

1.0 INTRODUCTION

Soils & Environmental Services, Inc. conducted this House Petroleum Vapor Assessment, Vapor Remediation Evaluation, and Vapor Corrective Action Plan (CAP) for a reported release from a residential aboveground heating oil storage tank (UST) at the Richter Residence in Manassas, Virginia. The site activities described in this report and the Corrective Action Plan were directed by Alex Wardle of the Virginia Department of Environmental Quality (VDEQ) in a letter to Catherine Richter dated March 1, 2005, subsequent phone discussions, and the CAP VDEQ Activity Authorization Form (AAF) approved by the VDEQ on April, 14, 2005. The VDEQ letter is provided in Appendix A and the VDEQ AAF is provided in Appendix B.

Referring to Figure 1, the site is located at 10406 Moore Drive, Manassas, Virginia. Subsequent sections of this report will describe additional initial abatement activities, petroleum vapor assessment activities, observations and results, vapor remediation evaluation, and corrective action activities planned for the site.

2.0 ADDITIONAL INITIAL ABATEMENT AND SITE ACTIVITIES

Field activities conducted for this report included additional initial abatement activities, volatile organic vapor field measurements, hand auger borings, soil logging, soil sampling, and submittal of soil samples for analytical analyses of the contaminants of concern.

During field activities conducted at the site, a survey of site features was performed. This survey was conducted using a measuring tape and measuring wheel. The survey was conducted for the creation of a scaled map of the site. Since the surveyed measurements were contained to the lawn area immediately around the house and within the house on the property, survey difficulties (e.g. wooded area) that could result in a significant error were not encountered. The site survey measurements were performed to the nearest foot.

The house petroleum vapor assessment included the field measurement of volatile organic vapors in the halfway into the cinder block wall of the house exterior at locations approximately one foot above the ground surface in the vicinity of the heating oil release.

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These measurements were made in half-inch drill holes using a photoionization detector (PID). To further assess the source of these vapors, PID measurements were conducted in a half-inch drill hole through the concrete floor of the house located approximately eight inches from inside the house's perimeter wall, which is adjacent to the release area. Additionally, hand auger borings were conducted immediately adjacent to the house in the vicinity of the petroleum release. The hand auger borings were conducted to log the type of soil that was impacted by the release and to sample the soil for laboratory analysis of the contaminants of concern.

The above-referenced half-inch drill holes in the house exterior cinder block wall and the house interior concrete floor were used to treat the source of the house petroleum vapors with five gallons of "Vapor Remed." Vapor Remed was injected into these holes to mitigate the source of petroleum vapors detected in the airspace in the house. The material safety data sheet (MSDS) for Vapor Remed is provided in Appendix C. The above-referenced PID measurements were conducted before and after the Vapor Remed treatment. The hand auger soil sampling was conducted after the Vapor Remed treatment.

As referenced above, the hand auger borings were conducted to log and sample petroleum-impacted soil and to submit soil samples for laboratory analysis of petroleum constituents of concern. Soil sampling was conducted at the three hand-auger boreholes that were extended diagonally toward the house. The hand auger soil samples were obtained using a clean, steel constructed hand auger at a depth of 2 feet below the ground surface (bgs), which is beneath the 12 to 18-inch depth of the interface between the house cinder block wall and the underlying concrete footer. An additional hand auger sample was taken at a depth of six feet bgs at HA-2, which is in the petroleum release area. The soil samples were obtained with a clean, steel constructed hand auger. Four soil samples were transferred directly to laboratory-prepared containers. Soil sample containers were labeled with the following information: sample designation, sampling date, sampling time, site name, and requested analyses. The samples were immediately packed in a cooler filled with ice and transported with a chain of custody to an environmental laboratory for analytical analysis of petroleum constituents of concern.

