

VAPOR MITIGATION SYSTEM INSTALLATION WORK PLAN

Riggs Park Neighborhood

Vapor Mitigation System Installation

WASHINGTON, D.C.

Prepared for

**DISTRICT
DEPARTMENT
OF THE
ENVIRONMENT**



green forward

*District Department of the Environment
Government of the District of Columbia*

April 23, 2013

Prepared by
Tetra Tech

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Washington, D.C.

1.0 OVERVIEW OF THE VAPOR MITIGATION SYSTEM (VMS) WORK PLAN

The District Department of the Environment (DDOE), on behalf of the District of Columbia (District), has prepared this Vapor Mitigation System (VMS) Work Plan (Work Plan) for the Riggs Park neighborhood (Site) in northeast Washington, District of Columbia (D.C.). The Work Plan describes the tasks to be completed for the VMS installation and details how the process will be completed.

This Work Plan was prepared to address the VMS installation activities at residences deemed eligible to receive VMS per the 2010 Homeowners Reports, and includes the following:

1. Site Background and History
2. VMS Design and Installation
3. VMS Monitoring and Sampling
4. Sampling Data Endpoints
5. Homeowners Concerns from Previous Investigations

The Work Plan includes several appendices that provide additional details and supplementary information to the Work Plan. Appendix A of the Work Plan provides Site figures. Appendix B of the Work Plan provides the Homeowners Outreach and Notification Plan, which was developed to promote communication between the Site residents and the District and works congruently with the Work Plan. A copy of the January 30, 2013 Introduction Letter that was initially sent to all residents receiving a VMS is provided in Appendix C. Appendix D provides a copy of the access agreement sent to the residents. Appendix E of the Work Plan provides the Statement of Basis: to the responsible party (RP) for the Gasoline Release at Chillum, Maryland and Response to Comments on Administrative Order on Consent, RCRA-03-2008-0355TH. Appendix F of the Work Plan provides the Site-Specific Health and Safety Plan. Appendix G provides Standard Operating Procedures (SOPs) for the activities conducted under this work plan. Appendix H includes the Final Remedy Selection and Response to Comments for Riggs Park Community, Washington, D.C.

2.0 SITE BACKGROUND

2.1 Site Location

The Riggs Park neighborhood is located in Northeast Washington, D.C., along the northeastern border of Washington, D.C. and the State of Maryland. The gasoline station where the initial UST release occurred is located at 5801 Riggs Road, Hyattsville, Maryland 20783. For purposes of this Work Plan, the Riggs Park neighborhood is defined as follows: Eastern Avenue NE is the northeastern border; 8th Street NE is the southeastern border; Nicholson Street NE is the southwestern border; and Riggs Road NE is the northwestern border. A street map of the Riggs Park neighborhood is included as Figure 1 and an aerial photograph of the Riggs Park neighborhood is included as Figure 2 in Appendix A.

2.2 History of Contamination

In October 1989, there was a reported release of an unknown amount of gasoline from an underground storage tank (UST) at the Chevron Service Station located at 5801 Riggs Road, Chillum, Maryland. The release was initially addressed by the Maryland Department of the Environment (MDE). At that time, MDE required Chevron to install a groundwater remediation system to remove the gasoline related impacts from the groundwater. The system has been in operation since 1990 and sampling of the groundwater is ongoing.

In April 2001, the gasoline plume was reported to have migrated into the District of Columbia, forming a plume beneath the residential area known as the Riggs Park Community. Because the gasoline plume impacted two separate political jurisdictions, (the State of Maryland, and the District of Columbia), EPA Region 3 assumed the lead investigatory role for the Site. In response to the off-site impacts identified in groundwater, the District assigned Leaking UST (LUST) case number 2001071 to the facility. Copies of the LUST files, which include previously completed reports regarding subsurface investigations completed to date, can be obtained from the DDOE UST Division upon request. To date, and in addition to the above referenced groundwater remediation system, remedial measures, such as the installation of an oxygen barrier and self-contained groundwater pump and treat wells have been installed at locations in the vicinity of the former Chevron gasoline service station. These measures were implemented by the RP, and approved by the EPA in an effort to assist in the remediation of the impacted groundwater as it relates to the gasoline release.

In the summer of 2002, during a site investigation at the petroleum hydrocarbon impacted areas, the EPA identified perchloroethene, also known as PCE, contamination within part of the groundwater contaminant plume. Subsequently, the EPA issued its "Final Decision and Response to Comments," which required the RP for the release of the regulated substance from

the USTs to install VMS at three (3) homes. Currently, these three VMS are on-line and operational. Based on the data collected to date, verbal approval was granted by the EPA to cease sampling activities from two of the three VMS locations. Because of a data gap, the third VMS location will need one additional sampling event (Spring 2013). Following the Spring 2013 sampling event, and after a review of the data, a petition to cease sampling of the VMS may be submitted by the RP to the EPA. Please note that two of the three VMS currently installed by the RP will be monitored as part of the District's Final Remedy. The third VMS is not included in the District's Final Remedy and is the sole responsibility of the responsible party and/or homeowner.

In an effort to further address the potential for a vapor intrusion risk as it relates to the PCE impacts identified in groundwater, and in addition to the numerous investigations completed at the Site, the District undertook a comprehensive evaluation of all available information and completed a 2010 Human Health Risk Assessment (HHRA). Based on an evaluation of the data, the District's Final Remedy for the Riggs Park neighborhood recommended the installation of VMS in select eligible residential homes to address potential health risks that could arise from groundwater-related contaminants in the subsurface. The District presented the above findings and recommendations in the 2010 Final Remedy for the Riggs Park community.

The findings presented in the Final Remedy are based primarily on data gathered by SSP&A as well as a comprehensive evaluation of the available data (as presented in the 2010 HHRA). The District has also relied on the documents logged in the Administrative Record for this project. Based on the 2010 Final Remedy, a Homeowners Report, which included an evaluation of the data collected to date, laboratory reports for the data collected and an explanation of the eligibility of the VMS was sent out in May 2010 to select residents.

3.0 VAPOR MITIGATION SYSTEM DESIGN AND INSTALLATION

3.1 VMS Justification

On February 20, 2009, based upon the review of the 2008 data and an administrative record, DDOE issued its proposed Remedy Selection for Riggs Park, identifying up to 43 homes as potentially qualifying for VMS installation because of potentially unacceptable risks posed by possible vapor intrusion. The District's final remedy selection recommends the installation of vapor mitigation systems in all residences or inhabited buildings in Riggs Park at which the sub-slab contaminant levels meet at least one of the following key criteria:

- Sub-slab contaminant level in the home exceeds a 1×10^{-5} cumulative cancer risk or a hazard index of 1 for cumulative non-cancer risk, posed by the contaminants of concern that are also attributable to groundwater contamination.
- The home's basement is in close proximity to groundwater with elevated concentrations of contaminants of concern that are also attributable to groundwater contaminations.
- The home is located on the same building slab or in the immediate vicinity of other homes meeting one of the previous criteria.

Based primarily on the District's 2008 data, the 2010 HHRA, and the above-stated criteria, the District identified the following:

- Twenty-two (22) residences with measured sub-slab soil vapor concentrations that pose an unacceptable potential human health risks.
- One (1) residence where measured soil vapor or groundwater concentrations pose an unacceptable human health risk.
- Twenty (20) residences with no directly measured data where projections based on statistical data extrapolations suggest possible unacceptable human health risks.

The sub-slab VMS will be installed in all residences selected for vapor mitigation as detailed in the 2010 Homeowners Reports. The effectiveness of this type of system is well known, and therefore the District considers this remedy selection to be protective of human health, upon proper installation, operation, and maintenance. The performance standard of the VMS is a depressurization of 0.016 to 0.04 inches of water, which should divert potential vapors emanating from beneath affected homes thereby removing the potential for future intrusion of contaminants into these homes. With the potentially contaminated vapors diverted, and with the absence of existing background sources (chemicals stored in the home) known to contain numerous compounds-of-concern, the Indoor Air Standards presented in Section 4.3 should be attained in each home with a VMS.

3.2 Homeowner Outreach and Notification Letter

On January 30, 2013, the District sent a letter to each of the 43 residents selected to receive a VMS indicating that the District has selected Tetra Tech, Inc. (Tetra Tech) as the environmental consultant to support the ongoing environmental remediation activities in the Riggs Park neighborhood. The letter also provided an approximate schedule for the installation of VMS at eligible residences in the neighborhood. The letters informed the recipients that an access agreement (described below in Section 3.2) must be signed and returned by residents prior to VMS installation activities commencing at their homes. Recipients were provided with the toll-free Riggs Park voice message service at 1-855-384-0092 and email address of RiggsParkVMS@tetrattech.com in the event they had questions. A Homeowner Outreach and Notification Plan promoting communication between the District and the Riggs Park neighborhood is included in Appendix B. A copy of the notification letter is included in Appendix C.

3.3 Access Agreements

During the week of March 11, 2013, Tetra Tech sent an access agreement form to each of the 43 residents eligible to receive a VMS. A self-addressed stamped envelope was also provided for the residents to return the executed (signed) access agreements. The access agreement is a binding document signed by the resident and Tetra Tech and allows access to the residence by the District and Tetra Tech personnel (and related subcontractors) in order to complete the VMS installation and monitoring activities. After Tetra Tech receives the executed access agreements, Tetra Tech will follow the procedures identified in Section 3.4 to schedule pre-installation site visits at each residence. In the event a resident denies access to the property and does not agree to have a VMS installed, the access agreement allows the resident to indicate that access to the residence is denied so that the District may keep a record of the process. In the event that access to the home, for the purpose of the VMS installation is denied, the resident understands that District will be released from any future request by the resident to install a VMS. In the event that no response is received 30 days after the delivery of the access agreements, Tetra Tech and/or the District will complete additional attempts to engage the resident. A copy of the access agreement sent to the residents is included in Appendix D.

3.4 VMS Design, Specifications, and Installation Procedures

Tetra Tech has completed the design and specifications of a typical VMS that will be installed in each of the eligible residences. A typical VMS is depicted in Figures 3 and 4 of Appendix A. Figure 3 provides an Elevation view and Figure 4 provides a Detailed View of a typical VMS. At the direction of the DDOE, Tetra Tech completed the proposed VMS design based on a review of available data as well as a review of the VMS previously installed by the RP at three

residences in the Riggs Park neighborhood where an actual risk of vapor intrusion was determined to exist by the EPA. Tetra Tech was directed by DDOE to use existing design and specifications of the VMS based on available data and because it was determined that each of the 43 residences was similar in size and construction to the three residences that already have the operating VMS. With that, please note the VMS installed at each residence is required to meet or exceed EPA depressurization goals of 0.016 to 0.04 inches of water (4 to 10 Pascals).

After an executed access agreement is returned to Tetra Tech, a pre-installation site visit will be scheduled with the resident. During this visit, Tetra Tech representatives and one member of Radon Control Professionals, Inc. (RCP), Tetra Tech's subcontractor for installation of the VMS, will assess the electrical infrastructure of the residence to ensure it is compatible with the VMS and that the electrical system will not require an upgrade. It should be noted that an additional circuit breaker for the VMS blower could be installed by RCP's electrician; however, a substantial modification to the electrical system of a residence would be considered beyond the scope of this task. During the completion of the pre-installation site visits, Tetra Tech will keep the District apprised of the schedule and any issues that arise.

During the pre-installation site visit, Tetra Tech and/or RCP personnel will take photographs, discuss proposed locations for equipment and the vapor extraction point with the resident and RCP, and conduct an inventory of potential background sources of volatile organic compounds (VOCs) in the basement of the residence. If any potential background sources are noticed, Tetra Tech will identify and request the resident remove the source. It should be noted that while Tetra Tech will make every attempt to ensure the completeness of the inventory, it will be limited to documenting chemicals observed in the open. Tetra Tech will not open cabinets or drawers, nor perform any type of search of any portion of the residence. In the event obstructions to the VMS installation work area are observed, the resident will be informed and asked to relocate the obstructions prior to the VMS installation activities. It is assumed that three pre-installation site visits will be performed per day.

Once the pre-installation site visit is completed, the resident will be contacted to schedule a date for the installation of the VMS in their home. It is anticipated that approximately 8 hours are needed to install the VMS. During this time, an adult (age 18 years or older) must remain home at all times. In the event the resident leaves the residence, the installation activities will cease and standby time charges will apply.

Prior to installing a VMS, RCP will perform a diagnostic communication test to determine the vacuum needed to depressurize the area directly beneath the building. The results of the diagnostic test will be used to confirm whether one extraction point and the fan size specified herein are adequate to achieve the performance standard (depressurization of 0.016 to 0.04 inches of water). The test will be performed by applying a vacuum to a test suction point, then

measuring vacuum at smaller observation holes installed at increasing distances from the suction point. Vacuum will be measured using a differential pressure manometer.

Once the diagnostic testing confirms that one extraction point is sufficient and the fan size is adequate, RCP will penetrate the basement slab utilizing a hammer drill and install one four-inch schedule 40 PVC (PVC40) vapor extraction pipe. If it is determined that additional extraction points are needed, they will be installed. The extraction point(s) will be placed in a location that allows for adequate depressurization beneath the slab, yet is in an unobtrusive location in the resident's basement. The penetration will be excavated approximately ten inches below the slab and backfilled with crushed stone with an approximate diameter of ¾-inch. The sump diameter will be a minimum of 12 inches. During construction activities, Tetra Tech and RCP will make every effort to mitigate dust generated during the concrete drilling. In addition, Tetra Tech will collect air samples during construction activities at select VMS installations to confirm concentrations of airborne dust remain within applicable Occupational Safety and Health Administration (OSHA) standards. Radon Control Professionals will then use a sealant or non-shrink grout to install an airtight seal between the slab and the vapor extraction pipe. Sealant will be a polyurethane or urethane product conforming to ASTM International (ASTM) C920. Non-shrink grout will be a hydraulic cement grout conforming to ASTM C1107. The set time of the grout will be one hour or less and the grout will attain minimum 2,000 pounds per square inch (psi) compressive strength within 24 hours.

Radon Control Professionals will then drill a three- to five-inch diameter hole in the exterior wall of the building for the installation of the discharge vent (PVC40 mitigation vent stack piping). A round to square transition will be installed and aluminum downspout will be installed to complete the stack to the roofline. The discharge stack will extend 18 inches above the roofline. A cap sufficient to keep nuisance water from entering will be installed at the top of the stack.

Two stainless steel (SS) ¼-inch tubes that can be read with a magnehelic gauge to measure cross slab differential pressure relative to the basement will be installed. One tube will be open to the air above the basement slab and one tube will extend beneath the basement slab in the same location for comparative accuracy. Gauges will be installed on the exterior wall of the building. Polyethylene tubing will be used to connect the aboveground and sub-slab tubing to a magnehelic gauge.

Radon Control Professionals will then install an electric mitigation fan according to the ASTM Standard E-2121-03. The fan will be mounted on the exterior of the residence. A removable petcock and separate sampling port will be installed in the vent stack so that flow readings can be measured and the discharge stack can be sampled from the exterior of the home. A gate valve will be installed beneath the fan for isolation and sampling.

Electrical connections from the VMS to the residence's electrical system will be completed by a Washington, D.C.-licensed electrician under subcontract to RCP or Tetra Tech. Electrical work will be completed in accordance with ASTM standards and local electrical codes. The electrical work for the VMS will be completed the same day of the VMS installation. For the purposes of this work plan, Tetra Tech assumes that electrical permitting will not be required by the District. District electrical requirements will be confirmed with the licensed electrician prior to the commencement of VMS installation activities. Please note that based on the fact that each VMS installed by the District is to mitigate the potential risk of vapor intrusion, and not an actual risk of vapor intrusion (as in the case of the three homes that currently have a VMS). Therefore, the District will not be responsible for electrical costs associated with operating each VMS.

Once connections are complete, the VMS will be activated for testing. A post-installation vacuum confirmation test will be completed to verify that the VMS attains the performance standard throughout the area to be depressurized (the basement slab). Vacuum will be measured at three test points including the corners of the slab furthest from the extraction point (where possible). In addition, back draft testing will be completed to ensure that gas appliances and/or furnaces are not back drafting while the VMS is operational.

At the conclusion of testing, and as approved by the homeowner, visible minor cracks in foundation wall or concrete floor will be sealed with polyurethane caulk, if needed. The sealing of larger cracks in the basement or foundation not caused by VMS installation activities is considered to be beyond the scope of work for VMS installation. The existence of larger cracks will be noted and reported to the District.

3.5 VMS Installation Health and Safety Plan

A part of Tetra Tech's commitment to the health and safety of its employees, subcontractors, and the Riggs Park neighborhood residents, Tetra Tech will follow the guidelines laid out in the Riggs Park-specific Health and Safety Plan (HASP) completed for the specific activities that will be performed at each residence. As part of the development of the HASP, RCP was required to submit their health and safety credentials to Tetra Tech for review and approval. In addition, all Tetra Tech personnel completing VMS installation activities will have OSHA 40-hour Hazardous Waste Operation and Emergency Response (Hazwoper) training. The HASP is included in Appendix F.

4.0 VAPOR MITIGATION SYSTEM MONITORING AND SAMPLING

4.1 Standard Operating Procedures

As part of the scope of work provided by DDOE, SOPs were required to be included in this work plan. Standard Operating Procedures for the following tasks are attached in Appendix G:

- Complete a brief building survey to assess contents in each residence basement, screen each basement area for the presence of sources for volatile organic compounds, and provide the building occupant with general guidelines to follow during sampling events.
- Sample indoor air in each home prior to VMS installation.
- Sample indoor and ambient air while the mitigation systems are operating and after an equilibration period following system shutdown.
- Sample sub-slab vapor from the discharge stack.
- Measure pressure differential across the basement slab.
- Measure the airflow rate after VMS fan/blower.

4.2 Monitoring Plan

To ensure each VMS is operating properly, and to assess the effectiveness of each VMS, indoor air samples will be collected annually for a minimum period of one (1) year to a maximum of three (3) years, as determined from the sampling data obtained from each residence. The monitoring and sampling plan may also be based on the data included in the 2010 Homeowner Reports provided from the District to each resident, as well as the data obtained from each home after the initial sampling event (tentatively scheduled to occur two months after VMS installation).

The VMS will be installed in such a way that airflow rate, differential pressure, and indoor air, soil gas, and ambient air samples can be collected without entering resident homes. Sampling ports will be installed through the foundation wall and directly on the VMS. Residents will be notified via telephone approximately one week prior to Tetra Tech sampling activities. In addition, Tetra Tech personnel will ring the doorbell (or knock on the door of the residence) on the day of sampling activities to attempt to inform the resident of activities occurring. The VMS are required to be operating for at least 24 hours at the time of indoor air sample collection. Summa canisters will be connected by Tygon® or equivalent sampling tubes to the sampling port for an eight (8) hour time period and then sent to an off-site laboratory for analysis.

In an effort to establish that vapor intrusion as it relates to the former gasoline spill is not a risk to human health, indoor air samples will be collected from the basement of each home and compared to the previously established EPA remediation standards for the compounds-of-concern (as detailed below). The EPA remediation standards for indoor air are detailed in the August 2007 EPA

Statement of Basis. Based on the fact that PCE and Chloroform were not included in the indoor air standards established by the USEPA, the District has adopted the USEPA Region 3 Regional Screening Level (RSL) for Resident Air (April 2012).

If during sampling, the COCs exceed each of their respective remediation standards/RSLs, then the District's option to sample the indoor air will continue on a case by case basis until the COCs in indoor air are observed at concentrations below the established EPA standards/RSLs. At that time, notification to the homeowner that the District's option to maintain each VMS has been fulfilled may be submitted.

If after the VMS has been running for approximately two (2) months and the initial indoor air sampling data from each home does not exceed the EPA remediation standards/RSLs for the COCs, the homeowner will be notified that the District's option to monitor the VMS has been fulfilled. The District also has the right to amend the VMS sampling plan as the data is reviewed or as it deems necessary.

In addition to the homes where VMS are proposed in this work plan, and as detailed in the 2010 Final Remedy located in Appendix H, Tetra Tech, on behalf of the District, will continue monitoring activities at two of the three residences currently equipped with a VMS that was installed on behalf of the RP for release of gasoline that impacted groundwater in the Riggs Park neighborhood. These VMS are currently in service and are being petitioned to be shut down by the current RP. The operation and maintenance as well as the sampling of these two systems are part of this Work Plan. The VMS currently installed at the third residence is the sole responsibility of the current homeowner as based on the data collected and reviewed, it was not deemed eligible to receive a VMS by the District.

