "Management of Investigation-Derived Wastes During Site Inspections", EPA/540/G-91/009, May 1991. The preference is to leave both RCRA hazardous and non-hazardous investigation-derived wastes on site whenever it complies with regulations and does not pose any immediate threat to human health and the environment.

7.3 SITE RESTORATION

The work site or sampling location will be restored to its 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.

7.4 HEATLH AND SAFETY

The contractor will develop a site-specific 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 designated health and safety officer 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 contractor 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 contractor will identify all potential health and safety risks present at the site. The contractor 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 contractor 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.

8.0 EXCEPTIONS, ADDITIONS, AND CHANGES TO THE TCEQ PST QAPP

Deviations from S.O.P. 6.5 *Collection of QA/QC Samples* exist as it pertains to Field Duplicates. Deviations from the QAPP are described in Section 4.4 of this FSP.

FIGURES

APPENDIX A

Sample Numbering System

For the purposes of this FSP, sampling numbers are as follows:

1. Soil gas samples collected will be labeled as "SG-X" and will be consecutively numbered, starting with SG-1.