During the hand augering at the site, samples were collected at one-foot intervals beneath the surface fill dirt. The site geologist examined each sample for soil type and visual or

olfactory evidence of petroleum. In addition, each sample was screened for volatile organic compounds (VOCs) using a direct-reading PID. The PID was calibrated to a 100-ppm isobutylene standard prior to field screening.

3.0 RESULTS OF SITE ACTIVITIES

3.1 Hand Auger Soil Logging Observations

Hand auger-boring logs, including soil descriptions and PID measurements, are provided as Appendix D. Based on the logs of the three hand auger borings conducted immediately north of the house at the site, fill dirt was observed from the ground surface down to approximately 1.5 feet bgs, sandy silt loam was observed between 1.5 to 4 feet bgs, and sand loam was observed from 4 to 6 feet bgs.

3.2 Presence of Compounds of Concern

3.2.1 Liquid-Phase Hydrocarbons

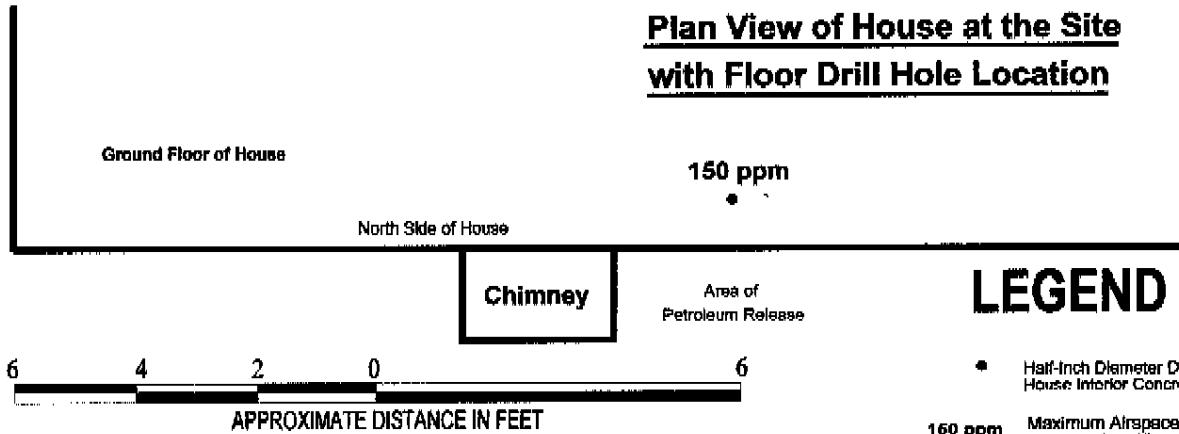
Free product was not observed at the site during the implementation of the above-referenced site activities.

3.2.2 Vapor-Phase and Residual-Phase Compounds of Concern

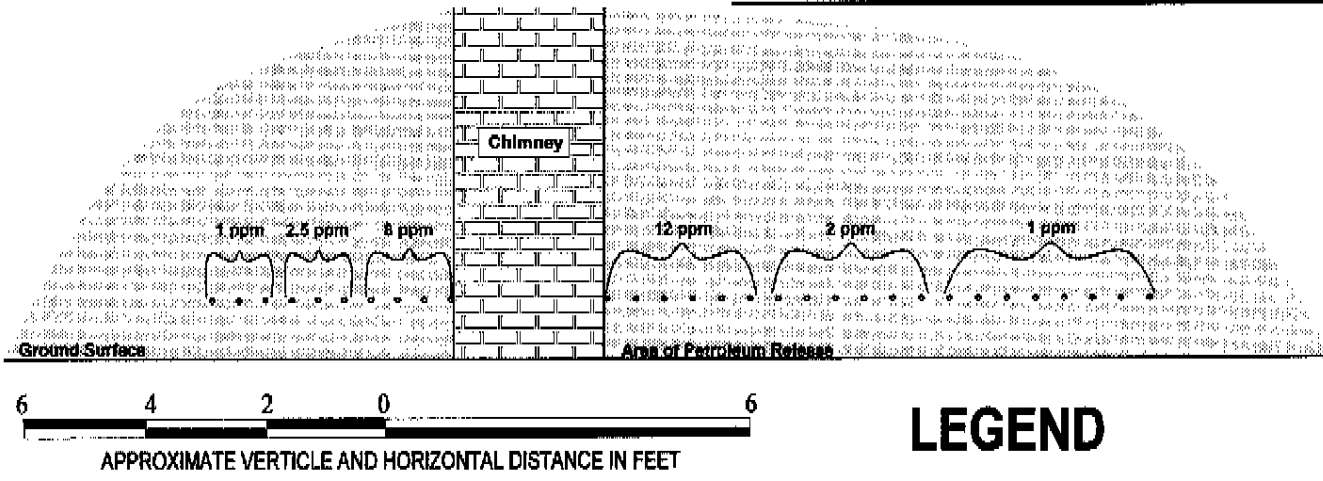
Volatile organic vapor concentrations were measured in the field with a PID on April 21, 2005 before the application of Vapor Remed treatment. Subsequently, after the Vapor Remed treatment, vapor levels were measured again on May 10, 2005. The locations and recorded levels of vapors are displayed on the scaled maps displayed in Figure 2 and Figure 3.