4.3 Sampling Data Endpoints

The COCs for the Riggs Park neighborhood as it relates to the potential risk for vapor intrusion from contaminated groundwater and as detailed in the 2010 Homeowner Reports are chloroform and PCE. Please note that since these COCs were identified within the groundwater contaminated from the gasoline release, and to maintain consistency with previous investigations and remedial actions implemented by the EPA, the District has included benzene, toluene, ethylbenzene, xylenes (BTEX), and methyl tert-butyl ether (MTBE) in the list of COCs. Note that the potential risk for vapor intrusion of these COC's must be attributable to the contaminated groundwater to be remediated at the direction of the District.

Based on data collected throughout the Riggs Park neighborhood (both within and outside the plume of impacted groundwater), the following Indoor Air Standards were calculated and identified by the EPA in the Statement of Basis: Chevron Gasoline Release at Chillum, Maryland, dated August 30, 2007 and the "Final Decision and Response to Comments on

Administrative Order on Consent, RCRA-03-2008-0355TH” (EPA 2008). Residents are encouraged to review these documents in Appendix E. In establishing the Standards, the EPA states “For vapor mitigation, indoor air [must be remediated] to local background levels with respect to gasoline vapors.” Since PCE and Chloroform were not included in the Indoor Air Standards established by EPA as detailed above, the District has adopted the EPA RSLs for Region 3, April 2012. These standards will be used for identifying remedial endpoints for the VMS sampling program implemented by the District.

Table 1. Standard Levels for Remedial Endpoints for the District Riggs Park VMS Sampling Program

Compound of Concern	EPA Standards ($\mu\text{g}/\text{m}^3$)
Benzene	8
Toluene	5,000
Ethylbenzene	1,000
Total Xylenes	100
MTBE	17
Chloroform	0.11 ¹
PCE	9.4 ¹

$\mu\text{g}/\text{m}^3$ – micrograms per cubic meter

¹ – EPA RSL April 2012

5.0 HOMEOWNER CONCERNS FROM PREVIOUS INVESTIGATIONS

Based on previous investigations completed at select residential homes in the Riggs Park neighborhood, several homeowners have voiced concerns regarding incomplete restoration of the basement floors. According to the homeowners, previous boring locations or sampling points installed into the concrete sub-slab of the homes were not properly backfilled to their original condition. During the VMS installation activities at eligible residences, Tetra Tech and RCP will attempt to schedule repairs that resulted from the previous investigations with affected residents if the resident identifies them during the pre-installation inspection. Residents requesting repairs will be required to sign a separate access agreement. Large-scale repairs or repairs to basements from causes other than previous environmental investigations that were not brought to the attention of the District prior to implementation of this work plan will not be addressed. Residents that decline the access agreement will not be eligible for repair activities.

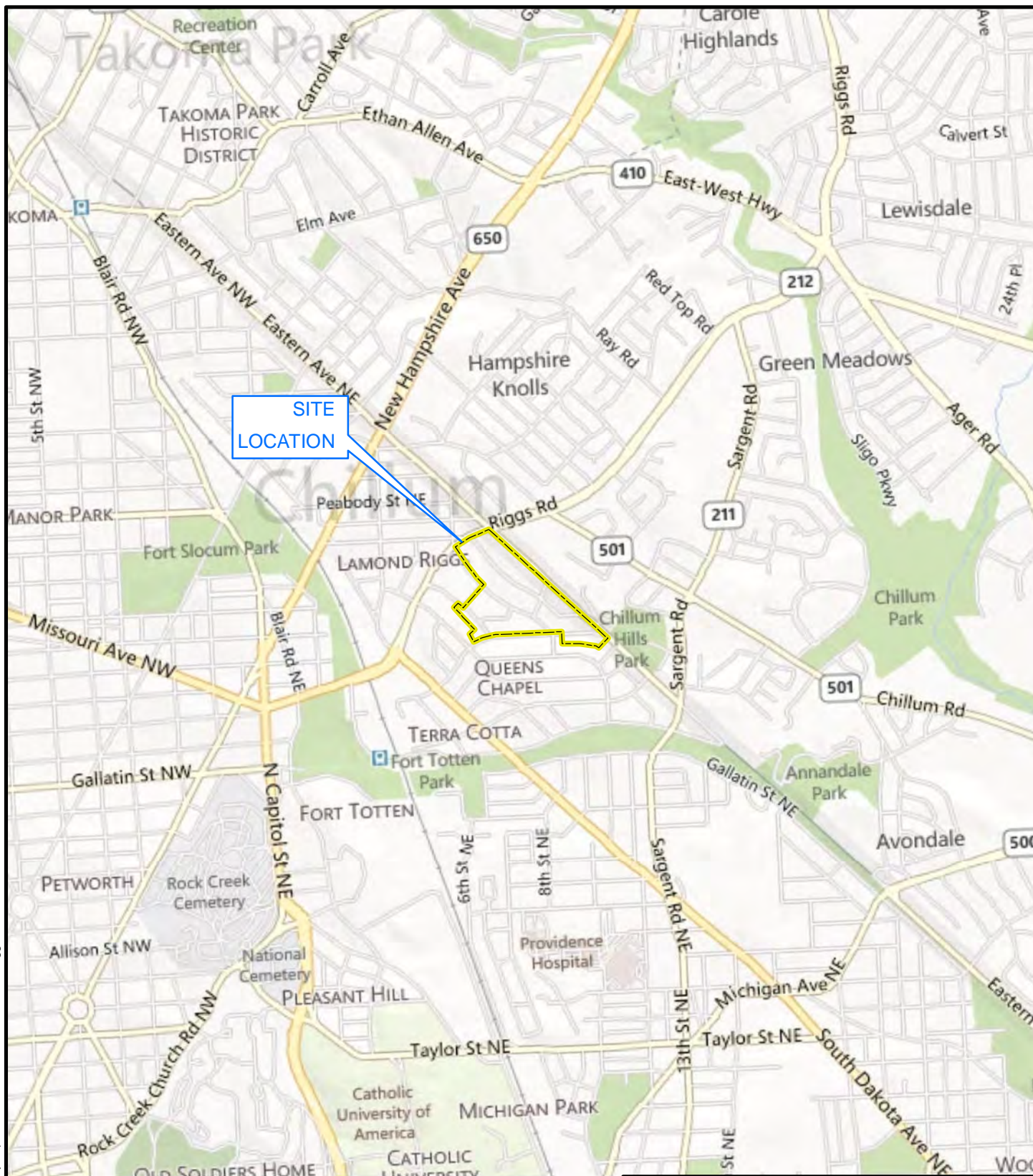
6.0 DELIVERABLES


Following the installation and sampling of VMS, Tetra Tech will prepare the following reports and deliver them to the District. A copy of each report will also be mailed to each respective homeowner with their address-specific results.

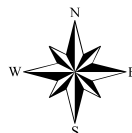
- VMS Installation Report detailing initial home inspection results, VMS installation activities and baseline air sampling results to be submitted 30 days after completion of these activities.
- VMS Monitoring and Sampling Report to be submitted on an annual basis approximately 75 days after completion of each sampling events.

APPENDIX A
FIGURES

- FIGURE 1 – RIGGS PARK NEIGHBORHOOD STREET MAP**
FIGURE 2 – RIGGS PARK NEIGHBORHOOD AERIAL PHOTOGRAPH
FIGURE 3 – TYPICAL VMS AS BUILT ELEVATION VIEW
FIGURE 4 – TYPICAL VMS AS BUILT DETAILED VIEW



 Property Boundary

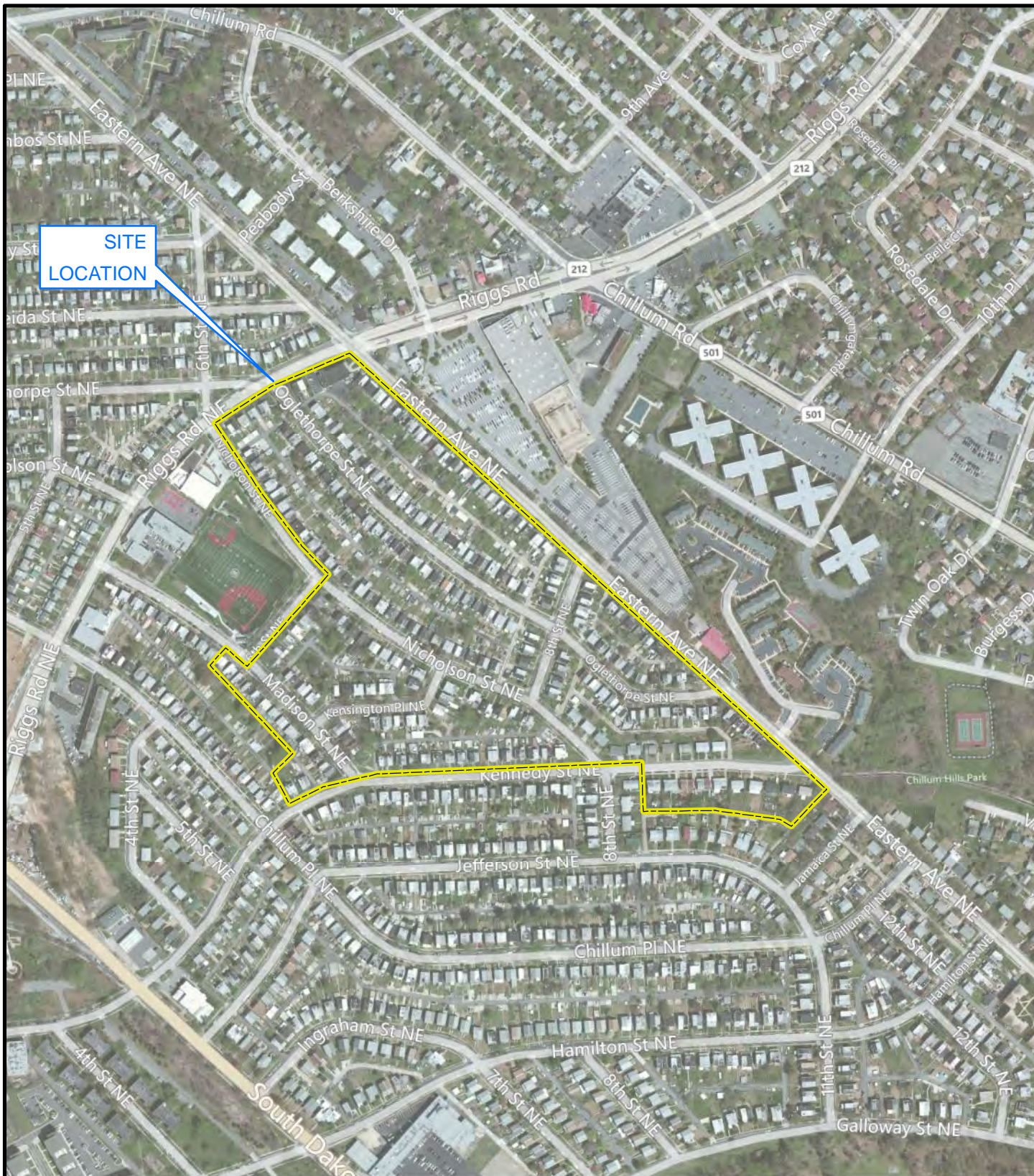


0 1,000 2,000
Feet

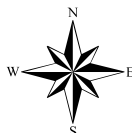
RIGGS PARK NEIGHBORHOOD
WASHINGTON, DC

FIGURE 1
SITE LOCATION





Property Boundary



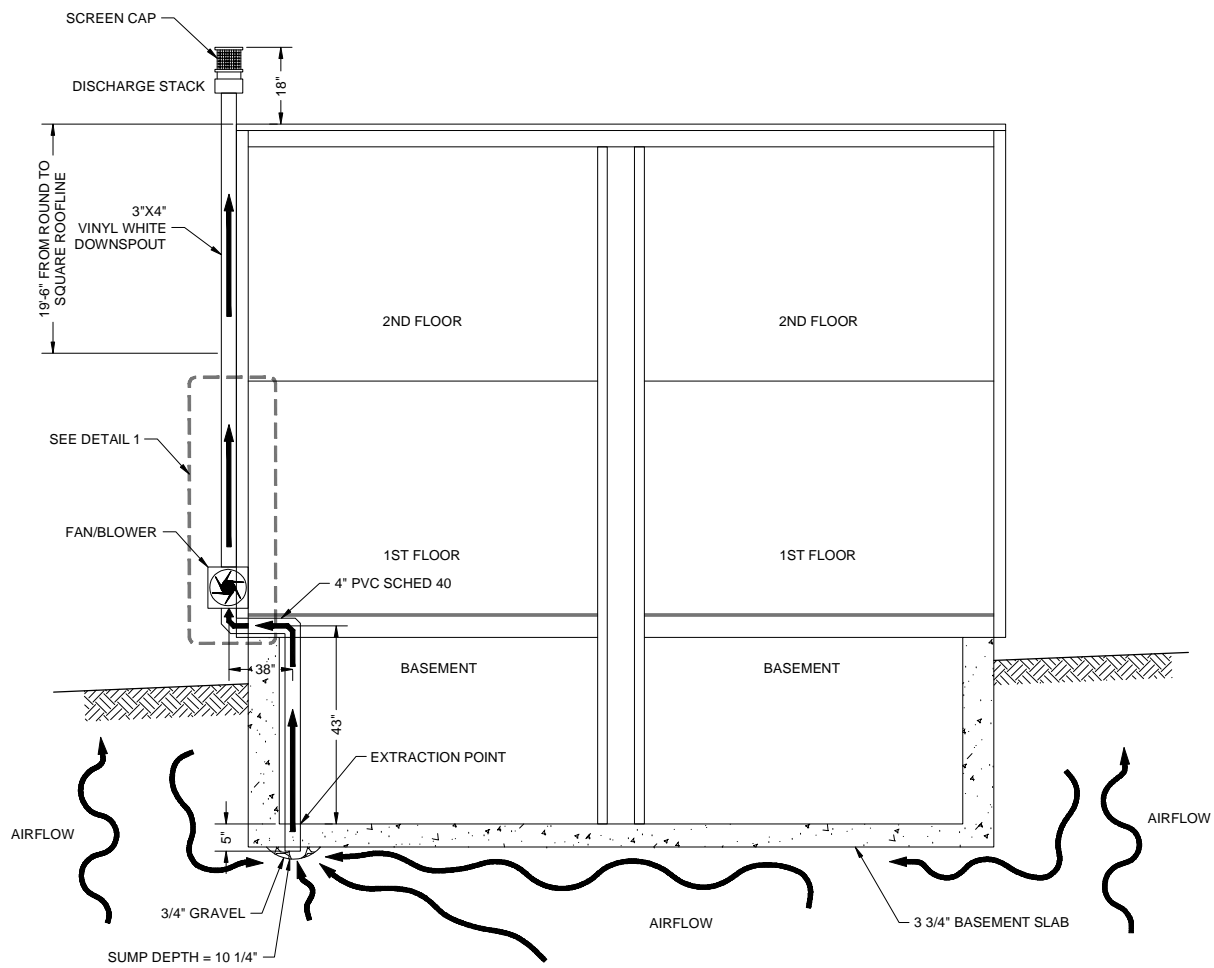
0 250 500
Feet


RIGGS PARK NEIGHBORHOOD
WASHINGTON, DC

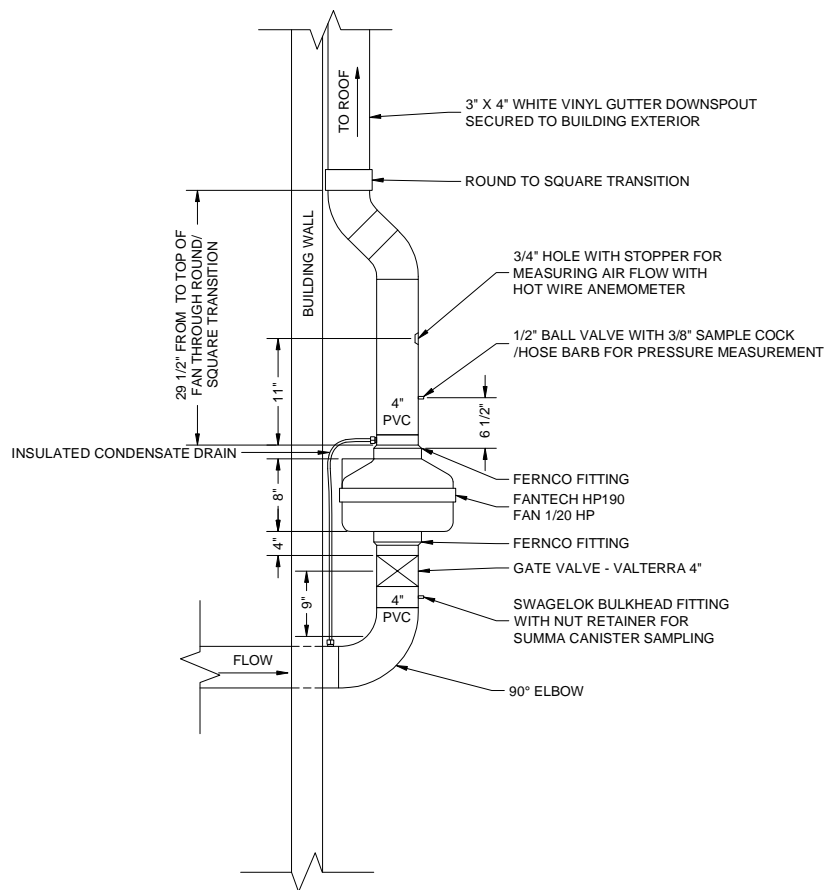
FIGURE 2
AERIAL PHOTOGRAPH



TETRA TECH



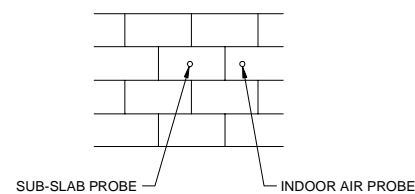
DRAWING NO.: FIGURE 3		RIGGS PARK NEIGHBORHOOD WASHINGTON, DC VAPOR MITIGATION SYSTEM AS-BUILT ELEVATION VIEW				DESIGNED BY: X.X.X.	APPROVED BY: X.X.X.	DATE: 01-15-13
						DRAWN BY: R.T.F.	SCALE: N.T.S.	
						CHECKED BY: X.X.X.		



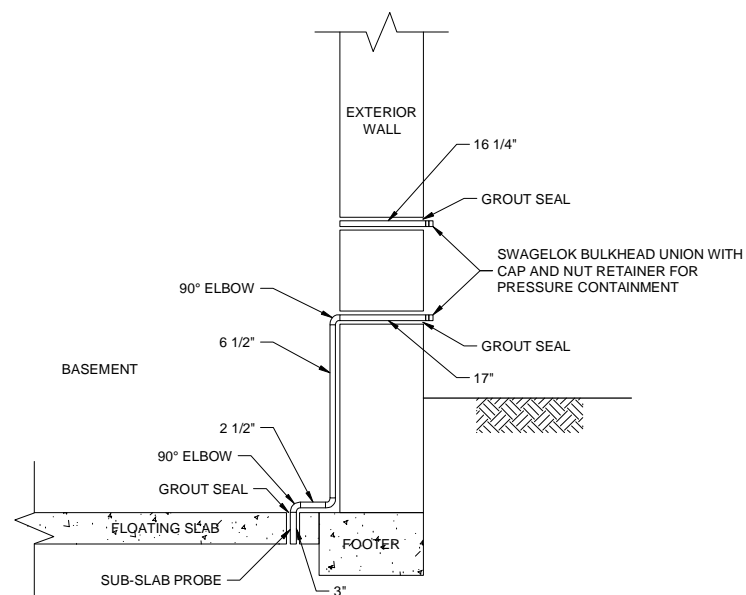
NOTES:

1. ALL PIPE FITTINGS ARE 4" PVC
2. FAN HAS AN EXTERNAL JUNCTION BOX WITH SWITCH MOUNTED ON THE EXTERNAL WALL. (NOT SHOWN)
3. FAN IS WIRED TO CIRCUIT BREAKER BOX. (NOT SHOWN)
4. TOTAL PURGE VOLUME FROM SUMP TO GATE VALVE:
0.69 FT³ OF 19,538 mL

DETAIL 1 FAN AND PIPING DETAIL




EXTERIOR VIEW



NOTES:

1. TUBING: 1/4" OD STAINLESS STEEL
2. ELBOWS: SWAGelok UNION ELBOW 1/4" STAINLESS STEEL
3. TOTAL PURGE VOLUME FOR SUB-SLAB PROBE: 6mL

DETAIL 2 - CROSS-SLAB DIFFERENTIAL PRESSURE MEASUREMENT APPARATUS

DESIGNED BY: X.X.X.	APPROVED BY: X.X.X.	DATE: 01-15-13
DRAWN BY: R.T.F.	SCALE: R.T.F.	
CHECKED BY: X.X.X.	DATE: X.X.X.	
		
