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GERAGHTY & MILLER, INC.
Environmental Services

Ground Water *Engineering* *Hydrocarbon* *Remediation* *Education*

January 24, 1994

Caroline Kwan
U.S. Environmental Protection Agency
Region II
26 Federal Plaza, Room 737
New York, New York 10278

Re: Addendum to Appendix A - Soil Gas Survey Procedures, Phase II Remedial Investigation (RI) Work Plan, Tutu Wells Site, St. Thomas, U.S. Virgin Islands.

Dear Ms. Kwan:

As discussed in our January 21, 1993 meeting, Geraghty & Miller, Inc. has prepared this letter addendum to clarify the soil gas procedures presented in Appendix A of the Phase II Remedial Investigation (RI) Work Plan, Tutu Wells Site, St. Thomas, U.S. Virgin Islands (Geraghty & Miller, Inc. 1993). The U.S. Environmental Protection Agency's (USEPA) comments on Appendix A were presented in a draft letter to Ms. Ana Gloria Ramos, Tutu Environmental Investigation Committee (TEIC) Designated Coordinator, received on January 12, 1994. The specific responses or revisions to USEPA's concerns are presented below.

A revised Appendix A (Revision 1.0) has been prepared based on your comments. Revision 1.0 of Appendix A (enclosed) supersedes and replaces the original version. Please include Revision 1.0 in Appendix A of Volume 2 of the Phase II RI Work Plan (Geraghty & Miller, Inc. 1993).

- Page 3 - Geraghty & Miller defines a soil-gas "hot spot" as a location that has a soil-gas concentration that is an order of magnitude (10 times) greater than surrounding soil-gas values for other locations within the immediate area. These hot-spot areas may warrant further investigation.

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- Page 4 - If a location contains concrete that is greater than 1 foot, the sample location will be relocated or abandoned. The drill cannot penetrate concrete or asphalt greater than 1 foot in thickness.

- Pages 4 and 5 - The volume of the sample syringe is 500 ul.

- Page 5 - The sample syringe, teflon tubing and hosing apparatus will be purged with air between each sampling location. An air blank sample will be collected from this apparatus to determine that no cross-contamination is occurring.

- Page 5 - Yes. Sample probes will be purged with air before each new sampling location.

We hope this clarifies the soil gas procedures to your satisfaction. If you have any questions, please call.

Sincerely,

GERAGHTY & MILLER, INC.

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APPENDIX A

SOIL GAS SURVEY PROCEDURES
TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN THOMAS

Revision 1.0, January 1994

APPENDIX A

SOIL GAS SURVEY PROCEDURES
TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN THOMAS

INTRODUCTION

A soil-gas survey will be conducted at the Curriculum Center (former LAGA building) and the Virgin Islands Housing Authority (VIHA) maintenance area to identify potential sources of volatile organic compounds (VOCs) in soil. The study will be conducted in accordance with details outlined in Section 7.1.3 (Soil-Gas Surveys) of the Phase II Remedial Investigation (RI) Work Plan. VOCs detected by a soil-gas survey can originate directly from VOCs in the soil or from VOCs diffused upward into the soil atmosphere from ground water. Soil-gas surveys provide a qualitative indication of VOCs in the unsaturated zone, rather than a quantitative indication of VOCs in the soil or the ground water, because site-specific factors (such as paving, geology, distribution properties of VOCs, depth to water, soil moisture, and the geochemistry of the unsaturated sediments) can affect soil-gas concentrations. Although many soil gas surveys have been undertaken by various investigators at several facilities in the Tutu area, previously conducted soil-gas surveys have had mixed results due to these factors. Therefore, interpretation of the soil-gas survey results requires an understanding of the data and their limitations, as well as knowledge of the site geology. Additional sampling and laboratory analyses of the soil and ground water can confirm the presence and quantify the concentration of VOCs identified by the soil-gas survey.

A Photovac 10S50 portable Gas Chromatograph (GC) will be used to determine the presence or absence of VOCs in soil vapor samples collected at the Curriculum Center (former LAGA building) and the VIHA maintenance area. A Photovac 10S50 GC will be used for its ability to separate and quantify selected VOCs. Results can be obtained from the GC within 20 to 30 minutes. Compound identification and approximate concentrations are provided; however, only those compounds for which the instrument is initially calibrated can be identified and quantified. Therefore, prior to the study, the GC will be calibrated with air standards for benzene, toluene, xylene, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene. Each of these standards will be prepared by introducing a known volume of the compound into a 1-liter (L) Tedlar bag that has previously been filled with organic-free air.

SURVEY GRID

The soil-gas survey will be conducted on an unbiased rectilinear grid pattern established initially on a 40-foot spacing. As "hot spots" are encountered, the grid will be reduced to 20-foot spacing, as needed. The survey will be conducted in the areas to the north and west of the Curriculum Center (former) LAGA building. These areas include the former LAGA loading dock area and the area adjacent to the former LAGA dry cleaning room. The survey will also include the areas to the north and west of the VIHA maintenance garage. Areas to be investigated at the Curriculum Center and VIHA maintenance garage are shown on Figure 7-1 of the Phase II RI Work Plan. The soil-gas survey results will be summarized on a map delineating the approximate areal extent and the concentrations of VOCs detected. This map will be used to evaluate potential sources and to identify optimal locations for monitoring wells at the Curriculum Center and VIHA facilities, as appropriate.