The recorded vapor levels coupled with the lack of free product detected at the site suggest that there is not a significant pool of free product in the subsurface, which may be acting as a continuing source of petroleum vapors for the house interior. However, the relatively high pretreatment vapor levels appeared to indicate that residual-phase petroleum is capable of acting as a continuing source of petroleum vapors for the house interior.

**Plan View of House at the Site
with Floor Drill Hole Location**



**Profile of North Exterior
Wall of House at the Site
with Exterior Wall Drill Hole Locations**



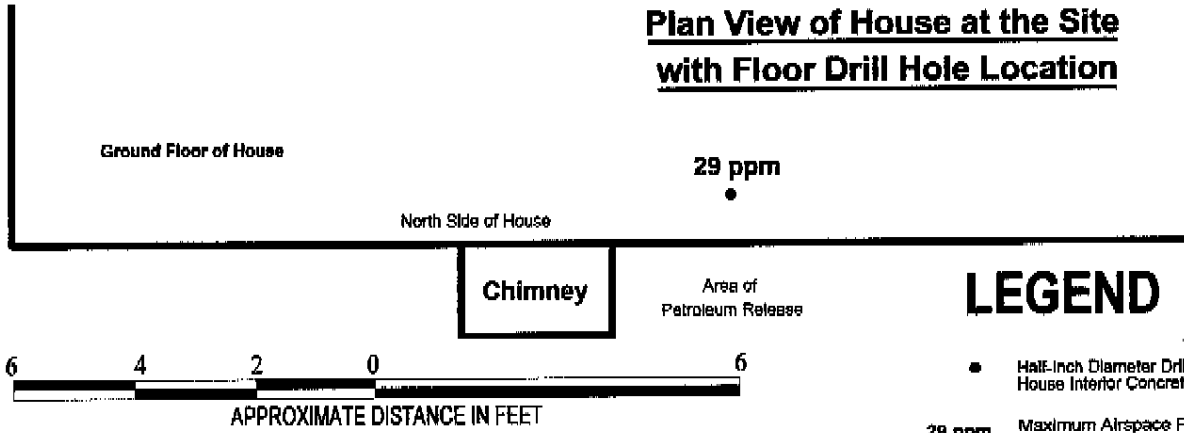
Project Title: Richter Property
10406 Moore Drive
Manassas, VA