RIGGS PARK NEIGHBORHOOD WASHINGTON, DC VAPOR MITIGATION SYSTEM AS-BUILT		
DETAILED VIEW		
DRAWING NO.: FIGURE 4		

APPENDIX B
HOMEOWNER OUTREACH AND NOTIFICATION PLAN

HOMEOWNER OUTREACH AND NOTIFICATION PLAN

*Riggs Park Community
Vapor Mitigation System Installation
WASHINGTON, D.C.*

Prepared for

**DISTRICT
DEPARTMENT
OF THE
ENVIRONMENT**



green forward

*District Department of the Environment
Government of the District of Columbia*

April 23, 2013

Prepared by
Tetra Tech

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1.0 OVERVIEW OF THE HOMEOWNER OUTREACH AND COMMUNICATION PLAN

The District Department of the Environment (DDOE), on behalf of the District of Columbia (District), has prepared this Homeowner Outreach and Notification Plan (the Plan) for the Riggs Park community site in northeast Washington, D.C. The District's community outreach effort is committed to promoting communication between the Riggs Park community and the District. For the purpose of this Plan, the Riggs Park community is defined as the group of homeowners eligible to receive a vapor mitigation system (VMS) as determined by the District's Final Remedy Selection Process. The District wants to ensure the community's current concerns and information needs are considered as site activities progress.

This Plan was prepared to support the VMS installation activities, including providing an approximate schedule of activities surrounding the installation of the VMS in homes in the Riggs Park community. The District used several information sources to develop this Plan, including research and information received from previously held public meetings and public comments. The Plan is a working document that will evolve as the VMS project continues and input is received from the community. The Plan is intended to be flexible and adaptable, and it will be used as a guideline for the District's communication with the Riggs Park community.

1.1 Community Engagement is Essential to Remediation

Ongoing input and involvement by the community is essential to the District's efforts to provide effective community engagement throughout the duration of the project. The District's decision-making ability is enhanced by actively seeking comments and information from the community. Community members need to be involved in all phases of the VMS installation project so that they have input on how the contamination (that addresses potential health risks that could arise from groundwater-related contaminants in the subsurface) is addressed in a way that protects human health and the environment.

1.2 Purpose of this Plan

The District will use this document as a guide to involve and communicate with local homeowners deemed eligible for VMS in the Riggs Park community.

If you are interested in submitting comments or have questions or suggestions concerning this homeowner outreach and notification plan, please contact the toll-free Riggs Park voice message service at 1-855-384-0092 or send an email message to RiggsParkVMS@tetrattech.com.

If you are interested in obtaining more information on the site regarding previous investigations completed, reporting and related documents, please visit <http://ddoe.dc.gov/riggspark> or <http://www.epa.gov/reg3wcmd/chev7003.htm>.

1.3 Plan Overview

This Plan contains the following sections:

- **Section 1** – Overview of the Homeowner Outreach and Notification Plan: Describes the purpose and intended uses of this Plan.
- **Section 2** – Site Background: Shares background information about the site’s location and history.
- **Section 3** – Past Community Involvement Efforts: Summarizes past community involvement at the site.
- **Section 4** – Community Involvement Goals, Activities, and Notification Schedule: Describes the plan and timeline for conducting site-specific activities to keep residents and local officials informed and involved during the cleanup process.
- **Appendix A** – Information Repository, Administrative Record, and Public Meeting Locations: Identifies places where community members can find more information about the site.

2.0 RIGGS PARK COMMUNITY SITE BACKGROUND

2.1 Site Location

The Riggs Park community is located in northeast Washington, D.C., along the northeastern border of Washington, D.C. and the State of Maryland. For purposes of this Plan, the Riggs Park neighborhood is defined as follows: Eastern Avenue NE is the northeastern border; 8th Street NE is the southeastern border; Nicholson Street NE is the southwestern border; and Riggs Road NE is the northwestern border. A street map of the Riggs Park neighborhood is included as Figure 1 and an aerial photograph of the Riggs Park neighborhood is included as Figure 2 in Appendix A.

2.2 History of Contamination and Summary of Final Remedy

In October 1989, there was a reported release of an unknown amount of gasoline from an underground storage tank (UST) at the Chevron Service Station located at 5801 Riggs Road, Chillum, Maryland. The release was initially addressed by the Maryland Department of the Environment (MDE). The Maryland Department of the Environment required Chevron to install a groundwater remediation system to remove the gasoline from the groundwater. The system has been in operation since 1990.

In April 2001, the gasoline plume was reported to have migrated into the District of Columbia, forming a plume beneath the residential area known as the Riggs Park community.

During a site investigation in the summer of 2002 at the petroleum hydrocarbon impacted areas, the U.S. Environmental Protection Agency (EPA) Region 3 identified perchloroethene, also known as PCE, contamination within part of the groundwater contaminant plume. In response, and in an effort to address the vapor intrusion risk as it relates to the PCE impacts identified, the District undertook a comprehensive evaluation of available information and data in order to produce a final remedial action plan for the Riggs Park community.

Based on a review and comprehensive evaluation of the various sampling data, and the information contained within the 2010 Human Health Risk Assessment (HHRA) generated for the Riggs Park community, the District has determined that 43 homes qualify for the VMS installation based on the potential risk to vapor intrusion from impacted groundwater. Twenty-two homes contain soil vapor concentration levels that pose a risk to residents and one home contains soil vapor or groundwater concentration levels that pose a risk to residents. The remaining 20 homes do not have direct data, but based on statistical information, vapor concentrations in these homes could possibly pose a risk to residents; therefore, for the safety of the residents, the District will include these homes among those planned to receive VMS.

For the potentially affected homes, a VMS is recommended to divert vapors emanating from beneath the home, thereby removing the potential for future vapor intrusion of contaminants into these homes.

3.0 PAST COMMUNITY INVOLVEMENT EFFORTS

As early as 2005, the District Department of Health (DOH) conducted meetings on a quarterly basis with the Riggs Park community regarding the 1989 petroleum spill. These meetings were conducted monthly until 2007. In March 2008, the District made it a top priority to communicate with the Riggs Park residents. The ultimate goal was to keep the Riggs Park community updated on progress in selecting an appropriate remedy that would protect their health and the environment. Beginning in 2008, the District held bi-monthly meetings until the summer of 2010 after the Final Remedy Selection and Response to Public Comments was released. Since 2005, DOH and the District have attended approximately 58 public meetings dedicated to the subject of this release.

As part of the community outreach activities, the District utilizes a dedicated the Community Outreach Officer (COO) for the Riggs Park community to ensure that information was provided to the residents in a timely manner. The COO continues to respond to emails, telephone calls, and Freedom of Information Act (FOIA) requests both from within and outside of the Riggs Park community as defined in the Plan.

In addition to these outreach efforts, the District also participated in approximately 20 public information meetings conducted by the EPA and Chevron and attended approximately 12 special meetings with Councilmember Muriel Bowser. Additionally, numerous fact sheets have been released from 2007 to present from the District, EPA, the Agency for Toxic Substances and Disease Registry (ATSDR), and Chevron. These fact sheets have given residents information regarding the remedy selection process and selected remedy, risks associated with contaminated media from the original release by Chevron, and the VMS installation planned to take place for Riggs Park residents.

- An information repository has been established for the site at the Lamond-Riggs Library, located at 5401 South Dakota Avenue NE, Washington, D.C. 20011. The repository contains site-related documents such as technical reports, sampling results, general information about the District and other information. Documents in the repository are available for public review during the library's hours of operation and online (see Appendix A for more details). In addition to the information repository located at the Lamond-Riggs Library, site-related documents can also be found on a portion of the DDOE website dedicated to the Riggs Park VMS project, <http://ddoe.dc.gov/riggspark>.

4.0 COMMUNITY INVOLVEMENT GOALS AND ACTIVITIES

When establishing the objectives for a site-specific community involvement program, several factors are considered, including federal requirements and District policy that assess the nature and extent of known or perceived site contaminants and known community concerns and requests. In addition, a Notification Plan has been established to keep residents informed of the schedule and process the District intends to follow to keep local homeowners informed during the VMS installation in their homes.

To be effective, the community involvement program must be designed to meet the community's need to know, give information in a timely manner, and accommodate the community's interests and its willingness to participate in the decision-making process. The District must also share information in language the public can understand.

To meet the needs of the community, respond to information obtained during the public comment periods and public meetings, and meet federal requirements, the following objectives have been established for community involvement efforts:

- Enlist the support and involvement of local officials and community leaders, as needed.
- Monitor citizen interest in the site and respond accordingly.
- Keep the community informed of ongoing and planned site activities.
- Explain technical site activities and findings in plain language.
- Provide updates on the District's websites, as needed.
- Hold meetings, when necessary, within the community to give residents an opportunity to attend.

The District has implemented, or will implement, the activities described below to meaningfully and actively engage the community in decisions regarding the cleanup of the Riggs Park Community. These activities are intended to provide opportunities for communication between the community and the District and address key concerns and questions raised.

4.1 Specific Community Involvement Activities

To address community concerns and questions, the District has conducted (or will conduct) the activities described below. Through these activities, it is the District's goal to inform, involve and engage the community during site cleanup decisions and efforts. The timeframe for completing these activities is shown in Section 4.2.

- **Establish a hotline and email address for residents to ask questions and receive information.** The Riggs Park toll-free voice message service is 1-855-384-0092. Residents can call this number as questions or concerns arise, rather than wait for a public

meeting or to receive written information. The email address is RiggsParkVMS@tetrattech.com. The District will provide this hotline number and email address in District communications with the public regarding the Riggs Park project.

- **Maintain communication with community residents.** The District will continue to maintain communication with the homeowners eligible for the VMS throughout the remediation process.
- **Share site information on the Internet.** Based on information received in previous public meetings and discussions with residents, many people in the area have access to and are accustomed to using the Internet. The District has established a website for the Riggs Park community site. Information on the site is provided on the following District website and will be updated as events occur: <http://ddoe.dc.gov/riggspark>.
- **Update and maintain the site mailing list.** A mailing list of local residents who have been affected has been established for the site. This list will be used for mailing letters, access agreements, fact sheets, site updates and other site-related information mailed to the community.

The District uses the site mailing list to distribute written information such as fact sheets and other important notifications. This is a way to ensure that those without Internet access or other information sources still have a way to receive information directly about the site and are notified about important meetings.

- **Prepare and distribute fact sheets and site updates.** Fact sheets, letters, and site updates summarizing current information about the site and describing upcoming activities may be prepared and distributed to those on the site mailing and email lists. These documents are written in non-technical language and typically timed to coincide with important site activities.

The District uses these types of documents to provide the community with detailed information quickly and in a simple format and easy-to-understand manner. In addition to being distributed to individuals on the site mailing lists, fact sheets and site updates are also placed in the information repository and posted on the website.

- **Establish and maintain a site-specific information repository.** The District has set up a local information repository at the Lamond-Riggs Library, located at 5401 South Dakota Avenue, NE, Washington, D.C. 20011. The repository is a reference collection of site

information available to the public for reading and photocopying. Documents include fact sheets, technical reports, the Plan, and other documents. The District will add new documents about the site as they become available. Information repositories give residents local access to site information in a format that can be easily read and photocopied for future use.

- **Establish and maintain the administrative record.** The Administrative Record for the Riggs Park site is located at the Lamond-Riggs Library, located at 5401 South Dakota Avenue, NE, Washington, D.C. The District will update the Administrative Record as necessary. The Administrative Record gives residents a paper trail of all documents the District relied on or considered to reach decisions about the site cleanup.
- **Conduct public meetings and information sessions.** A public meeting is an opportunity for the District to present specific information and a proposed course of action. District staff is available to share information and answer questions. A public meeting is not a formal public hearing where testimony is received. Instead, it might be a meeting to exchange information or comments. These types of meetings allow community members an opportunity to express their concerns and ask questions of District, federal, state, or local government officials. Public meetings or availability sessions will be held as needed, throughout the remediation process.

A public hearing is a formal meeting wherein the District officials hear opinions and concerns from the public about an action or proposal. Public hearings are required at certain points throughout the remediation process to consider comments from the public when evaluating cleanup actions. Public hearings are recorded by a professional transcriber and become part of the Administrative Record. The comments are posted on the Riggs Park website as well.

4.2 Timeframe for Conducting Community Involvement Activities

The following table presents the general timeframe for the activities described in Section 4.1.

Community Involvement Activities	Timeframe
Establish a hotline number and email address	Completed; published on written materials
Maintain communication with community residents	Ongoing as needed
Share site information on the Riggs Park website	Completed; update as needed
Update and maintain the site mailing list	Completed; update as needed
Prepare and distribute fact sheets and site updates	Ongoing as needed
Establish and maintain a site-specific information repository	Completed; update as needed
Establish and maintain the administrative record	Completed; update as needed
Conduct public meetings, hearings and information sessions	Ongoing as needed
Write and distribute news releases and public notices	Ongoing as needed

4.3 Notification Plan

The following table presents the general timeframe for the communication activities between the District and the community leading up to the VMS installation.

Activity	Date
Letter of Introduction to Homeowners <ul style="list-style-type: none"> Letter announcing Tetra Tech as a contractor; background information on Tetra Tech; overview of the VMS system; and next steps 	January 30, 2013
Letter(s) with Access Agreement to Homeowners <ul style="list-style-type: none"> Include Access Agreement and self-addressed stamped return envelope Detailed installation description/construction activities Sampling schedule 	March 2013
Upon receipt of executed access agreement, contact homeowner to schedule initial site inspection	Resident is contacted within one week of receiving access

Activity	Date
<ul style="list-style-type: none">• Take pictures; create file for individual property.• Evaluate VMS compatibility with existing electrical components and placement of the VMS equipment on property	agreement
Call homeowner to schedule date and time of VMS installation	One to two weeks before installation
Follow-up letter with installation date	Once installation is scheduled

APPENDIX A

Information Repository, Administrative Record, Website and Public Meeting Locations

Information Repository and Administrative Record

Lamond-Riggs Library
5401 South Dakota Avenue, NE
Washington, D.C. 20011
202-541-6255
Hours: Monday, Wednesday, Friday and Saturday: 10 am – 5:30 pm;
Tuesday and Thursday 10 am to 9 pm

District Website

<http://ddoe.dc.gov/riggspark>

EPA Site Web Page

www.epa.gov/reg3wcmd/chev7003.htm

FIGURES

FIGURE 1 – RIGGS PARK NEIGHBORHOOD STREET MAP

FIGURE 2 – RIGGS PARK AERIAL PHOTOGRAPH

APPENDIX C
INTRODUCTORY LETTER

GOVERNMENT OF THE DISTRICT OF COLUMBIA
District Department of the Environment



Remediation and Site Response Program

Toxic Substances Division

January 30, 2013

Riggs Park Resident
Riggs Park
Washington, DC 20011

Subject: Vapor Mitigation System Installation

Dear Resident,

The District Department of the Environment (District), on behalf of the District of Columbia (the “District”) is pleased to announce that an environmental contractor, Tetra Tech, Inc. (Tetra Tech), has been selected to assist the DDOE in completing the final phase of our project to protect the human health of the Riggs Park residents affected by impacted groundwater in the vicinity of their homes. On May 3, 2010 the DDOE released a final remedy that identified the contaminants in groundwater in the vicinity of the Riggs Park neighborhood and prevents the potential for vapors from the groundwater from entering your home. The residents that were selected to receive vapor mitigation systems (VMS) by the District were deemed eligible based on a thorough review of data obtained from previous subsurface investigations as well as a comprehensive human health risk assessment (HHRA) completed in 2010.

Tetra Tech is an environmental technical and engineering consulting firm with more than 30 years of experience addressing environmental issues and has a long history of supporting local government in the development and implantation of environmental programs. Tetra Tech also has direct experience supporting site investigations and remedial clean-up actions for federal, state, and local government agencies and has remediated thousands of sites across the United States.

The District, with Tetra Tech’s support, plans to complete the installation of the VMS in the coming months. Prior to installing the VMS and approximately in the next 30 days, the District will be sending you an access agreement. This access agreement, which upon your review and signature, grants authorization for the District and Tetra Tech personnel to access your property to assess your home prior to installing the VMS, during the installation of the VMS systems and during subsequent monitoring activities. During these activities, the District will require an adult resident (age 18 or older) of your household be present at the home as well as the area where the VMS equipment will be placed on your property. The initial visit is estimated to take approximately one hour. Once this initial visit is complete, Tetra Tech personnel will contact you again to schedule a date and time for the installation of the VMS in your home.

In general, the installation of the VMS generally consists of drilling small diameter holes through the basement foundation floor as well as through the foundation wall of the home. A small diameter pipe is then run from the basement floor, through the foundation wall to a fan installed on the outside of your home. Any space between the pipe and the holes in your basement floor and foundation wall are then sealed. The fan installed on the outside of your home draws any air or vapors from beneath the home, pulls it through the small diameter pipe and releases it to the outside atmosphere. The entire installation process is expected to take approximately 8 hours.

After the VMS is installed at your home, the District plans to sample the indoor air and periodically sample the VMS to ensure the system is operating properly. Details of the VMS sampling plan will be outlined in the access agreements you will receive in the next 30 days. Prior to each of the sampling events, Tetra Tech will contact you to schedule a date that is convenient for you and one where an adult will be present to supervise the activities.

If you have questions or require assistance, please call the **toll-free** Riggs Park voice message service at 1-855-384-0092 or send an email to RiggsParkVMS@tetrattech.com. A response will be returned to you within 24 hours or the next business day. If you would like additional information about Tetra Tech, please visit their website at www.tetrattech.com.

The District and Tetra Tech appreciates your patience and cooperation in this matter.

Sincerely,



Paul Connor

Deputy Director

Environmental Services Administration

District Department of the Environment

APPENDIX D
ACCESS AGREEMENT



ACCESS AGREEMENT

THIS AGREEMENT ("Agreement") is made and entered into as of the _____ day of _____, 2013, by and between _____ ("Owner") Tetra Tech, Inc. ("TETRA TECH") concerning the following described property owned by Owner ("Property"): _____.

A. TETRA TECH has an interest in accessing the Property for the purpose of performing activities related to the installation of a sub-slab vapor mitigation system (VMS), including the performance of a preliminary site visit, installation activities, and post-VMS installation monitoring and sampling; and

B. In order for TETRA TECH to perform VMS installation activities, it is necessary for employees, agents or independent contractors of TETRA TECH to enter upon and inspect the Property; and

C. Owner has an interest in allowing the installation of a sub-slab VMS and post-VMS installation activities; and

D. Owner and TETRA TECH desire to provide for the entry upon, inspection and/or testing activities, and installation of a VMS on the Property pursuant to the terms contained in this Agreement.

NOW, THEREFORE, in consideration of the mutual promises, covenants, undertakings, and other consideration set forth in this Agreement, the sufficiency of which is hereby acknowledged, Owner and TETRA TECH agree as follows:

1. Consent. Owner consents and agrees that TETRA TECH, its employees, agents and independent contractors and DDOE personnel (collectively "Authorized Parties") may enter upon the Property to conduct and perform some or all of the following activities ("Permitted Activities"): Perform a pre-installation site visit, complete photodocumentation of conditions before and after VMS installation activities, perform inspection of circuit breakers and other electrical infrastructure, complete the installation of a VMS, including the penetration of the basement slab and the residence's exterior wall(s), and post VMS installation sampling activities. TETRA TECH agrees to be responsible for any and all costs related to the Permitted Activities, subject to Paragraph 5, including installation, activation, and sampling of equipment on the Property.

2. Access. Owner agrees that the Authorized Parties may enter upon the Property to perform the Permitted Activities upon execution of this Agreement and may have access to the Property for up to four years.



3. Post VMS Installation and Equipment Retention. The VMS and related equipment will be installed on the Property and samples will be collected according to the following schedule:

Once the VMS is installed, it will operate for approximately two (2) months prior to any sampling event being initiated. In an effort to establish that vapor intrusion as it relates to the former gasoline spill is not a risk to human health, indoor air samples will be collected from each home and compared to the previously established United States Environmental Protection Agency (USEPA) remediation standards for the compounds-of-concern (as shown below). The USEPA remediation standards for indoor air are detailed in the August 2007 USEPA Statement of Basis. Based on the fact that tetrachloroethylene (PCE) was not included in the indoor air standards established by the USEPA, the District has adopted the USEPA Region 3 Regional Screening Level (RSL) for Resident Air (April 2012). These standards will be used for the purpose of identifying remedial endpoints for each VMS sampling program.

If during sampling, the COCs exceed each of their respective remediation standards/RSLs, then the District's option to sample the indoor air will continue on a case by case basis until the COCs in indoor air are observed at concentrations below the established EPA standards/RSLs. At that time, notification to the homeowner that the District's option to maintain each VMS has been fulfilled may be submitted.