A soil-gas "hot spot" is defined, for the purposes of this survey, as a location that has a soil-gas concentration that is an order of magnitude (10 times) greater than surrounding soil-gas values for other locations within the immediate area. The highest soil gas value within a "hot spot" will be identified as the focus for possible further investigation. The exact concentration of soil gas can vary, depending on soil type, initial concentration, soil moisture, and depth to groundwater; therefore, an exact concentration is not useful for determination of hot spots.

CALIBRATION

Prior to the initiation of the soil-gas survey, the GC will be calibrated with air standards of site-specific compounds. Standards will be made for each compound by introducing known volumes of each compound into a 1-L Tedlar bag that has been previously filled with organic-free air. The amounts of each compound injected into the Tedlar bag are based on the following formula:

$$\text{amount of compound added in microliters (ul)} = (A \times 760 \text{ mm/Hg})/p$$

where A = concentration of the compound, parts per million by volume (ppmv)

p = vapor pressure of the compound, in millimeters of mercury (mm/Hg)

For each initial calibration, the standards will be injected into the GC five times. An average response factor will be obtained by dividing the concentration of the standard by the average area under the peak from the five injections.

SAMPLING PROCEDURE

A rotary hammer drill with a 1 1/2-inch bit will be used to obtain access to the soil beneath asphalt and cement, if present. If the asphalt or cement is believed to be thicker than 1 foot, which is generally the case around the loading docks, then no attempt will be made to core through it. The location will either be relocated or abandoned. A 1/2-inch diameter borehole in the soil will be created with a slide hammer and solid rod assembly. These boreholes will be approximately 3 feet in depth. The solid rod will be removed and a 1/4-inch diameter hollow, stainless-steel rod will be inserted. A 1/8-inch Teflon tube will be contained inside the stainless-steel tube. The Teflon tube will extend outside of the hollow, stainless-steel tube. Midway down the exposed tubing is a stainless-steel tee through which syringe samples will be taken. A nail inserted into the lower end of the Teflon tubing will prevent clogging of the assembly as it is lowered into the borehole. The nail will then be disengaged, and the top of the borehole will be sealed around the stainless-steel rod with drill cuttings.

A pumping time study will then be conducted to determine the appropriate evacuation time(s) for soils at the Tutu Wells Site. In this study, the Teflon tubing is attached to a diaphragm pump and the borehole is evacuated for 1 minute. A 300-ul sample is collected through the stainless-steel tee with a gas-tight syringe (the maximum capacity of the syringe is 500 ul), and then the pump is shut off. The sample is injected into the portable GC for analysis. This procedure is repeated until five samples, at 1 minute intervals, are collected. The pumping time to be used at the Tutu Wells Site will correspond to the time when the highest concentrations of VOCs are detected. If compounds are not detected in the first borehole, the procedure will be repeated. If compounds are not detected by the third borehole, a pumping time of 2 minutes will be used. Care will be taken to ensure that at least two probe volumes will be purged, prior to sampling at each new location.

The sample syringe, teflon tubing, and hosing apparatus will be purged with air in between each sampling location. An air blank sample will be collected as discussed below from this apparatus to determine that no cross-contamination is occurring.

COMPOUND IDENTIFICATION AND QUANTITATION

The GC will identify all peak areas greater than 0.1 volt seconds (VS) as unknowns. The GC operator will then match the retention times of the most recent standard with the unknowns. If the retention times match, the VOCs will be identified and quantified by multiplying the area (in VS) of the VOCs by the response factor calculated from the initial calibration. The final concentration will be reported in parts per million (ppm).

BLANKS

Blanks will be run to determine if there is carryover from previous samples and standards. The blanks will be one of the following: GC blanks, syringe blanks, or equipment blanks. A GC blank will be run at the start of each day's sampling to ensure a steady baseline. This is done by starting a GC analysis without injecting a sample. Syringe blanks will be analyzed following the completion of the calibration runs by injecting 500 ul of ambient air into the GC (500 ul is the maximum capacity of the syringe). Syringe blanks will also be analyzed periodically during the day. VOC contamination detected in the syringe will be cleaned from the syringe by using a methanol and organic-free water rinse. Equipment blanks of the sampling

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apparatus (i.e., tubing and hose) will be analyzed following every sample where a positive result is obtained. Equipment blanks are collected by removing the sampling assembly from a borehole and running the pump for a few minutes to draw ambient air through the system. An air sample is collected from the stainless-steel equipment and analyzed with the GC. If VOCs are detected in the equipment blank sample, the sampling equipment will be decontaminated by purging the equipment with the sampling pump until the VOCs is no longer detected.

QUALITY CONTROL

In addition to the calibration analyses, duplicate analyses will be run once every ten samples. Continuing calibration analyses will be performed as required, or a minimum of once every 2 hours, by injecting 300 ul of the standard into the GC. A syringe blank will be run after every calibration check. The retention time of each compound will then be checked for peak drift by comparing the new retention time with the one from the previous standard analysis. A fresh standard will be prepared at the beginning of each day to update the average response factors.