DATE: May 2005
SCALE: As Shown
DRAWN BY: TRL
VDEQ PC#: 2005-3168

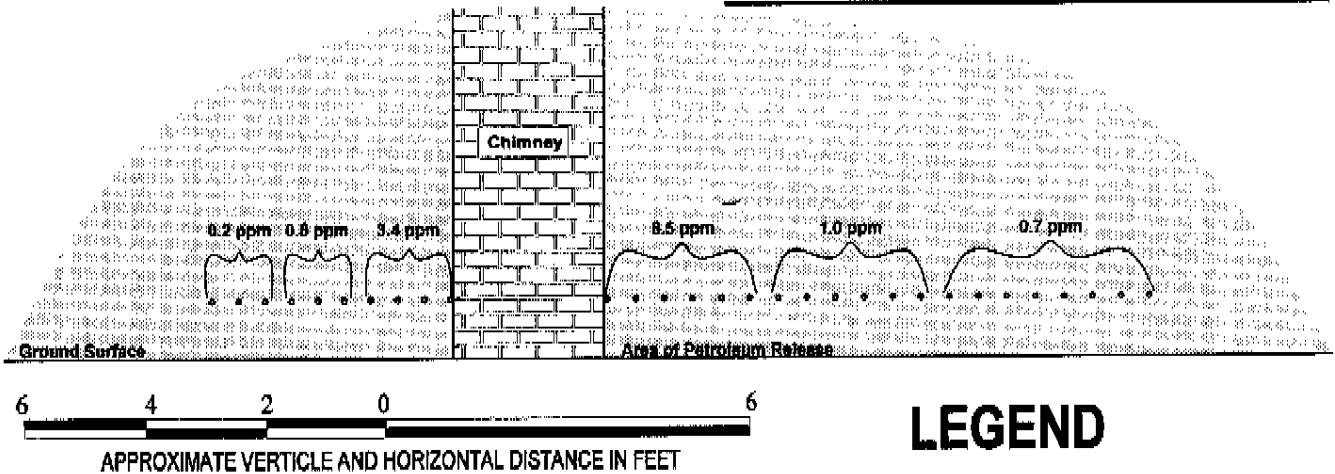
FIGURE 2
PreTreatment
Volatile Organic Vapor Concentration Map



**Plan View of House at the Site
with Floor Drill Hole Location**



**Profile of North Exterior
Wall of House at the Site
with Exterior Wall Drill Hole Locations**



Project Title: Richter Property 10406 Moore Drive Manassas, VA			
DATE: May 2005	SCALE: As Shown	DRAWN BY: TRL	VDEQ PC#: 2005-3188

FIGURE 3
PostTreatment
Volatile Organic Vapor Concentration Map



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The post-treatment vapor levels appear to indicate that the Vapor Remed treatment was effective in mitigating vapor levels in the source areas. Vapor levels in the airspace of the house interior were not detected during the above-referenced vapor monitoring events.

To further assess the source of house petroleum vapors, soil samples were collected on April 29, 2005 from two feet bgs in all three hand auger borings at the site and at six feet bgs at HA-2, which is located in the source area. Figure 4 displays the locations of the hand auger locations on a scaled map.

All the samples were analyzed for TPH-DRO (Method 8015B). Soil samples obtained at two and six feet bgs in the source area were also analytically analyzed for BTEX, MTBE, and Napthalene (Method 8021B). Analytical reports are included in Appendix E and summarized in the Table below. Figure 4 also includes a cross section of the source area showing the estimated petroleum-impacted area.

Hand Auger Sample Location	Date Sampled	TPH-DRO (ppm)	Benzene (ppb)	Toluene (ppb)	Ethyl Benzene (ppb)	Xylenes (ppb)	MTBE (ppb)	Napthalene (ppb)
HA-1, 2' bgs	4/29/2005	BDL	BDL	BDL	BDL	BDL	BDL	BDL
HA-2, 2' bgs	4/29/2005	846.9	2.4	166.5	230.2	1,102.60	9.7	331.6
HA-2, 6' bgs	4/29/2005	44.9	BDL	BDL	BDL	BDL	BDL	325.1
HA-3, 2' bgs	4/29/2005	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL - Below Detection Limit
ppm - Milligrams per Kilograms
ppb - Micrograms per Kilograms