If after the VMS has been running for approximately two (2) months and the initial indoor air sampling data from each home does not exceed the USEPA remediation standards/RSLs for the COCs, the homeowner will be notified that the District's option to monitor the VMS has been fulfilled.

The following remediation standards, as established by the USEPA for the Riggs Park neighborhood are as follows:

Compound of Concern	EPA Standards (µg/m³)
Benzene	8
Toluene	5,000
Ethylbenzene	1,000
Total Xylenes	100
MTBE	17
PCE	9.4*

µg/m³ = micrograms per cubic meter

MTBE = Methyl *tert*-butyl ether

*= EPA RSL April 2012

Once sampling results confirm that the VMS is performing as required, ownership of and responsibility for the VMS will transfer to the Owner.



Tetra Tech

1881 Campus Commons Drive, Suite 200 ♦ Reston, Virginia 20191 ♦ (703) 390-0600 ♦ FAX (703) 391-5876

4. Indemnity. TETRA TECH agrees to indemnify, save harmless, and defend Owner, its directors, officers, employees, if any, from and against any and all claims, actions, damages, liability and expense in connection with personal injury and/or damage to property arising from or out of any occurrence in, upon or at the Property, to the extent caused by the negligent acts or omission of the Authorized Parties in conducting the Permitted Activities. Any defense conducted by TETRA TECH of any such claims, actions, damages, liability and expense will be conducted by attorneys chosen by TETRA TECH, and TETRA TECH will be liable for the payment of any and all court costs, expenses of litigation, reasonable attorneys' fees and any judgment that may be entered therein. TETRA TECH's liability for all of the aforesaid matters shall be limited to the proceeds recovered from the insurance provided by TETRA TECH. In no event shall TETRA TECH be liable for any special, indirect, incidental, nominal, or consequential damages.

5. Damages to Installed Equipment. Owner assumes the costs of repairs, maintenance, and other damage to equipment; provided however, that such assumption of damages be limited to those not incurred during normal wear, use or operation. The costs of repair relating to damaged equipment installed by TETRA TECH, resulting from damages inflicted through the reckless or intentional actions of Owner shall be borne solely by the Owner.

6. Insurance. At Owner's request, TETRA TECH agrees to provide a certificate of insurance evidencing TETRA TECH's insurance coverage.

7. Governing Law. The parties agree that the interpretation and construction of this Agreement shall be governed by the laws of the District of Columbia, without regard to such state's conflict of laws provisions.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year first above written.

Tetra Tech, Inc.:

OWNER:

By: _____
Name: _____
Title: _____
Date: _____

By: _____
Name: _____
Title: _____
Date: _____



Tetra Tech

1881 Campus Commons Drive, Suite 200 ♦ Reston, Virginia 20191 ♦ (703) 390-0600 ♦ FAX (703) 391-5876

Access Declination Form

I hereby decline to grant access to TETRA TECH and the DDOE for the purpose of performing tasks including and related to installation of a vapor mitigation system (VMS). I understand that by declining access I am relieving the DDOE of any future obligation to install a VMS on my property. In addition, please note that by declining access to the District and Tetra Tech personnel for the installation of a VMS, you will have waived your rights to receive a VMS and a copy of this agreement, and other related documents may be filed with the Recorder of Deeds.

OWNER:

By: _____

Name: _____

Title: _____

Date: _____

APPENDIX E

**STATEMENT OF BASIS: TO THE RESPONSIBLE PARTY (RP) FOR THE GASOLINE
RELEASE AT CHILLUM, MARYLAND AND FINAL DECISION
AND RESPONSE TO COMMENTS ON ADMINISTRATIVE ORDER ON CONSENT,
RCRA-03-2008-0355TH**



STATEMENT OF BASIS

Chevron Gasoline Release

At Chillum, Maryland

August 30, 2007

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GLOSSARY

ACE – U.S. Army Corps of Engineer

ATSDR - The Agency for Toxic Substances and Disease Registry

BTEX - Benzene, toluene, ethylbenzene, and xylenes

COC – Contaminants of Concern

DOH – District of Columbia Department of Health

EPA- U.S. Environmental Protection Agency

FDRTC - Final Decision Document and Response to Comments

MCL - Maximum Contaminant Levels

MDE - Maryland Department of Environment

MTBE - Methyl tertiary-butyl ether

OSHA - Occupational Safety and Health Administration

PCE – Perchloroethylene, also known as Tetrachloroethylene

ppb – Parts per billion

RBC – Risk Based Concentrations

RCRA – Resource Conservation and Recovery Act

FDRTC - Final Decision Document and Response to Comments

SB – Statement of Basis

TI - technical impracticability

UAO - Unilateral Administrative Order

ug/l – Micro grams per liter

UST – Underground Storage Tank

VOC - Volatile organic compounds

I. INTRODUCTION

This Statement of Basis (SB) explains the United States Environmental Protection Agency's (EPA's) proposed remedy for the gasoline release originating from the gas station formerly owned by Chevron U.S.A. Inc. (Chevron) and located at 5801 Riggs Road in Chillum, Prince George's County, Maryland (the Facility) under the Resource Conservation and Recovery Act, as amended, 42 U.S.C. § 6901 to 6939(e) (RCRA). After reviewing extensive groundwater, soil vapor, and indoor air sampling data generated by EPA, Chevron and the District of Columbia (District), EPA is proposing as the remedy for the Facility the expansion of the existing groundwater remediation system, the installation of vapor mitigation systems in homes impacted by subsurface vapor intrusion, and the implementation of institutional controls.

The purpose of this document is to solicit public comment on EPA's proposed remedy prior to making its final remedy selection for the Facility. The information presented in this SB can be found in greater detail in the work plans and reports submitted by the Facility to EPA, the District Department of Health (DOH), and the Maryland Department of Environment (MDE). To gain a more comprehensive understanding of the RCRA activities that have been conducted at the Facility, EPA encourages the public to review these documents which are found in the Administrative Record. The Administrative Record and index are available for public review at the EPA Region III Office in Philadelphia and the Lamond Riggs Branch Library located on 5401 South Dakota Avenue, N.E., Washington, D.C.

The public may participate in the remedy selection process by reviewing this SB and documents contained in the Administrative Record and submitting written comments to EPA during the public comment period. Public participation is discussed in further detail in Section X, below. EPA will address all significant comments submitted in response to the proposed remedy described in this SB. EPA will make a final remedy decision and issue a Final Decision and Response to Comments after it considers information submitted during the public comment period. If EPA determines that new information or public comments warrant a modification to the proposed remedy, EPA may modify the proposed remedy or select other alternatives based on such new information and/or public comments.

II. FACILITY BACKGROUND

The Facility is located at the eastern corner of the intersection of Eastern Avenue and Riggs Road in Chillum, Maryland. The north side of the right-of-way of Eastern Avenue delineates the boundary between Prince George's County, Maryland and the District. The southern extent of the Facility property abuts the District.

Gulf Oil Corporation (Gulf) constructed a service station on the Facility property on or about 1954. Standard Oil Company of California merged with Gulf in 1984, and after restructuring, changed its name to Chevron. Chevron owned and operated the Facility until it was sold to an independent owner in 1993.

In October 1989, as required by the newly promulgated Underground Storage Tank (UST) regulations codified at 40 C.F.R. Part 280, Chevron conducted an UST tightness test on its underground storage tanks. The UST tightness test and subsequent investigations by Chevron under MDE oversight confirmed the release of gasoline from the Facility and the presence of gasoline product in groundwater. Since 1990, Chevron has been recovering gasoline product from the groundwater by operating a groundwater remediation system at the Facility.

In 2001, Chevron discovered that the gasoline contaminated groundwater (plume) had migrated into the District affecting a residential neighborhood known as Riggs Park. Because the plume impacts two separate political jurisdictions (the State of Maryland and the District), at the request of District Councilmember Adrian Fenty, who was later elected as Mayor of the District, EPA assumed the lead investigatory role for the Facility.

In December 2002, EPA issued a unilateral Administrative Order (Order), RCRA-03-2003-0006th, pursuant to Section 7003 of RCRA, 42 U.S.C. § 6973, to Chevron. The Order requires Chevron to perform interim measures to mitigate threats to human health and the environment; to perform a Site Investigation to determine the nature and extent of petroleum related contaminants in the groundwater; and to perform a Corrective Measure Study to evaluate alternatives for corrective action necessary to protect human health and the environment.

During the summer of 2002, as a result of the Site Investigation, perchlorethylene (PERC) was discovered in the gasoline plume. Since PERC is not a contaminant associated with gasoline, but rather is commonly associated with dry cleaning activities, EPA determined that PERC is not a Facility-related contaminant. The PERC contamination, therefore, is not within the scope of EPA's RCRA corrective action investigation and is not addressed in EPA's proposed remedy for the Facility. EPA's Superfund Removal program has taken the lead on investigating the PERC release.

III. SUMMARY OF GASOLINE RELEASE INVESTIGATION

As required by the Order, Chevron has collected soil, soil vapor, indoor air and groundwater samples, and has conducted pilot tests to upgrade the existing groundwater remediation system. Between 2001 and 2007, Chevron installed 232 temporary Geoprobe wells, 80 groundwater monitoring wells, 7 product recovery wells, and 4 soil vapor monitoring wells. Cumulatively, during the same period, Chevron has collected over 3000 groundwater samples, 300 soil samples, 250 soil vapor samples from 90 properties, 50 indoor and ambient air samples from 20 properties, and 14 basement sump samples.

Between 2002 and 2005, EPA's Superfund Removal program collected indoor air samples from 32 properties and installed 24 soil vapor wells for its PERC investigation; and the U.S. Army Corps of Engineer (ACE), on behalf of EPA, generated split /quality control data from over half the properties sampled by Chevron. In 2006, DOH initiated

an independent indoor air sampling effort, based on voluntary participation by the Riggs Park residents. During that investigation, DOH collected indoor air data from 97 homes in Riggs Park bounded geographically by four streets: Kennedy Street, Madison Street, Eastern Avenue, and Riggs Road. While EPA's proposed remedy does not address the DOH or PERC investigation, EPA has relied on data collected by both investigations to support its proposed remedy for the Facility.

Based on soil, soil vapor, indoor air and groundwater data collected through September 2005, EPA has delineated a shallow benzene plume and a shallow methyl tertiary-butyl ether (MTBE) plume as shown in Figures 2 and 3. The shallow benzene plume extends approximately 700 feet from the Facility into the District, and the shallow MTBE plume is about twice as long, extending about 1400 feet from the Facility into the District. For the purposes of this SB, the combined maximum boundary of both plumes will be referred to as the gasoline plume.

The primary direction of groundwater movement from the Facility is towards the southeast as evidenced by the southeasterly orientation of the plume that crosses the Maryland State line into the District. A clay body in the middle of Riggs Park has divided the plume into two lobes. Since the Riggs Park is serviced by public water and there are no known private groundwater wells in Riggs Park, there is no human health threat associated with consumptive uses of the contaminated groundwater. The primary health concern is that vapor can volatilize from the plume and migrate vertically through soil into basements through cracks, joints and utilities openings. This effect is referred to as subsurface vapor intrusion.

Subsurface vapor intrusion can impact only those homes located above the gasoline plume. Homes located outside the extent of the gasoline plume cannot be impacted by vapor intrusion from the plume. Therefore, EPA required Chevron to use the gasoline plume boundaries as a selection criterion for identifying homes to be sampled for subsurface vapor intrusion. DOH's indoor air sampling differs from Chevron's approach because DOH relied upon voluntary participation from residents within designated geographic boundaries which did not correlate with the plume boundaries.

EPA has statistically characterized the indoor air data collected from 97 homes by DOH in Figure 4. The data in Figure 4 indicate that there is elevation in benzene and MTBE vapor concentrations in homes above the gasoline plume as compared to homes situated outside the plume boundaries, suggesting that there is likelihood of subsurface vapor intrusion associated with the gasoline plume. Based on EPA's review of 151 indoor air samples collected by EPA, Chevron, and DOH, EPA has identified up to 5 homes above the gasoline plume where measured vapor concentrations have exceeded EPA's remediation standards as presented in Section VI, below. EPA has also statistically characterized the outdoor ambient air data collected by Chevron, DOH, and ACE in Figure 5. On average, outdoor benzene and MTBE concentrations are at levels of about one-third to equal that of indoor air concentrations.

IV. INTERIM MEASURES

In 1990, under MDE oversight, Chevron installed and began operating a skimmer system at the Facility to recover gasoline product from groundwater. In 1994, the system was modified into a dual phase extraction system to recover gasoline product from both groundwater and soil vapor. For the purposes of this SB, both the skimmer system and the dual phase extraction system, along with any modifications to those systems, are hereinafter collectively referred to as the groundwater remediation system or system.

Between 1997 and 2000, Chevron conducted several shut-down tests of the groundwater remediation system to evaluate whether the system had met its objective of removing all gasoline product. The system was turned back on after each shut-down test because each test failed to demonstrate that the objective was met. In 2000, after the last failed shut-down test, Chevron conducted an additional site investigation during which it discovered additional gasoline product beneath the parking lot outside the Facility and a gasoline plume that had migrated into the District.

Under the interim measures provision of the Order, Chevron was required to upgrade the groundwater remediation system to recover the additional gasoline product sources discovered in the parking lot. Chevron completed the system upgrade in early 2005. This upgraded groundwater remediation system is currently pumping about 20 gallons per minute, versus about 2 gallons per minute the old system was pumping before the upgrade. The upgraded system has noticeably increased the capture zone and groundwater movement, thereby enhancing the remediation efficiency. As of March 2007, the system has recovered 4,800 gallons of gasoline product cumulatively since the beginning of its operation in 1990.

V. SCOPE OF REMEDIATION

EPA proposes to expand the existing groundwater remediation system and install vapor mitigation systems in homes impacted by subsurface soil vapor intrusion.

A. Groundwater Remediation Strategy

The gasoline plume is 1400 feet long and extends from the Facility to the intersection of Eighth Street and Nicholson Avenue (Figures 2 and 3). EPA proposes to remove all liquid phase hydrocarbons (gasoline product sources) that are present at or near the Facility, as depicted by Areas A and B in Figure 4. Although gasoline product has only been detected once in a monitoring well within Area B, non-mobile product is believed to be present in Area B soil within the water table fluctuation zone known as the “smear zone.” Non-mobile product will not migrate with groundwater or enter wells in measurable or recoverable quantities. The objective of the remediation system is to eliminate all gasoline product sources, mobile and non-mobile, from further tainting the groundwater. EPA anticipates that once the sources are eliminated, the plume will be

self-cleaning due to rapid biodegradation of dissolved phase hydrocarbons (benzene, toluene, ethylbenzene, xylenes and MTBE).

B. Vapor Mitigation Strategy

Homes located above the gasoline plume are vulnerable to subsurface vapor intrusion coming from the plume and entering basements through cracks, joints and utilities openings. Extensive soil vapor and indoor air samples have been collected to evaluate the health impact from this pathway. Based on data collected to date, up to 5 homes above the plume have measured vapor concentrations exceeding EPA's remediation standards as identified in Section VI.B below. EPA proposes to have Chevron install a subslab depressurization system, commonly used in radon mitigation, to prevent vapor entry into residential basements impacted by the gasoline plume. The depressurization system operates by creating a slight vacuum beneath the subslab by drawing a slow stream of air through subslab venting pipes, thereby reversing the vapor movement gradient and direction.

VI. REMEDIATION STANDARDS

The contaminants of concern (COC) relating to the Facility are benzene, toluene, ethylbenzene, xylenes (BTEX) and MTBE. These COCs are present in groundwater and soil vapor within the gasoline plume boundaries.

A. Groundwater Remediation Standards

EPA proposes to cleanup groundwater to meet drinking water standards established by the Maximum Contaminant Levels (MCLs) promulgated at 40 C.F.R. Part 141 pursuant to Section 1412 of the Safe Drinking Water Act, 42 U.S.C. Section 300g-1, except for MTBE. MTBE does not have a MCL. EPA's proposed remediation standard for MTBE is based on taste and odor thresholds adopted by the District and Maryland. EPA's proposed groundwater remediation standards are as follows:

Benzene	5 micrograms per liter (ug/l)
Toluene	1,000 ug/l
Ethylbenzene	700 ug/l
Xylenes	10,000 ug/l
MTBE	20 ug/l

B. Vapor Remediation Standards

EPA proposes to mitigate subsurface soil vapor intrusion into homes to meet the following remediation standards:

Benzene	8 micrograms per cubic meter (ug/m ³)
Toluene	5,000 ug/m ³
Ethylbenzene	1,000 ug/m ³
Xylenes	100 ug/m ³
MTBE	17 ug/m ³

EPA considered both the background concentrations of BTEX constituents and MTBE and the acceptable risk ranges for those contaminants in establishing the above remediation standards. According to EPA remediation guidelines, the acceptable risk range for cancer protection is between one in 10,000 to one in 1,000,000, and for non-cancer protection is a Hazard Quotient equaling one. Benzene is a known human carcinogen. The carcinogenic status of MTBE has not been established by EPA, however, EPA Region III conservatively treats MTBE as a possible carcinogen. All other petroleum compounds of concern, toluene, ethylbenzene and xylenes, are not considered to be carcinogenic by EPA.

EPA used the indoor air sampling data provided by DOH to identify the background concentrations of benzene and MTBE. DOH collected indoor air samples from 97 homes in 2006; 52 homes are located outside the plume boundaries and 45 homes are located above the plume. Based on statistical analyses of the indoor air data collected from the 52 homes located outside the plume, the mean background concentrations for benzene and MTBE are 2.7 ug/m³ and 2.8 ug/m³, respectively, with standard deviations of 2.7 ug/m³ and 7.2 ug/m³, respectively. Since these 52 homes are located outside the plume, the measured values cannot be affected by the gasoline plume and therefore represent local background concentrations.

In selecting remediation standards, EPA must consider implementation factors such as background concentrations. EPA is not aware of any practical technology that can reduce indoor air vapor concentrations to below background concentrations, or any measurement technique that can distinguish background concentrations from vapor intrusion concentrations if the two are numerically similar. A 95 percentile value (mean value plus two standard deviations) will provide confidence that the measured value is likely caused by vapor intrusion, and that technology will be available to reduce the elevated concentrations to background concentrations. Therefore, EPA selects the 95 percentile values; that is, 8 ug/m³ and 17 ug/m³, as the remediation standards for benzene and MTBE, respectively. Lifetime excess cancer risks associated with the selected standards are estimated to be 3.5×10^{-5} and 1.1×10^{-5} for benzene and MTBE, respectively, and are within the EPA acceptable risk range. These values are more stringent than the national background concentrations default in EPA's national data base for the J&E Vapor Intrusion Model, which lists the background concentrations for benzene and MTBE as 10 ug/m³ and 18 ug/m³, respectively.

For toluene, ethylbenzene and xylenes, the remediation standards were established by adopting the concentrations corresponding to a Hazard Quotient of one; that is 5000 ug/m³, 1000 ug/m³ and 100 ug/m³, respectively. The measured background

concentrations of these compounds are far lower than the risk-based concentrations and will have no impact on the overall risk or attainment of the remediation goal. Therefore, the selected remediation standards for these compounds are purely risk-based without factoring in the background concentrations.

The Agency for Toxic Substances and Disease Registry (ATSDR), a division of the Center of Disease Control, has reviewed EPA's remediation standards. In a letter to EPA, dated May 10, 2007, ASTDR supports EPA's proposed remediation standards as appropriate and protective of human health.

VII. PROPOSED REMEDY

A. Expansion of Existing Groundwater Remediation System

EPA proposes to have Chevron continue to operate the existing groundwater remediation system in Area A, and expand the system into Area B by installing angle recovery wells. Groundwater and vapor extraction wells will be installed at an angle in the parking lot on the Maryland side for completion on the District side across Eastern Avenue up to the boundaries of private properties. EPA will determine the exact locations and number of angle recovery wells to be installed in the design phase subject to boring exploration. All new recovery wells will be connected to the existing groundwater treatment unit.

Although gasoline product has been detected only once in a monitoring well in Area B, non-mobile product is believed to be present in Area B soil within the water table fluctuation zone known as the "smear zone." It is also possible that mobile product is present beneath Eastern Avenue where traffic condition has restricted exploration in the past. Angle drilling can overcome that restriction. Although non-mobile product will not migrate with groundwater or enter wells in measurable or recoverable quantities, the residual product in the smear zone will continue to contaminate groundwater and soil vapor. The proposed angle recovery wells will enlarge the capture zone, accelerate groundwater movement, extract contaminated soil vapor, and enhance product degradation in Area B even if the product may not be recoverable.

Chevron will be required to operate the expanded system and provide adjustment or upgrades as appropriate in the future with the goal to restore groundwater to drinking water standards. If the goal of restoring drinking water standards is not attainable within a reasonable time frame from an engineering perspective, EPA may grant a technical impracticability (TI) waiver in accordance with EPA's Guidance for Evaluating TI for Groundwater Restoration (October 1993).

B. Installation of Vapor Mitigation System

EPA proposes to require Chevron to install a subslab vapor mitigation system, similar to a radon system, in all homes located above the gasoline plume where the measured indoor petroleum vapor concentrations have exceeded EPA's remediation

standards. EPA will provide Chevron with the addresses of homes where installation of such a system is necessary, or where retesting is necessary prior to installation of such a system. All installation and testing will be subject to home owner consent.

EPA proposes that Chevron install, maintain and provide annual testing of each system and reimburse the energy cost to the homeowners to run the system for as long as necessary to protect human health. A testing protocol will be established during the design phase of the system. EPA will evaluate the test results to determine the effectiveness of each system in reducing indoor air concentrations and preventing subsurface vapor intrusion. If the test results in accordance with EPA's approved protocol can demonstrate that the remediation standards for vapor intrusion have been met without further operation of the system, Chevron may request that EPA allow it to shut down of the system.

C. Institutional Controls

EPA proposes that institutional controls be implemented in order to prevent any activities which would interfere with or adversely affect the integrity and protectiveness of the final remedy. The institutional controls are necessary to ensure that contaminated groundwater is not used for consumptive purposes; the integrity and protectiveness of the groundwater remediation system is maintained; and subsequent purchasers of the Facility property are informed of the environmental conditions at the Facility and of EPA's final remedy for the Facility. During the design phase of the remedy, EPA will require Chevron to identify specific actions that will accomplish the institutional controls objectives.

Institutional controls may include, but may not be limited to:

1. A notice to be placed on the deed to the Facility property which would notify successors-in-interest that Chevron entered into the Order requiring it to implement the final remedy selected by EPA for the Facility.
2. Restrictive covenants between Chevron and the owners of properties on which components of the groundwater remediation system are placed ensuring that (a) Chevron and its successors, contractors, and authorized representatives have the ability to implement, facilitate and/or monitor the final remedy; (b) the properties will be used only for purposes that are compatible with EPA's final remedy; (c) the properties will not be used in a manner that will pose a threat to human health or adversely affect the environment and (d) no new wells are installed at the properties unless they are necessary to implement the final remedy.

VIII. EVALUATION OF PROPOSED REMEDY

This section provides a description of the criteria EPA used to evaluate the proposed remedy in accordance with EPA's guidance. The criteria are applied in two phases. In the first phase, EPA evaluates three remedy threshold criteria as general goals.

In the second phase, for those remedies which meet the threshold criteria, EPA then evaluates seven balancing criteria to determine which proposed remedy alternative provides the best relative combination of attributes.

A. Threshold Criteria

EPA's evaluation of the threshold criteria is as follows:

1. Protect human health and the environment

There are no human health threats associated with domestic uses of the contaminated groundwater originating from the Facility because groundwater is not used for drinking water purposes. Riggs Park is serviced by public water from a source not affected by Facility related contamination and there are no private wells located in the area. Several tap water samples were collected by EPA and the ACE for volatile organic compounds (VOCs) analyses and the results show that the community tap water is safe for consumption.

According to DOH, the public water supply for the District comes from the Potomac River or reservoirs and the District does not rely on groundwater for its water supply. There are no known private water supply wells in Riggs Park. The nearest water supply source for Riggs Park is the McMillan Reservoir, which is located approximately 5 miles southwest of Riggs Park. Even though there are no current consumptive uses of Facility-contaminated groundwater, the goal of EPA's proposed groundwater remediation is to restore groundwater to drinking water standards to be protective of potential future use. Until groundwater is restored to drinking water standards, EPA is proposing to require institutional controls, as necessary, to prevent consumptive use of the groundwater. EPA's proposed remedy also requires the implementation of institutional controls to prevent any activities which would interfere with or adversely affect the integrity or effectiveness of the remedial actions performed at the Facility.

The primary health concern of the contaminated groundwater under current conditions is vapor intrusion into basements. The proposed remedy will require Chevron to install a vapor mitigation system in each home where the measured vapor concentrations have exceeded EPA's vapor remediation standards. Based on extensive sampling, up to five homes above the gasoline plume have measured indoor air vapor concentrations above EPA's vapor remediation standards. The proposed groundwater remediation objective which is to restore groundwater to drinking water standards will also achieve the long-term goal to eliminate all subsurface vapor intrusion sources.

2. Achieve media cleanup objectives

The proposed groundwater remediation will achieve the media cleanup objectives by restoring groundwater to drinking water standards and by eliminating all subsurface vapor intrusion sources linking to Chevron's gasoline release.

The proposed vapor mitigation systems will achieve the media cleanup objective by preventing subsurface vapor intrusion into all homes affected by the gasoline plume. The vapor remediation standards presented in Section VI, above, are within EPA's acceptable risk range guideline.

3. Control the source(s)

The existing groundwater remediation system was designed to remove gasoline product sources in Area A. The proposed expansion of the system will further reduce the sources in Area B not previously captured by the existing system. EPA recognizes that no remedy will be fully effective unless there is cessation of future releases from the Facility. MDE has informed EPA that the current operation of the Facility is in compliance with the MDE's UST leak detection requirements. Therefore, adequate safeguards are in place at the Facility to prevent another major release. Moreover, should a release occur, the remediation system can act as a sentinel and emergency containment system.

B. Balancing Criteria

After satisfying the threshold criteria, EPA evaluates the following balancing criteria to demonstrate the suitability of the proposed remedy:

1. Long-term Reliability and Effectiveness

As of March 2007, the existing groundwater remediation system has recovered over 4,800 gallons of gasoline product since the beginning of its operation in 1990. Its effectiveness is evidenced by the fact that 7 of the 8 recovery wells currently in operation are outside the Facility, because the initial release has largely been depleted allowing abandonment of all but one of the original recovery wells located inside the Facility. Since the system was upgraded in 2005, it has drastically reduced benzene and MTBE concentrations in Area B wells, further demonstrating the effectiveness of the existing system. The proposed expansion of the system is expected to be more effective and efficient in remediating the sources in Area B.

The proposed vapor mitigation systems to be installed in those homes affected by vapor intrusion are proven technology adopted from the radon mitigation industry. Similar systems have been installed in millions of homes throughout the nation to mitigate radon intrusion. The proposed systems are expected to be equally reliable and effective because the mechanism to prevent vapor and radon intrusion is identical.

A monitoring plan has been in place whereby Chevron is required to submit quarterly progress reports to EPA, MDE and DOH to monitor the effectiveness of the groundwater remediation system, in addition to notification requirements to all agencies immediately if the operation of the system is disrupted. During the design phase of the remedy, EPA will require Chevron to update the groundwater remediation system

monitoring plan, and to propose a testing protocol to evaluate the effectiveness of the individual home vapor mitigation systems.

2. Reduction of Waste Toxicity, Mobility or Volume

The volume and mobility of the sources (liquid phase hydrocarbons) and the contaminated groundwater (dissolved phase hydrocarbons) have reached equilibrium and will begin to shrink as the remediation progresses. The sources are confined in Areas A and B, and the saturation level is so low that much of the product is non-mobile. Non-mobile product will not enter wells in measurable or recoverable quantities, and will not migrate with groundwater. Currently, only 4 monitoring wells and 7 recovery wells located in Area A contain measurable product, and none of the wells in Area B contains measurable product.

The volume and mobility of the contaminated groundwater have reached equilibrium as the shallow plumes have reached the maximum extent at the intersection of Eighth Street and Nicholson Avenue. Nicholson Avenue is a natural groundwater divide where an ancient creek, which is now replaced by a storm interceptor, existed. Eighth Street is also a groundwater divide for unknown reasons as evidenced by the fact that the plumes terminate on Eighth Street.

The objective of the groundwater remediation system is to aggressively deplete all product sources. EPA anticipates that once the sources are depleted from further contaminating the groundwater, the plume will be self-cleaning because dissolved phase hydrocarbons are known to biodegrade rapidly. However, the shrinking of the plume will not be apparent until the sources are further depleted in the next 5 to 10 years by the expanded groundwater remediation system.

3. Short-Term Effectiveness

The short-term effectiveness criterion is intended to address hazards posed during construction of the remedy. Short-term effectiveness is designed to take into consideration the impact on site workers and nearby residents such as potential for volatilization of contaminants, the spread of contamination through dust generation, and disposal and/or transportation of the wastes. Workers are required to comply with the Occupational, Safety and Health Administration rules and to follow the Health and Safety Plans submitted to EPA. No short-term hazards to the residents have been identified for the proposed remedy.

4. Implementability

The implementability criterion addresses various constraints such as regulatory constraints, ability to obtain access agreements, technological and practicability limitations, and intrusiveness to residents due to noise, traffic and aesthetic disruptions.

The existing groundwater remediation system has been operating for the last 17 years and no new regulatory requirements are anticipated. The proposed angle recovery wells will stop at private property boundaries so that the constraint to obtain access agreements from residents is eliminated. The proposed angle recovery wells will not interfere with the busy traffic on Eastern Avenue during testing, construction and future maintenance of the completed wells.

The vapor mitigation system proposed is a proven technology with no implementation constraints except for obtaining access agreements from homeowners to install, maintain and test the systems. Installation of the systems in private properties is contingent upon consent from homeowners.

5. Cost

The proposed remedy is cost effective in meeting the remediation objectives. Chevron has already expended capital costs in upgrading the groundwater remediation system. According to Chevron, the estimated cost to install the angle wells and connect to the existing groundwater remediation system is \$280,000.

6. Community Acceptance

Community acceptance of EPA's proposed remedy will be evaluated based on comments received during the public comment period and will be described in the Final Decision and Response to Comments.

7. State Acceptance

State acceptance will be evaluated based on comments received from MDE and the District during the public comment period and will be described in the Final Decision and Response to Comments.

IX. OTHER ALTERNATIVES

EPA has evaluated four other alternatives which are not recommended for a variety of reasons. Each alternative is briefly described below with an explanation of the key reasons as to why it is not recommended.

A. Electrical Resistive Heating

This technology consists of heating the subsurface to the boiling point of water via electrical current flow between electrodes installed in Area B. Volatile constituents would be evaporated and stripped from the subsurface by the steam produced during heating. Vapors and steam would be collected using a soil vapor extraction system and would be treated prior to discharge to the atmosphere.

EPA does not recommend this alternative because of safety concerns and excessive disruption to the community. Although precautionary safety measures would be implemented to protect the homes above the remediation zone, the short-term risks outweigh the long-term benefit. It is unknown how the high temperature would affect existing foundations and utility materials as application of this technology has been known to melt PVC pipes. The operation of the electrodes is highly disruptive because the electrodes must be placed at close spacing on private properties and a trailer must be placed on one property to house the high voltage equipment for up to a year.

B. In-situ Chemical Oxidation

This technology involves the injection of an oxidizing agent through temporary wells into the subsurface to oxidize hydrocarbons on contact. The complete oxidation or mineralization of the BTEX would result in water and carbon dioxide as final end products.

EPA does not recommend this technology due to uncertainty of its effectiveness and disruption to residents. According to the Corrective Action Plan submitted by Chevron, pilot tests must be conducted on this technology prior to its full implementation. EPA does not recommend selection of an experimental technology for this phase of the clean up. Another obstacle of this technology is that it is highly intrusive as temporary Geoprobe wells must be installed at close spacing on private properties several times a year to inject the oxidizing agent.

An alternative and less intrusive application of this technology would be to inject the oxidizing agent through new horizontal or angle wells. However, the spacing of horizontal or angle wells would not be close enough for this technology to be effective.

C. Expansion of Existing System by Horizontal Wells

This alternative involves expansion of the existing groundwater remediation system by installing horizontal wells beneath Area B. The horizontal wells would be installed by directional drilling from the parking lot on the Maryland side for completion across Eastern Avenue in Area B on the District side.

EPA does not recommend this alternative due to difficulty in long-term maintenance of horizontal wells and the intrusiveness of the construction. A horizontal well is not a straight well, but has a mild curvature in the entrance and exit transition, and the bore hole tends to wriggle along a straight line. Maintaining a horizontal well can be challenging due to the difficulty in retrieving and reinstalling pump and sensors, and the redevelopment of aging wells. Another obstacle is that the construction is disruptive to properties downhill of Area B because the bore holes would need to exit at that location and enough horizontal space must be available to pull several hundred feet of well casing and screen through the bore holes.

D. Installation of an Independent Recovery and Treatment System in Riggs Park

This alternative involves installation of conventional recovery wells in Area B connected to an independent treatment system which would be constructed in Riggs Park. The housing for the treatment system is considered a commercial building which will require a zoning waiver from the District to be placed in a residential area.

EPA does not recommend this alternative because of the concern that an independent recovery system can overpower the existing system by pulling the plume from the Maryland side further into the District, and excessive disruption to the community. There are also numerous implementation obstacles to overcome, such as obtaining a zoning waiver, acquiring a private property for placement of the treatment building, securing a separate power source, installing recovery wells and underground piping at private properties for tie-in with the treatment system and discharge to the storm sewer, and noise, esthetic, emission and traffic interference during construction and long-term operation of the system in a residential neighborhood.

X. PUBLIC PARTICIPATION

A repository of documents generated from all investigations of this Facility is maintained at the following location:

Lamond Riggs Branch Library
5401 South Dakota Avenue, N.E.
Washington D.C. 20011

On August 30, 2007, EPA placed an announcement in the Washington Times and Washington Post to notify the public of EPA's proposed remedy and of the location of the Administrative Record. The Administrative Record, including this SB, is available for review during business hours at the following two locations:

U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, Pennsylvania 19103
Telephone Number: (215) 814-3426
Attention: Mr. Andrew Fan (3WC23)

and

Lamond Riggs Branch Library
5401 South Dakota Avenue, N.E.
Washington D.C. 20011
Phone: (202) 541-6255

EPA is requesting comments from the public on the remedy proposed in this SB. The public comment period will last sixty (60) calendar days beginning August 30, 2007 and ending October 29, 2007. Comments on, or questions regarding, EPA's identification of a proposed remedy may be submitted to:

Mr. Andrew Fan (3WC23)
U.S. EPA, Region III
1650 Arch Street
Philadelphia, PA 19103
Phone: (215) 814-3426
FAX: (215) 814-3113
Email: fan.andrew@epa.gov

During the sixty-day public comment period, EPA will hold a public meeting on EPA's proposed remedy if sufficient public interest indicates that a meeting would be valuable for distributing information and communicating ideas. Requests for a public hearing must be received by EPA by close of business on October 29, 2007. EPA will determine by October 29, 2007, if a public hearing is warranted. After October 29, 2007, any interested parties may contact Mr. Andrew Fan at the EPA address or telephone number above to find out whether or not a public hearing will be held. Handicapped persons with a need for special services should contact Mr. Fan far enough in advance of any hearing to enable the services to be secured.

After evaluation of all comments, EPA will prepare a Final Decision Document and Response to Comments (FDRTC) that identifies final selected remedy. The FDRTC will address all significant written comments and any significant oral comments generated at the public meeting and will be made available to the public. If, on the basis of such comments or other relevant information, significant changes are proposed to be made to the corrective measures identified by EPA in this SB, EPA may seek additional public comments.

EPA anticipates that the final remedy will be implemented using available legal authorities including, but not necessarily limited to, RCRA Section 7003, 42 U.S.C. 6973.

Site Map

Former Chevron Facility

- ☒ Dual-Phase Extraction Well
- ☒ Abandoned Dual-Phase Extraction Well
- ▲ Soil Vapor Extraction Well
- ▲ Abandoned Soil Vapor Extraction Well
- Soil Vapor Sample Location
- Soil Vapor Well
- Basement Sump
- Property Line
- Prince George's County / Washington D.C. Boundary
- Former Chevron Facility No. 122208 Property Line
- Benzene 5 μ g/L (Geoprobe Data)
- MTBE 20 μ g/L (Geoprobe Data)
- ▨ Clay Body; Limits Dashed Where Inferred
- Sanitary Sewer Manhole
- Sanitary Sewer Pipe
- Storm Drain Manhole
- Storm Drain Pipe
- Topography Contours (2 foot intervals)

Date Prepared: June 21, 2004

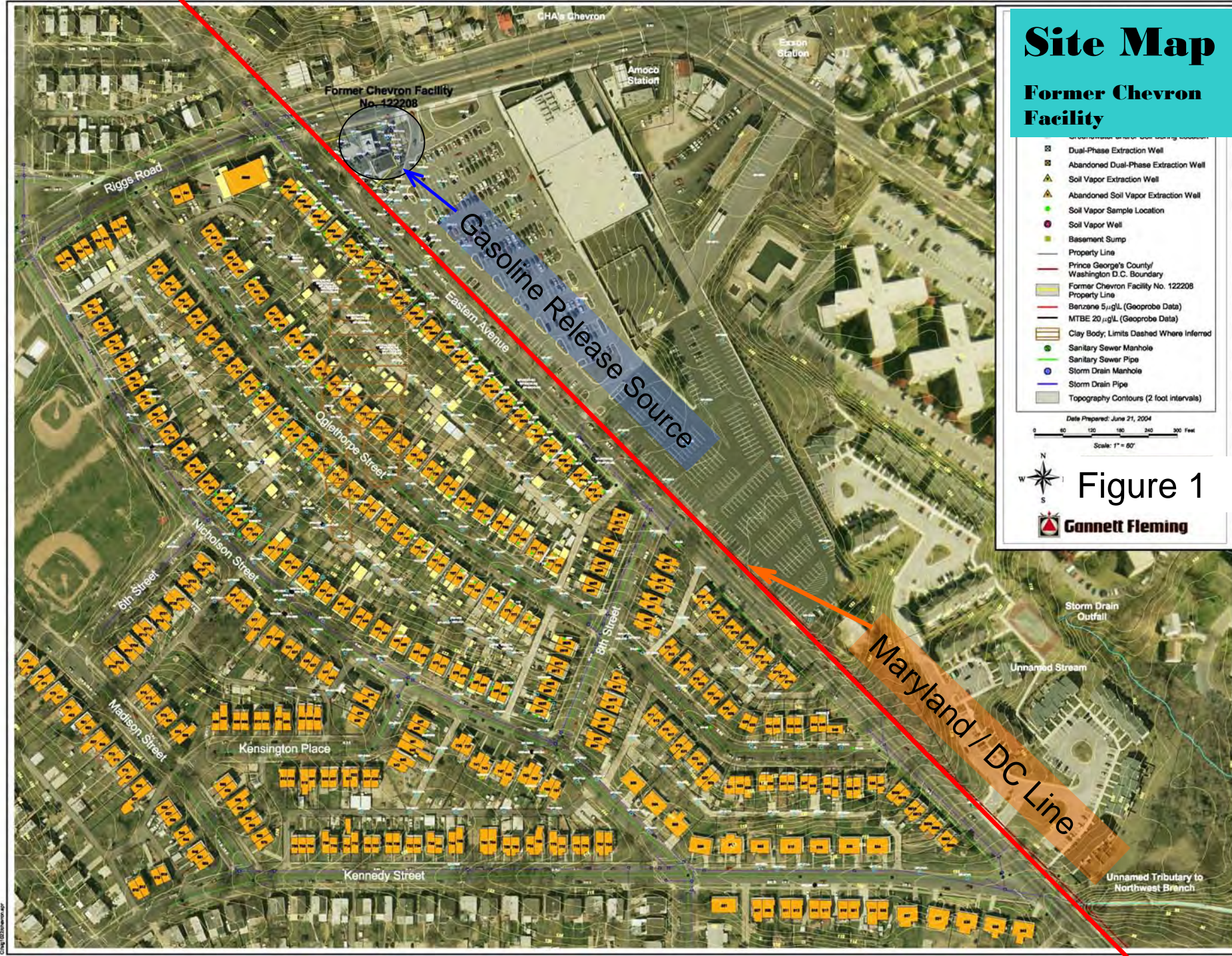
Scale: 1" = 60'



Figure 1



Gonnert Fleming



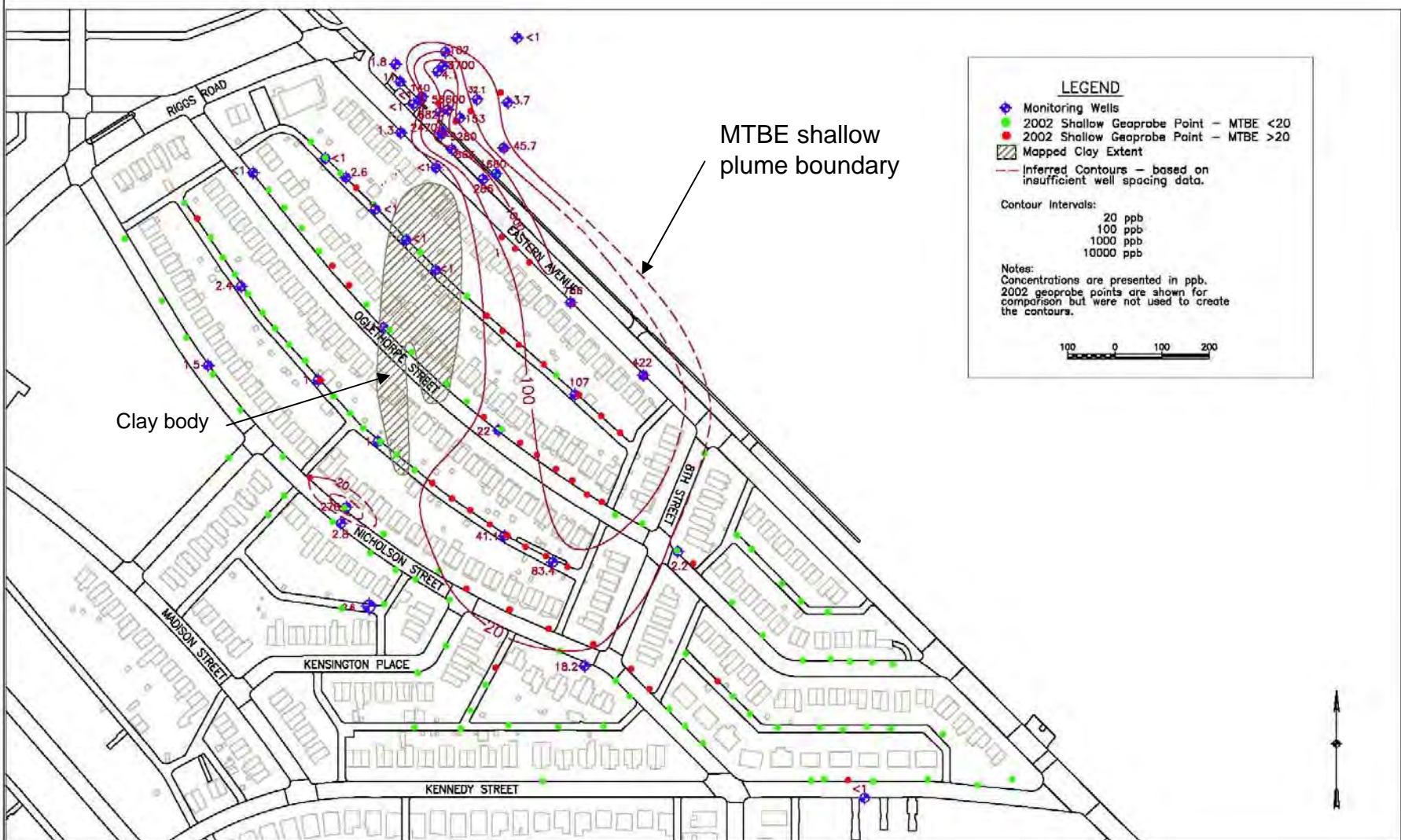


Figure 3



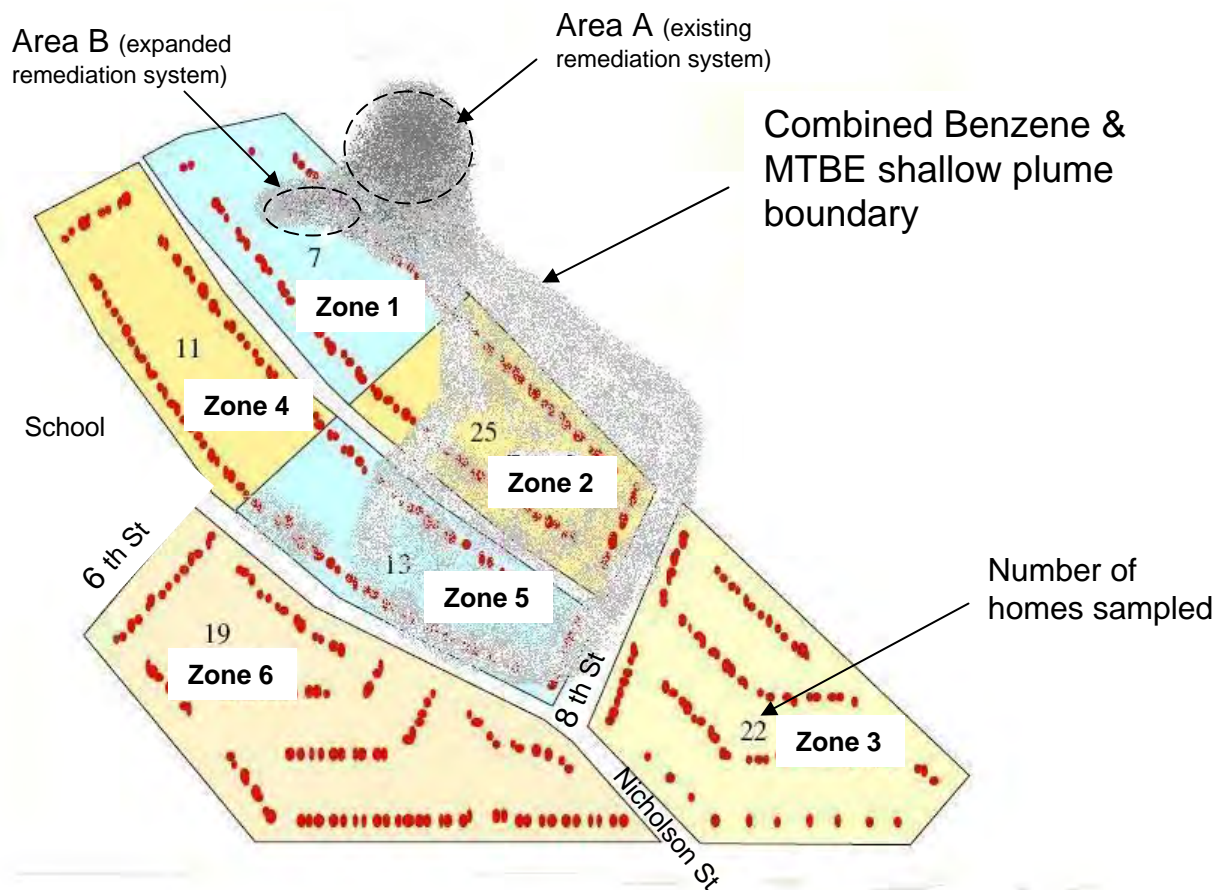
U.S. Army Corps of Engineers
10 S. Howard Street
Baltimore, Maryland 21040

PREPARED BY: PAD

DATE: December 2004

MTBE Shallow Plume
May-June 2004 Data from Shallow Wells

Figure 4		Benzene	(ug/m ³)	MTBE	(ug/m ³)
DOH indoor air sampling data 2006	Number of Samples	Average	95%	Average	95%
Outside plume (Zones 3,4,6)	52	2.7	8.0	2.8	17.2
Above plume (Zones 1,2,5)	45	3.0	10.7	3.5	25.8



Outdoor Ambient Air

Figure 5

Figure 5		Benzene	(ug/m ³)	MTBE	(ug/m ³)
	Number of Samples	Average	95%	Average	95%
DOH 2006 outdoor air data (Zones 3,5,6)	22	0.9	1.3	0.3	0.5
Chevron 2005 outdoor air data (Zone 5)	12	0.8	1.4	2.9	3.5
ACE 2005 outdoor air data (Zone 5)	12	0.8	1.2	2.7	6.1
McMillan Reservoir Station 1 (2006 DOH data) about 5 miles from Riggs Park	61	4.6		2.5	
McMillan Reservoir Station 2 (2006 DOH data) about 5 miles from Riggs Park	30	6.2		27.1	



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

By Overnight Delivery

January 16, 2009

Judson Polikoff
Assistant Secretary
Chevron Products Company
2300 Windy Ridge Parkway, Suite 575
Atlanta, GA 30339

Re: Administrative Order On Consent
Former Chevron Facility
5801 Riggs Road
Chillum, Prince George's County, Maryland
RCRA-03-2008-0355TH

Dear Mr. Polikoff:

Enclosed please find the Administrative Order on Consent (Order) executed by Chevron U.S.A. Inc. and the United States Environmental Protection Agency (EPA) in regard to the above-referenced Facility. As you know, EPA made the Order available for public review and comment. During the public comment period EPA received five sets of comments. EPA has responded to those comments in a document entitled, "Response to Comments on Administrative Order on Consent, RCRA-03-2008-0355TH" which is attached hereto as Attachment A.

Based on the comments provided, EPA has determined that no modifications to the Order are necessary. Therefore, the Order should be made effective in its present form and will become effective upon your receipt of this letter to which a true and correct copy of the fully executed Order is attached as Exhibit B.

If you have any questions concerning this matter, please contact Andrew Fan at (215) 814-3426.

Sincerely,

A handwritten signature in black ink, appearing to read "Abraham Ferdas", is written over a horizontal line.

Abraham Ferdas
Director
Land and Chemicals Division

Enclosures

Response to Comments
on
Administrative Order on Consent, RCRA-03-2008-0355TH

In this document, EPA responds to public comments received by EPA on the proposed Administrative Order on Consent (Consent Order), RCRA-03-2008-0355th, for the gas station formerly owned by Chevron U.S.A. Inc. (Chevron) which is located at 5801 Riggs Road in Chillum, Prince George's County, Maryland (the Facility). EPA provided the public the opportunity to comment on the Consent Order as a matter of policy. EPA's responses do not constitute a final agency action.

The following comments are direct quotes from comments received during the public comment period for the Consent Order:

■ **Response to District of Columbia Comments, dated September 28, 2008**

Question 1: We are concerned that EPA may have inadvertently derived its background concentration based upon the 95th percentile of concentrations measured in homes "off-plume," rather than the 5th percentile. This mathematical, or statistical error, may have artificially inflated the benzene concentration EPA assumes is present in each home as being associated with ambient background levels not associated with the Chevron plume. By inflating the assumed background level, EPA may have raised the threshold for requiring remediation, and inadvertently screened out Riggs Park homes where a VMS should be installed.

Answer: EPA selected the 95 percentile value as the representative background concentration to assure that, with a 95 percent statistical confidence level, the elevated concentrations measured in homes located over the plume are not caused by background sources. EPA derived the 95 percentile value from the District's 2006 sampling data from homes located outside of the plume. Using the 95 percentile value, EPA identified the site-specific background concentrations in Riggs Park for benzene and MTBE as 8 and 17 micrograms per cubic meter (ug/m³), respectively. These site-specific background concentrations are more stringent than the national background levels for those constituents listed in EPA's 2007 national data base which are 10 and 18 ug/m³, respectively.

Please also note that while EPA's selection of the 95 percentile value as the representative background concentration provides a 95 percent statistical confidence level that the elevated concentrations measured in homes are not caused by background sources, it does not prove conclusively that the elevated concentrations are caused by vapor intrusion. There are other uncommon sources of indoor petroleum vapor which were not captured by the 95 percentile value. For example, an individual visiting a house during a sampling event might have accidentally contaminated his/her clothing with gasoline refilling his/her car. In order to conclusively determine that an elevated indoor

air concentration is linked to the Chevron release, the indoor air data must be evaluated in conjunction with soil vapor and groundwater data. However, to reduce the burden of repeat sampling, EPA has taken a conservative approach consistent with its authority under RCRA Section 7003 and required Chevron to take action based on indoor air sampling results alone.

Question 2: Riggs Park residents are being exposed to multiple toxic chemicals associated with the contaminated plume. When people are being exposed to multiple chemicals, EPA risk assessment guidance and risk management policies require EPA to calculate the cumulative cancer risks and hazard index to determine if they are at acceptable levels. EPA is not following its practice here. Instead, EPA is making decisions based on a chemical-by-chemical basis that assumes Riggs Park residents are being exposed to each chemical separately and independently from one another. The District requests that EPA calculate cumulative risk and health hazards for each residence, and base decisions regarding remediation on the results of such risk assessment.

Answer: EPA considers the additive toxicity effect of multiple chemicals in risk management where appropriate. For vapor intrusion assessments, however, EPA has determined that it was not appropriate to add the toxicity effect of multiple indoor air contaminants because doing so would include the toxicity effect of contaminants from background indoor sources. Additionally, cancer risks should not be added to non-cancer risks; and non-cancer risks should not be routinely summed unless they affect the same target organs (EPA Risk Assessment Guidance for Superfund, Volume 1, Section 8.2.2). For example, the risks of toxins that primarily affect the liver can only be summed up with one another, but not with toxins that affect the nervous system.

Please note that the District of Columbia Risk Based Corrective Action Guidance (DCRBCA), Section 5.3.1, states that:

The estimation of cumulative risk or the hazard index (sum of hazard quotients) is not required for the following reasons:

- There are a limited number of COCs [chemicals of concern] at most regulated underground storage tank release sites and the COC's affect different organs,*
- The DCRBCA process uses conservative exposure factors and target risk values,*
- The models used to estimate the RBSLs [risk based screening levels] and SSTLs [site specific target levels] include numerous conservative assumptions.*

Question 3: The 8 ug/cu.m. benzene standard calculated by EPA Region 3 is actually the sum of two parts, or concentrations: 1) the risk-based concentration (RBC) of benzene (assuming background levels are zero), and 2) the site-specific background concentration in each Riggs Park home It should be noted that the EPA region 3 SOB does not specifically state the calculated 95th percentile benzene concentration, but it is assumed to be approximately 5.7 based on the following relationship equation:

EPA Region 3 “Standard” (8 ug/cu.m.) = 95th Percentile Background (5.7 ug/cu.m.) + RBC (2.3 ug/cu.m.)

Answer:

EPA derived the 95 percentile values for benzene and MTBE as follows:

95 percentile = Mean background value + 2 Standard Deviations

Benzene (8.1 rounded to 8) = Mean background value (2.7) + 2 Standard Deviation (2.7)

MTBE (17.2 rounded to 17) = Mean background value (2.8) + 2 Standard Deviation (7.2)

Section VI.B (Vapor Remediation Standards) of the Statement of Basis dated August 2007 describes how the 95 percentile background concentrations were identified:

EPA used the indoor air sampling data provided by DOH to identify the background concentrations of benzene and MTBE. DOH collected indoor air samples from 97 homes in 2006; 52 homes are located outside the plume boundaries and 45 homes are located above the plume. Based on statistical analyses of the indoor air data collected from the 52 homes located outside the plume, the mean background concentrations for benzene and MTBE are 2.7 ug/m³ and 2.8 ug/m³, respectively, with standard deviations of 2.7 ug/m³ and 7.2 ug/m³, respectively. Since these 52 homes are located outside the plume, the measured values cannot be affected by the gasoline plume and therefore represent local background concentrations.

In selecting remediation standards, EPA must consider implementation factors such as background concentrations. EPA is not aware of any practical technology that can reduce indoor air vapor concentrations to below background concentrations, or any measurement technique that can distinguish background concentrations from vapor intrusion concentrations if the two are numerically similar. A 95 percentile value (mean value plus two standard deviations) will provide confidence that the measured value is likely caused by vapor intrusion, and that technology will be available to reduce the elevated concentrations to background concentrations. Therefore, EPA selects the 95 percentile values; that is, 8 ug/m³ and 17 ug/m³, as the remediation standards for benzene and MTBE, respectively.

Question 4: “Installation of individual vapor mitigation systems in homes above the plume where measured indoor air concentrations have exceeded EPA’s standards.” This statement indicates that EPA is applying defined “EPA Region 3 standards” that originate or are based on law, policy, regulations, and for guidance developed by EPA. We believe this statement could be misleading.

Answer: While the District states that it has quoted from the Consent Order, EPA cannot find this exact quote. Nonetheless, EPA does not believe that the statement is misleading. EPA established the site-specific indoor air standards for Riggs Park by

following the National Contingency Plan (NCP), which is codified at 40 C.F.R. Part 300. EPA selected those standards as part of its Final Remedy after considering comments received from the District, the Agency for Toxic Substances and Disease Registry and the public. Therefore, those indoor air standards are EPA's standards for Riggs Park.

Question 5: EPA Region 3 should modify its technical approach and make correct and appropriate comparisons for each Riggs Park home. The only scientifically tenable approach for comparing an EPA benzene standard with the indoor air concentration for each home is to subtract the background benzene concentration from the measured indoor air benzene concentration in each home. That is, the indoor air concentration measured for each Riggs Park home should be adjusted by subtracting the background benzene concentration measured outside the home from the concentration measured inside the home.

It should also be noted that the home-specific background level should also be used to determine when the vapor mitigation systems are no longer required. That is, the target remediation level for each home should be set to match the outdoor air concentration, as EPA correctly notes that it is impossible to remediate below ambient levels. However, once again, the site-specific (home-specific) background level should always be used to represent the background ambient conditions---not an upper-bound 95th percentile concentration derived from another distant population of homes in the general area.

Answer: It appears that the District is assuming that the difference between indoor and outdoor air concentrations of volatile organic compounds (VOC) is completely attributable to vapor intrusion. However, VOC concentrations are typically higher in indoor air than in outdoor air for reasons other than vapor intrusion. Benzene concentrations in indoor air, for example, are typically higher than benzene concentrations in outdoor air due to many indoor chemical sources, such as cleaners, paints, glues and cigarette smoke; reduced air circulation and dilution indoors; and lack of direct sunlight to photodegrade benzene indoors.

The District's indoor and outdoor air data collected in 2006 in homes located outside the plume demonstrate this general relationship between indoor and outdoor VOC concentrations. In 2006, DOH sampled indoor air in 52 homes which are located outside the boundary of the plume. The average indoor air concentration for benzene inside those 52 homes was 2.7 ug/m³, versus 1.9 ug/m³ measured by DOH in outdoor ambient air during the same period.

Further, if EPA were to adopt the District's proposed technical approach, it would be necessary to install vapor mitigation systems in many homes in the District that are not affected by the Chevron plume. Moreover, such systems would not be effective because the VOC sources do not originate from beneath the slab.

Question 6: It should be noted that in adding the 95th percentile background benzene concentration to each home, EPA is only protecting 5 percent of the residents instead of the 95 percent of Riggs Park residences.

Answer: It appears that the District is assuming that 100 percent of the measured indoor air concentrations of VOCs in homes located above or outside the plume is attributable to the Chevron plume. Rather, EPA's selection of the 95 percentile background concentration is to assure, with a 95 percent statistical confidence level, that the elevated concentrations measured are not caused by background sources.

Question 7: In its decision-making documents, EPA has stated that an "innovative independent remediation system" would be employed in Area B. District staff were very impressed with the presentation provided at the Region 3 Corrective Action Workshop held at Rocky Gap Maryland, of advanced and accelerated remediation by EPA's invited contractor. This technology employs a combination of remediation techniques, such as air stripping, vapor extraction, air sparging, and recirculation of groundwater pumping - all of these taking place below ground with minimal disruption to the impacted community. The District firmly requests that this advanced and innovative technology be employed on behalf of the Riggs Park residents.

Answer: EPA is pleased that the District supports EPA's selection of an Independent Remediation System (IRS) as an added component to the Final Remedy. While the EPA-approved IRS will include the remediation techniques that the District has listed, please note that the IRS as described in the Final Decision and Response to Comments document is a generic system, not a proprietary system. Federal law prohibits EPA from favoring a particular proprietary system or vendor.

■ Response to Comments from Walter and Francis Reeder, dated September 23, 2008

Question 1: We are objecting to the proposed final remedy in AOC [sic] as presented by EPA during the Informational Session held September 4, 2008. Why is Area B (alley south of Eastern Avenue) the only area to have an installed remediation system?

Answer: The remedy in the AOC is EPA's Final Remedy for the Facility. The Final Remedy was selected by EPA in the April 2008 Final Decision and Response to Comments after a public comment period. EPA selected the Final Remedy based on input from the District and the community which urged EPA to install an Independent Remediation System in Area B on the District side.

The Final Remedy includes continuing the existing groundwater remediation system in Area A and installing an Independent Remediation System (IRS) and angled recovery wells in Area B. Area B is the only area to have an IRS because liquid gasoline is present

only in Areas A and B and the existing groundwater remediation system is already located in Area A. The objective of the IRS is the elimination of liquid gasoline sources which prevents further contamination of the groundwater. EPA anticipates that once the liquid gasoline in Areas A and B is eliminated, the entire plume will be self-cleaning due to rapid biodegradation of dissolved phase hydrocarbons.

Question 2: Why did EPA not know [sic] that the upgraded dual phase extraction system installed in 2005 is ineffective? The system's mission is to prevent any new releases from migrating into the District. Yet Gannett Fleming's (subcontractor of Chevron) maps for Years 2007 and 2008 show an increase of benzene in MW25A which is at least 15 properties away from Area B and at least 270 feet from the gas station (source). Where is the source for the release?

Answer: EPA disagrees with the commenter's assertion that the extraction system is ineffective. To the contrary, data collected show that the dual phase extraction system has been working effectively. Since the system's expansion in 2005, benzene concentrations in groundwater on the District side have steadily declined and the benzene plume has retreated and shifted slightly northward. Regarding monitoring well MW-25A, benzene concentrations have not been detected in the groundwater sampled from this well since 2004, and MTBE concentrations in the groundwater have been declining. The following chart summarizes the benzene and MTBE concentrations from groundwater sampled from monitoring well MW-25A from June 2004 through September 2008:

MW-25A	Benzene (ug/m3)	MTBE (ug/m3)
06/04/04	ND (1.0)	107.0
08/02/04	ND (1.0)	238.0
09/15/05	ND (1.0)	28.6
03/24/06	ND (1.0)	17.1
10/04/06	ND (1.0)	16.0
03/27/07	ND (1.0)	6.1
10/03/07	ND (1.0)	5.8
04/01/08	ND (1.0)	36.0
09/24/08	ND (1.0)	4.6

Notes: ND-Not Detected above reporting limit shown in parenthesis.

Question 3: Is EPA providing documents to the community that the old non-effective extraction wells in Area A were free of contaminations in 2005? Were the wells removed? What were the contaminants? In 2001 and 2002 Chevron was only required to submit the analytical results for compounds found in gasoline, BTEX and MTBE to the residents. The community became aware with the emerging of [sic] the Superfund Program.

Answer: The old extraction wells were not non-effective. EPA approved those wells for abandonment because they had successfully removed gasoline from the surrounding soils and were no longer necessary in that area. In accordance with Maryland regulations, the six wells were abandoned in 2004 by pouring bentonite (clay) chips into the well to one foot below the top of the casing, and then the casing and well vault were filled with concrete to grade.

Information about the dual phase extraction system, including the abandonment of the old extraction wells, can be found in the EPA-approved "Interim Dual-Phase Extraction Design Plan and Specifications, October 2003." That document can be found in the Administrative Record for the Statement of Basis and is available in the Lamond Riggs Library for public review.

Chevron is only required to provide analytical results for compounds related to the gasoline release. Those compounds are benzene, toluene, ethylbenzene, xylenes (BTEX) and methyl tertiary-butyl ether (MTBE). Perchloroethylene (PERC), a dry cleaning solvent, was discovered in 2002 during the site investigation. Since PERC is not a contaminant associated with gasoline, but rather is commonly associated with dry cleaning activities, EPA determined that PERC is not related to the Chevron gasoline release. The PERC contamination, therefore, is not within the scope of EPA's RCRA investigation. EPA's Superfund Removal program has taken the lead on investigating the PERC release.

Question 4: Why is EPA rushing their proposed remedy? What data is EPA using for the final remedy? Have the latest results from the testing conducted by the District Government's subcontractor been analyzed and considered in the final remedy?

Answer: EPA did not rush the remedy selection process. EPA invited the public to comment on the proposed final remedy during a 60-day public comment period and selected the Final Remedy after consideration of all the public comments received. In addition, the Final Remedy was based on seven years of investigative information accumulated between 2001 and first quarter of 2008. The investigative information included thousands of sampling results including the District's sampling results of 97 homes in 2006 and follow-up test results up to the April 2008 issuance of the FDRTC. EPA understands that the District is still collecting data and EPA will evaluate new data furnished by the District.

Question 5: Where the [sic] documents to support the gas station (former Chevron) is cleaned of gasoline contamination? EPA made the statement at the Informational Session. Why did EPA allow Chevron to "clean up" its source and further contaminated [sic] DC? How will angle recovery wells protect the community? The gasoline has already migrated into the District.

Answer: Documents supporting the abandonment of the old extraction wells at the former Chevron gasoline station can be found in a series of pre-2005 quarterly progress reports that document the performance of the old dual phase extraction system. Those progress reports are contained in the Administrative Record for the Facility and are available in the Lamond Riggs library for public review. Recovery wells were selected for abandonment because the abandoned wells had effectively removed gasoline from the surrounding soils during their decade of operation. Neither liquid gasoline nor gasoline vapor had been detected in groundwater from those wells for several years prior to 2005.

By requiring Chevron to cleanup the liquid gasoline source, EPA has forestalled further groundwater contamination in the District. The objective of the groundwater remediation

activities is the elimination of liquid gasoline sources thereby preventing further contamination of the groundwater. EPA anticipates that once the liquid gasoline in Areas A and B is eliminated, the entire plume will be self-cleaning due to rapid biodegradation of dissolved phase hydrocarbons.

The future angled recovery wells will enlarge the capture zone, accelerate groundwater movement, extract contaminated soil vapor, and enhance product degradation in Area B.

Question 6: Whose standard (MD, DC, EPA) will EPA use for the final remedy? The question (along with many others) was asked at the Informational Session. Promises were made to answer all residents' questions. Were promises kept? Has EPA formed a partnership with the District of Columbia Government on remediating Riggs Park? The DC agencies present had no voice during the Informational Session.

Answer: The standards for the Final Remedy are set forth in the April 2008 Final Decision and Response to Comments (FDRTC). EPA, the Agency for Toxic Substances and Disease Registry, and the District have jointly prepared a fact sheet to explain the various standards. Please see Attachment 1 for a copy of that fact sheet.

From August 30, 2007 to October 29, 2007, EPA accepted comments on the Statement of Basis (SB) in which it proposed its remedy for the Facility. EPA responded to all comments and questions raised on the SB before selecting the Final Remedy in the FDRTC.

EPA has not formed a partnership with the District to remediate Riggs Park. However, EPA continues to keep the District informed on all aspects of the remediation and will continue to evaluate data collected by the District.

With respect to the District's participation during the Informational Session, since it is EPA who entered into the AOC with Chevron under federal authority, it was appropriate for EPA, and not the District, to respond to inquiries regarding the AOC.

■ Response to comments from Delores Ford, September 23, 2008

Question 1: Interim Measure work plan for vapor sampling and mitigations at resident homes [should be carried out] at a minimum of 8 times per year; at the beginning, and during and end of each seasonal change for each home.

Answer: The vapor mitigation systems that EPA is requiring Chevron to install will be in operation 24 hours per day, 365 days per year. Each system will be sampled once a year to monitor the effectiveness of the system. Conducting sampling eight times per year is not warranted as it would be overly disruptive to the residents.

Question 2: Medical monitoring should be made available to each member of each residence for the rest of their lives, especially those that may have stayed a consistent period of time in either of the homes since the gasoline spill occurred.

Answer: The Agency for Toxic Substances and Disease Registry (ATSDR) has completed three Health Consultation reports on the Riggs Park community which are available in the Lamond Riggs library for public review. ATSDR has determined that all indoor and outdoor air VOC concentrations are at levels that are not expected to cause adverse cancer or non-cancer health effects in members of the Riggs Park community. ATSDR has classified the Chillum Facility as "No Apparent Public Health Hazard" and does not recommend further medical study or monitoring.

Question 3: A private consulting contractor independent of Chevron should monitor and check for new releases, identify and [sic] immediate or potential threat to human health, or the environment at or from the facility. This should occur 3 times each quarter. A written report should be presented to the Riggs Park Committee, City Counsel Representative, DOE, DOH and a source considered by the committee. Chevron [sic] part in this is to pay the cost for each process for the duration. Otherwise, Chevron and EPA give the appearance that Chevron can legally police themselves. A written schedule of these events should be provided to the Riggs Park Committee for the year for acceptance and approval.

Answer: Chevron is not policing itself; rather Chevron is performing the necessary work selected by EPA in the FDRTC, pursuant to a federally-issued and enforceable Consent Order. EPA and the District are overseeing Chevron's work including hiring independent contractors to collect quality control samples. Moreover, Chevron will be subject to stipulated penalties if it violates the Consent Order once it becomes effective.

Question 4: This Consent Order should be delayed until all questions have been satisfactory answered to the residents, as well as they should receive their results.

Answer: The purpose of this document is to respond to the public comments submitted on the proposed Administrative Order on Consent (Consent Order), RCRA-03-2008-0355TH. The Consent Order becomes effective once EPA responds to public comments and provides Chevron with an executed copy of the Consent Order. EPA believes that it has responded satisfactorily to comments received and that it is appropriate at this time to make the Consent Order effective.

It is unclear to which results the comment is referring. Residential sampling results obtained to date by Chevron, EPA and the District are in the Administrative Record for the Facility and are available in the Lamond Riggs Library for public review. If the comment is referring to the sampling required by the Consent Order, those sampling requirements do not take effect until the Consent Order is effective.

■ Response to Judith Mills Comments, dated September 23, 2008

Question: Why aren't DC Standards being used for this Riggs Park Site. You stated only homes with measured indoor air concentrations exceeding EPA's indoor air standards are qualified for installation of individual vapor mitigation systems. Currently, only five homes above the plume have measured indoor air concentrations exceeding EPA standards. How many plumes are there?

Answer: Please refer to EPA's responses to Walter and Francis Reeder's Question #6 and the District of Columbia's Question #4 for discussions concerning EPA's standards. Regarding the number of plumes, there is one combined dissolved phase plume which includes both the benzene and MTBE plumes.

■ Response to Cleo Holmes Comments, dated September 23, 2008

Question 1: Why does EPA appear not to disclose the remediation system is being installed in the Riggs Park residential community in the District of Columbia?

Answer: EPA has, in fact, described the conceptual design of the Independent Remediation System in the April 2008 Final Decision and Response to Comments. Design details will be available after a contractor is selected to install the system and the design details are finalized.

Question 2: Is the District an EPA approved RCRA C and RCRA I state?

Answer: The District has been authorized for the RCRA Subtitle I Leaking Underground Storage Tank Corrective Action program and the RCRA Subtitle C Hazardous Waste Management program, but not the RCRA Subtitle C Hazardous Waste Corrective Action program. Moreover, RCRA Section 7003 Authority is not authorizable.

Question 3. Why did EPA decide the District of Columbia will not have any input in the implementation order on behalf of the residents of the District of Columbia?

Answer: The District had input on the proposed RCRA 7003 AOC via the public comment process. EPA has, in fact, received comments from the District and has responded to them as set forth above.

Question 4. Why is the remediation system not designed to clean up the groundwater?

Answer: The remediation system is designed to clean up the liquid gasoline present in Areas A and B. The liquid gasoline is the source of dissolved phase gasoline contaminants (plume) in the groundwater. EPA anticipates that once the liquid gasoline is removed, the plume will be self-cleaning due to rapid biodegradation of dissolved phase gasoline contaminants.

Question 5. Why is the remediation system not designed to address soil contamination on Oglethorpe St?

Answer: Based on extensive groundwater sampling by Geoprobes and monitoring wells, there is no gasoline-contaminated soil or liquid gasoline present on Oglethorpe Street or any areas outside Areas A and B. Dissolved phase groundwater contamination is not considered soil contamination. Liquid gasoline may be interpreted as soil contamination which is present in the smear zone intercepting the water table in Areas A and B.

Question 6. With some homes on Oglethorpe St. being 3.5 ft. to 9 ft from the water table why does this remediation system offer no protection for the residents of Oglethorpe St.?

Answer: Pursuant to the 2002 Order, EPA required Chevron to install a vapor mitigation system in each home for which EPA's data (data collected by EPA or under EPA's supervision) showed concentrations of indoor air in excess of EPA's standards. Chevron has installed a vapor mitigation system in one home on Oglethorpe Street. With respect to the remaining homes on Oglethorpe Street, EPA's data have not shown that soil vapor is migrating into those homes in concentrations that would pose a threat to human health.

Question 7. What protection does the additional remediation system being installed in the District of Columbia offer all the residents of Eastern Ave in the District of Columbia?

Answer: The goal of the angle wells and Independent Remediation System is the clean up of the liquid gasoline source in Area B. Once that source is eliminated, the dissolved phase plume underlying the neighborhood will dissipate through biodegradation.

Question 8. Why did EPA Superfund not investigate the used oil and used fuel tank pits located at the suspect service station for chemicals that are affecting the residents of the District of Columbia?

Answer: EPA is not aware that any used oil pit ever existed at the Facility. Moreover, used oil is a heavy motor oil that does not contain dissolved constituents that can contaminate groundwater. It is unclear what used fuel tank pit the Commenter is referring to because fuel tanks contain only fresh fuel, not used fuel. EPA's Superfund has no role in investigating the fuel (gasoline) release at this site. The fuel release is the responsibility of the EPA RCRA team.

Question 9. Why didn't EPA under RCRA C investigate the used oil and used fuel tank pits for hazardous waste that may be affecting the residents of the District of Columbia as a part of implementation order?

Answer: See EPA's answer to question 8, directly above on the issue of used oil and used fuel tank pits.

Question 10. Why is the EPA and Chevron doing a sub-standard investigation and not offering the District of Columbia any oversight?

Answer: EPA disagrees that its investigation is sub-standard. The public is aware of the significant resources EPA has expended investigating and remediating the Chevron gasoline release pursuant to the 2002 Order. EPA has required Chevron to install over 80 new groundwater monitoring wells, four soil vapor monitoring wells, 16 product recovery wells, and 232 temporary Geoprobe wells. Cumulatively, as of June 2007, Chevron has collected over 2300 groundwater samples, 14 basement sump samples, 300 soil samples, over 260 soil vapor samples from 90 properties, and over 50 indoor and ambient air samples from 20 properties. EPA has reviewed the data collected by Chevron along with indoor air and soil vapor data collected by EPA from 32 homes and indoor air data from 97 homes collected by DOH. In addition, the District has independent regulatory authority and has been overseeing Chevron's work including hiring independent contractors to collect samples.

Question 11. What power is EPA enforcing over the District of Columbia that causes the District back [sic] away from the RCRA C and RCRA I authorities in protection of District residents?

Answer: The District has been authorized for the RCRA Subtitle I and RCRA Subtitle C hazardous waste management programs and has independent authority to order Chevron to conduct work under those programs. The District has not been authorized for the RCRA Subtitle C corrective action program. EPA has not used any enforcement authority to prevent the District from requiring Chevron to perform additional work.

Question 12. Why didn't EPA require Chevron to remediate the soil in residential areas to the District's Tier 0 [sic] Standards for soil as adopted under DCMR Title 20, 6208?

Answer: See EPA's response to Question 5, above. As stated in that response, EPA is requiring Chevron to clean liquid gasoline present in the smear zone in Areas A and B. That liquid gasoline when present in the smear zone can be considered soil contamination.

Question 13. Why didn't EPA require Chevron to remediate the groundwater in residential areas to the District's Tier 1 standards for ground water quality as adopted under DCMR Title 20, 6209?

Answer: EPA is requiring Chevron to cleanup groundwater to meet drinking water standards established under the Safe Drinking Water Act, 42 U.S.C. Section 300g-1. Those standards which are referred to as Maximum Contaminant Levels (MCLs) are equivalent to or more stringent than the District's Tier 1 standards.

Question 14. Why didn't EPA require Chevron to remediate Upper Concentration Limits for benzene in ground water as adopted under DCMR Title 20, 6210.1?

Answer: See EPA's answer to Question 13, directly above.

Question 15. Why would EPA author an Implementation Order to remediate property within the District of Columbia that does not require responsible party, Chevron, to adhere to District standards DCMR Title 20, 6206 thru 6207?

Answer: See EPA's answers Questions 13 and 14, directly above, and EPA's answer to Walter and Francis Reeder's Question 6.

Question 16. After District residents complained Chevron [sic] did not provide residents full disclosure of test results of samples taken from resident properties, why would EPA issue an implementation order to remediate residential properties without residents having full disclosure of chemicals that are affecting their properties?

Answer: Chevron has complied with the reporting requirements in the December 2002, Administrative Order (Order), RCRA-03-2003-0006th, which require Chevron to submit to EPA the results of all sampling, tests, and other data generated by Chevron pursuant to the Order. The Order does not require Chevron to provide residents with all sampling results, but Chevron has voluntarily sent sampling results obtained from individual properties to property owners. The December 2002 Order requires Chevron to provide EPA with analytical results for compounds related to the gasoline release. Those compounds are benzene, toluene, ethylbenzene, xylenes (BTEX) and methyl tertiary-butyl ether (MTBE). All of Chevron's sampling results are available in the Lamond Riggs Library for public review.

Question 17. Why did EPA not properly enforce RCRA Subtitle C "cradle to grave" tracking and management priorities related to the used oil and used fuel tank pits buried at gasoline station off [sic] which the RCRA Administration Order is based?

Answer: See EPA's response to Question 8, above, on the issue of used oil and used fuel tank pits. With respect to RCRA Subtitle C, the decision to exercise enforcement authority is a matter of agency discretion. EPA's involvement at the Facility began in October 2001, by request of then Councilmember Fenty, District of Columbia. In December 2002, EPA issued an Administrative Order (Order), RCRA-03-2003-0006, pursuant to Section 7003 of RCRA, 42 U.S.C. § 6973. In addition, pursuant to RCRA § 7003, EPA is issuing the Administrative Order on Consent, RCRA-03-2008-0355TH, requiring that Chevron, among other things, implement EPA's Final Remedy. RCRA § 7003 gives EPA the authority to require parties to investigate and clean up hazardous releases. EPA's use of its 7003 authority is and continues to be the appropriate mechanism to address the contamination at and emanating from the former Chevron facility.

Question 18. Will EPA require Chevron through MDE release [sic] all documents relating to historical installation, sampling, complete lab reports, and maintenance records available for the used oil and used fuel tank pits buried at the service station?

Answer: See EPA's answer your Question 8 above regarding used oil and used fuel tank pits. As part of the site investigation, EPA obtained and reviewed the documents it determined were necessary to investigate and clean up the gasoline release. All such documents are contained in the Administrative Record for the Facility which is available in the Lamond Riggs Library for public review. Documents in MDE files can be obtained from MDE under its public information laws. Please contact Herbert Meade of MDE to to review MDE files on the Chillum site (hmeade@mde.state.md.us, 410-537-3386).

FACT SHEET FOR THE CHILLUM/RIGGS PARK COMMUNITY
Comparison of Indoor Air Levels Used by the U.S. Environmental Protection Agency
(EPA) Region 3; U.S. Agency for Toxic Substances and Disease Registry (ATSDR);
and the District of Columbia (the District)

INTRODUCTION:

The purpose of this factsheet is to provide community members at the Chillum/Riggs Park site in Washington, DC with more information on the different "comparison levels" being used to evaluate and make decisions about levels of indoor air contaminants found at this site. Table 1 summarizes the different levels by contaminant and by agency for the gasoline constituents of concern at this site. This table includes the action levels being used by EPA Region 3 as *cleanup levels* at this site. This table also shows the *screening levels* that EPA, ATSDR, and the District of Columbia ("District") historically used or are using to determine the need for, and extent of, cleanup at this site, and on the health agency side to evaluate the potential for health effects in the community. The District has not yet selected an action level or levels (or *cleanup levels*) for this site, but anticipates that it will evaluate chemicals in addition to those identified in Table 1; may evaluate the cumulative risk posed by exposure to multiple chemicals; and because it is evaluating cumulative risk, may not use screening levels when making cleanup decisions. Definitions to help understand this information follow Table 1. Table 2 summarizes the different agencies' roles, responsibilities and contact information for this site.

Table 1. Comparison of Cleanup and Screening Levels by Chemical and Entity for the Chillum/Riggs Park Site in Washington, DC

	Cleanup Levels ¹	Screening Levels ²			
	ug/m3	ug/m3			
	EPA	EPA ³	ATSDR Acute/Intermediate ⁴	ATSDR Chronic ⁵	District ⁶
Benzene	8	0.23 to 23	30/20	10 (0.1 CREG)	.8
Toluene	5,000	5,000	4,000/not available	300	1500
Ethylbenzene	1,000	1,000	40,000/4,000	1,000	3800
Xylenes	100	100	9,000/3,000	200	390
MTBE	17	1.6 to 160	7,000/2,000	2,000	160

EXPLANATION OF THE TABLE:

- Cleanup Levels** refer to the concentrations of a chemical that a regulatory agency has set to take a response action at a particular site. *Cleanup levels* are established by the regulatory agency on a site-specific basis to identify the cleanup goal at a particular site and to determine the level at which remediation is triggered. It is important to note that the environmental agencies at this site (EPA and the District's) have not established national/District-wide non-site specific cleanup "standards" for gasoline plume constituents in indoor air or soil vapor.
- Screening Levels.** Think about these numbers as a place to start. These numbers change over time as new science becomes available. Other names for screening values are "health based comparison values," "comparison values," "risk based concentrations," or "guidance values." These are numbers that help agencies start evaluating environmental sampling data. These numbers are not health effect levels, nor are they cleanup levels, or action levels. They are meant to be default numbers that let you "screen out" a problem from further consideration. This means you can have a sampling result that exceeds a screening value and a public health agency can still make the determination that the concentration is not high enough to actually make a person sick based on the results of the comprehensive public health review of the site-specific information. These levels are generally used to eliminate homes that do not pose significant health threats. That is, homes with levels lower than screening levels are eliminated from further evaluation or study while homes with concentrations higher than screening levels require additional evaluation.
- EPA screening levels at this site are based on 2007 EPA Region 3 Risk Based Concentrations (RBC) table.
- ATSDR Acute and Intermediate Comparison Values in this table are based on ATSDR's 2008 screening values, with the exception of the intermediate value for ethylbenzene, which is based on the ATSDR's 2007 screening value to be consistent with the May 2007 ATSDR Record of Activity Health Consultation evaluating the public health protectiveness of EPA's proposed cleanup levels. ATSDR refers to these values as Minimal Risk Levels or MRLs. ATSDR acute values screen for non-cancer health effects for exposures lasting 14 days or less. Intermediate values are for screening for non-cancer health effects for exposures from 14 days to one year.
- ATSDR Chronic Comparison Values in this table are based on ATSDR's 2008 screening values. ATSDR refers to these values as Minimal Risk Levels or MRLs. ATSDR chronic values are for screening for non-cancer health effects for exposures lasting from one year or longer. For the chemical ATSDR evaluates as a human carcinogen in the table (benzene), ATSDR also included the Cancer Risk Evaluation Guideline (CREG) as the lower end of this

screening range. The CREG uses the EPA Cancer Slope Factor to estimate the concentration to produce a lifetime risk of one additional cancer in a million people.

6. The District's screening levels were set forth in a 2005 Memorandum prepared by the Department of Health, Environmental Health Administration, titled "Target Indoor Air Action Levels." The District may adjust its screening levels over time as science evolves.

BENZENE

EPA's *clean-up value* for BENZENE was selected based on site-specific background indoor air concentration at a 95 percent confidence interval. The data for the background calculation were based on indoor air data collected by the District from homes outside the plume at Riggs Park in 2006. The selected value is within the acceptable cancer risk range of one-in-ten thousand to one-in-one million in accordance with the National Contingency Plan* remedy selection criteria. EPA's *screening level* is based on a cancer risk range of one-in-ten thousand to one-in-one million. The concentration 0.23 ug/m³ = a lifetime risk of one cancer per one million people; and 23 ug/m³ = a lifetime risk of one cancer per ten thousand people. The District's *screening level* for benzene, identified in the District's 2005 Memorandum (see supra, n. 6), is also set forth in Appendix G of the District's 2002 Risk Based Correction Action Plan Guidelines, which in turn is based on the 2000 EPA Region 3 RBC table.

TOLUENE, ETHYLBENZENE, and XYLENES

EPA's *clean-up values* for TOLUENE, ETHYLBENZENE and XYLENE were selected based on the EPA reference concentration (RfC). The RfC is an estimate of a daily inhalation exposure of the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. The District's toluene, ethylbenzene and xylene levels were set forth in the District's 2005 Memorandum (see footnote number 6 above). ATSDR has acute and chronic exposure duration non-cancer *screening levels* for toluene, and has acute, intermediate, and chronic exposure duration non-cancer *screening levels* for ethylbenzene, and xylenes.

MTBE (Methyl tert-Butyl Ether)

EPA's *clean-up value* for MTBE was selected based on site-specific background indoor air concentration at a 95 percent confidence interval. The data for the background calculation were based on indoor air data collected by the District from homes outside the plume at Riggs Park in 2006. The selected value is within the acceptable cancer risk range of one-in-ten thousand to one-in-one million in accordance with the National Contingency Plan* remedy selection criteria. EPA's *screening level* is based on a cancer risk range of one-in-ten thousand to one-in-one million. A concentration of 1.6 ug/m³ = a lifetime risk of one cancer per one million people; and 160 ug/m³ = a lifetime risk of one cancer in ten thousand people. The District's MTBE level was set forth in the District's 2005 Memorandum (see supra, n. 6). ATSDR evaluates MTBE for non-cancer effects using acute, intermediate, and chronic exposure duration non-cancer *screening levels*.

**The National Contingency Plan (NCP) is the federal government's blueprint for responding to both oil spills and hazardous substance releases. The NCP is the result of our country's efforts to develop a national response capability and promote overall coordination among the hierarchy of responders and contingency plans.*

**Table 2. Agency Roles, Responsibilities and Contact Information
for the Chillum/Riggs Park Site, Washington DC**

Agency name	Agency site role	Agency contact
Agency for Toxic Substances and Disease Registry (ATSDR)	Federal advisory agency on public health. ATSDR is not a regulatory agency and does not develop or set regulatory standards. ATSDR provides public health advice and technical assistance to other agencies and the community at this site.	Lora Werner, 215-814-3141, lkw9@cdc.gov
District Department of the Environment (DDOE)	Local environmental regulatory agency, previously part of the DC DOH. Conducting independent community environmental sampling at the site. Has regulatory authority over environmental contamination concerns in the District, but has not yet initiated enforcement action at this site at this time.	Sharon Cooke, 202-673-6738, Sharon.Cooke@dc.gov
District Department of Health (DOH)	Local public health agency (regulatory and advisory authorities). Previously conducted independent community environmental sampling at this site, now being conducted by DDOE. Among other public health responsibilities, administers District's cancer registry and asthma education programs.	Ron King, 202-698-4170, Ronald.King3@dc.gov
Environmental Protection Agency (EPA)	Federal environmental regulatory agency with enforcement authority over Chevron. Waste Management and Chemicals Division oversees order with Chevron, including characterization of gasoline contamination and establishment of action and cleanup levels for gasoline chemicals.	Andrew Fan, 215-814-3426 fan.andrew@epa.gov

APPENDIX F
RIGGS PARK SPECIFIC HEALTH AND SAFETY PLAN

Site Name: Riggs Park, VMS Installation	Site Contact: Jeremy Travis	Telephone: 703.390.0654												
Location: Riggs Park Community, Washington, DC	Client Contact: Raymond Montero	Telephone: 202.535.2294												
EPA ID No.	Prepared By: Jimmy Kehs	Date Prepared: 2/18/13												
Project No. 103S2592	Dates of Activities: Spring 2013 (HASP is not valid for periods longer than 12 months)	Emergency Response <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Objectives: TTEMI will oversee the advancement of a proposed 45 vapor mitigation systems (VMS) under the sub-slab of 45 residential properties in the Riggs Park Community of Washington, DC. </div> <div style="width: 50%;"> Site Type: <i>Check as many as applicable.</i> <table style="width: 100%; border: none;"> <tr> <td><input checked="" type="checkbox"/> Active</td> <td><input type="checkbox"/> Landfill</td> <td><input checked="" type="checkbox"/> Inner-City</td> </tr> <tr> <td><input type="checkbox"/> Inactive</td> <td><input type="checkbox"/> Railroad</td> <td><input type="checkbox"/> Rural</td> </tr> <tr> <td><input checked="" type="checkbox"/> Secured</td> <td><input checked="" type="checkbox"/> Residential</td> <td><input type="checkbox"/> Remote</td> </tr> <tr> <td><input type="checkbox"/> Unsecured</td> <td><input type="checkbox"/> Industrial</td> <td><input type="checkbox"/> Other (<i>specify</i>)</td> </tr> </table> </div> </div>			<input checked="" type="checkbox"/> Active	<input type="checkbox"/> Landfill	<input checked="" type="checkbox"/> Inner-City	<input type="checkbox"/> Inactive	<input type="checkbox"/> Railroad	<input type="checkbox"/> Rural	<input checked="" type="checkbox"/> Secured	<input checked="" type="checkbox"/> Residential	<input type="checkbox"/> Remote	<input type="checkbox"/> Unsecured	<input type="checkbox"/> Industrial	<input type="checkbox"/> Other (<i>specify</i>)
<input checked="" type="checkbox"/> Active	<input type="checkbox"/> Landfill	<input checked="" type="checkbox"/> Inner-City												
<input type="checkbox"/> Inactive	<input type="checkbox"/> Railroad	<input type="checkbox"/> Rural												
<input checked="" type="checkbox"/> Secured	<input checked="" type="checkbox"/> Residential	<input type="checkbox"/> Remote												
<input type="checkbox"/> Unsecured	<input type="checkbox"/> Industrial	<input type="checkbox"/> Other (<i>specify</i>)												
Project Scope of Work and Site Background <p>TTEMI will oversee the installation of 45 vapor mitigation systems. Prior to the installation of the VMS in each residence, TTEMI and RCP, Inc. will visit each residence for planning purposes. Each visit will be completed by a TTEMI representative and one or two members of the selected contractor. During the initial visit, the contractor representative will complete an inspection of the residence's electrical infrastructure, propose a primary and secondary location for the vapor extraction point, and note any obstructions that will impair the installation of the vapor point.</p> <p>Once the initial visit is completed and access is granted, each residence will receive a VMS system to be installed by the selected subcontractor. The VMS installation will include a subcontractor boring through the basement slab to an approximate depth of 10". Each boring will install a 4" extraction pipe which will extend to the exterior of the building through the side foundation for connection to a downspout. Additional work includes installing two stainless steel ¼" tubes that can be read with a magnahelic gauge to measure cross slab differential pressure relative to the basement, sealing visible minor cracks in foundation wall or concrete floor if applicable, installing an electric mitigation fan, completing a back-draft test to ensure back-drafting of appliances or furnaces are not occurring, and completing all electrical connections from the VMS to the residence's electrical system. All electrical work will be performed by a licensed Washington DC electrician.</p> <p>Following the damage to the fuel dispenser, tightness tests completed on the underground storage tanks (USTs) at the gasoline station confirmed the USTs failed. Subsequent subsurface investigations confirmed the release of a regulated substance from the USTs, and also confirmed the presence of gasoline-related products in the soil and groundwater in the vicinity of the service station. In addition, gasoline related impacts in groundwater were identified off-site. Because the gasoline plume impacted two separate political jurisdictions (the State of Maryland and the District), at the request of then-Councilmember Fenty, United States Environmental Protection Agency (USEPA) Region 3 assumed the lead investigatory role for the Site. In response to the off-site impacts identified in groundwater, DDOE assigned Leaking Underground Storage Tank (LUST) case number 2001071 to the facility.</p> <p>Since 1990, numerous environmental investigations, remediation and assessment activities have been completed at the Site. During the summer of 2002, as a result of a site investigation carried out by EPA Region 3 at the petroleum hydrocarbon impacted areas; perchloroethene (PCE) contamination was detected within part of the groundwater contaminant plume.</p> <p>In response to the PCE identified in the subsurface and in an effort to address the vapor intrusion risk as it relates to the PCE impacts identified, the District undertook a comprehensive evaluation of available information and data in order to produce a final remedial action plan for the Riggs Park community. Based on a review and comprehensive evaluation of the various sampling data, and the information contained within the 2010 Human Health Risk Assessment (HHRA) generated for the Riggs Park community, the District issued a final remedial action plan that recommends the installation of VMS in approximately 45 homes in the Riggs Park community.</p>														

Health and Safety Approver Comments or Additional Instructions: Ensure that the entire area has been adequately surveyed and marked for ALL utilities and that no intrusive work is conducted within the margin of error of the survey. ONLY subcontractors (i.e. drilling) that have been pre-approved by Tetra Tech and (if required) the client may be utilized. Further, subcontractors MUST complete their own HASP and provide JSA/AHAs for EACH of their assigned tasks, as well as comply with TT requirements.

Health and Safety Approver Comments or Additional Instructions:

- Ensure that the entire area has been adequately surveyed and marked for ALL utilities and that no intrusive work is conducted within the margin of error of the survey. ONLY subcontractors that have been pre-approved by Tetra Tech and (if required) the client may be utilized. Further, subcontractors MUST provide JSA/AHAs for EACH of their assigned tasks, as well as comply with TT requirements. Follow attached AHAs.
- Use safe lifting procedures when transferring supplies and equipment.
- Use only concrete coring techniques which minimize dust generation (i.e. wet methods or dust capture) and maximize capture of ALL fugitive dusts. Concrete coring may generate dust containing crystalline silica (review and address attached OSHA Fact Sheet with ENTIRE crew) PRIOR to intrusive activities. Do not eat, drink, smoke, or apply cosmetics in areas where crystalline silica dust is present. Wash your hands and face outside of dusty areas before performing any of these activities. The potential for crystalline silica exposure SHALL be characterized using industrial hygiene sampling at the FIRST THREE residence (6% of 45 residences) and the data shall be used to determine the efficacy of controls, including action levels, engineering controls and personal protective equipment.
- Have potable water on-hand for eyewash, drench, hand washing and drinking.
- Minimum PPE SHALL include: Safety glasses (AND face-shield for driller), hardhats, Nitrile gloves (leather for driller), ear plugs or muff with minimum 27 noise reduction rating (when drill is operating), Tyvek or similar long-sleeved coverall to be doffed onsite to minimize dust generation, and high-visibility vest

Health and Safety Plan Approver Signature:

Date:

Note: A minimum of two persons with appropriate training and medical surveillance must be on site for any fieldwork subject to Level 2 HASP requirements.

Note: A detailed site sketch or figure may be included on Page 10 of 12.

Initial Isolation and Protective Action Distances (for emergency response operations only):

Initial Isolation Distance: This zone should extend in all directions; 660 feet for unknown hazards and 0.5 mile for tanker truck or rail car incidents.

NOTE: Keep a maximum distance away for unknown sites until the identity of the materials is determined.

Subsequent Isolation and Protection Action Zones Based on Air Monitoring Results:

NOTE: Distance at sites with unknown hazards should be increased, if necessary, based on air monitoring results.

Investigation-Derived Waste will be stockpiled in onsite 55-gallon drums pending characterization.

Wind Speed and Direction (Approach from upwind)		Temperature (°F)	Relative Humidity (%)	Probability of Precipitation (%)	Weather Forecast (such as partly cloudy, snow, etc.)
Speed (mph):	From Direction:	A current weather forecast shall be attached to this HASP during all field operations.			

On-Site Supplies: ☐ First Aid Kit ☐ Fire Extinguisher ☐ Air Horn ☐ Oral Thermometer ☐ Noise Dosimeter

Known or Anticipated Site Hazards or Concerns: (Hazards covered by existing Safe Work Practices are listed on the next page)

<input type="checkbox"/> Work on active roadway	<input type="checkbox"/> Overhead utilities	<input checked="" type="checkbox"/> Energized electrical systems
<input type="checkbox"/> Onsite laboratory	<input checked="" type="checkbox"/> Buried Utilities	<input checked="" type="checkbox"/> Portable hand tool use
<input type="checkbox"/> Explosion or fire hazard	<input type="checkbox"/> Surface or underground storage tanks	<input type="checkbox"/> Portable electrical tool use
<input type="checkbox"/> Oxygen deficiency	<input checked="" type="checkbox"/> General slips, trips, falls	<input type="checkbox"/> Machine guarding
<input type="checkbox"/> Unknown or poorly characterized chemical hazards	<input type="checkbox"/> Uneven, muddy, rugged terrain	<input type="checkbox"/> Portable fire extinguisher use
<input type="checkbox"/> Inorganic chemicals	<input type="checkbox"/> Lift (man lift, cherry picker) use	<input type="checkbox"/> Driving commercial vehicles
<input checked="" type="checkbox"/> Organic chemicals	<input type="checkbox"/> Industrial truck (forklift) use	<input checked="" type="checkbox"/> Driving personal vehicles
<input type="checkbox"/> Chemical warfare materiel	<input type="checkbox"/> Wood or metal ladder use	<input type="checkbox"/> Scientific diving operations
<input type="checkbox"/> Compressed Gas Cylinders	<input type="checkbox"/> Dangerous goods shipped by air	<input type="checkbox"/> Injury and Illness Prevention Program (California only)
<input type="checkbox"/> Asbestos	<input type="checkbox"/> Elevated work (over 6' high)	<input type="checkbox"/> Ergonomics (California only)
<input checked="" type="checkbox"/> Respirable particulates	<input checked="" type="checkbox"/> Heavy equipment use or operation	<input type="checkbox"/> Work in strip or shaft mines
<input checked="" type="checkbox"/> Respirable silica	<input checked="" type="checkbox"/> Construction work	<input type="checkbox"/> Client-specific safety requirements (attach to HASP)
<input type="checkbox"/> Blasting and explosives	<input type="checkbox"/> Excavation or trenching	<input type="checkbox"/> ATV use
<input type="checkbox"/> Non-ionizing radiation (lasers, radiofrequencies, UV)	<input type="checkbox"/> Benching, shoring, bracing	<input type="checkbox"/> Methamphetamine lab
<input type="checkbox"/> Ionizing radiation (alpha, beta, gamma, etc.)	<input type="checkbox"/> Scaffold use	<input type="checkbox"/> Working over or near water
<input type="checkbox"/> Heat stress	<input checked="" type="checkbox"/> High noise	<input type="checkbox"/> Mold
<input type="checkbox"/> Cold stress	<input type="checkbox"/> Grinding operations	<input type="checkbox"/> Other (insert)

Explosion or Fire Potential: ☐ High ☐ Medium ☒ Low ☐ Unknown

Chemical Products Tetra Tech EM Inc. Will Use or Store On Site: (Attach a Material Safety Data Sheet [MSDS] for each item.)

- | | | | |
|--|---|--|--|
| <input type="checkbox"/> Alconox or Liquinox | <input type="checkbox"/> Calibration gas (Methane) | <input type="checkbox"/> Hydrogen gas | <input type="checkbox"/> Isopropyl alcohol |
| <input type="checkbox"/> Hydrochloric acid (HCl) | <input checked="" type="checkbox"/> Calibration gas (Isobutylene) | <input type="checkbox"/> Household bleach (NaOCl) | <input type="checkbox"/> HazCat Kit |
| <input type="checkbox"/> Nitric acid (HNO ₃) | <input type="checkbox"/> Calibration gas (Pentane) | <input type="checkbox"/> Sulfuric acid (H ₂ SO ₄) | <input type="checkbox"/> Mark I Kits (<i>number?</i>) _____ |
| <input type="checkbox"/> Sodium hydroxide (NaOH) | <input type="checkbox"/> Calibration gas (4-gas mixture) | <input type="checkbox"/> Hexane | <input checked="" type="checkbox"/> Other (<i>specify</i>) <u>Eyewash</u>
(potable water) _____ |

WARNING: Eyewash solution shall be readily available on ALL projects where corrosives (acids or bases) are used, including sample preservatives

Applicable Safety Programs and Safe Work Practices (SWP). Attach to HASP:

- ☐ DCN 4-03 Demolition and Decontamination
- ☒ DCN 4-05 Trenching and Excavation Safety
- ☐ DCN 4-08 Asbestos Protection Program
- ☐ DCN 4-09 Haulage and Earth Moving
- ☐ DCN 4-10 Lead Protection Program
- ☒ SWP DCN 5-01 General Safe Work Practices
- ☒ SWP DCN 5-02 General Safe Work Practices HAZWOPER
- ☐ SWP DCN 5-03 Safe Work Practices for Office Employees
- ☐ SWP DCN 5-04 Safe Drilling Practices
- ☒ SWP DCN 5-05 Safe Direct Push (GeoProbe) Practices
- ☐ SWP DCN 5-06 Working Over or Near Water
- ☒ SWP DCN 5-07 Use of Heavy Equipment
- ☐ SWP DCN 5-08 Special Site Hazards (Firearms, Remote Sites, Mines, aircraft, etc.)
- ☒ SWP DCN 5-09 Safe Electrical Work Practices
- ☒ SWP DCN 5-10 Fall Protection Practices
- ☒ SWP DCN 5-11 Portable Ladder Safety
- ☐ SWP DCN 5-12 Drum and Container Handling Practices
- ☒ SWP DCN 5-13 Flammable Hazards and Ignition Sources
- ☐ SWP DCN 5-14 Spill and Discharge Control Practices
- ☐ SWP DCN 5-15 Heat Stress
- ☐ SWP DCN 5-16 Cold Stress
- ☐ SWP DCN 5-17 Biohazards
- ☐ SWP DCN 5-18 Underground Storage Tank Removal Practices
- ☒ SWP DCN 5-19 Safe Lifting Procedures
- ☐ SWP DCN 5-22 Hydrographic Data Collection
- ☐ SWP DCN 5-23 Permit-Required Confined Space Entry Practices
- ☐ SWP DCN 5-24 Non-Permit-Required Confined Space Entry Practices
- ☒ SWP DCN 5-26 Prevention of Sun Exposure
- ☐ SWP DCN 5-27 Respirator Cleaning Practices
- ☐ SWP DCN 5-28 Safe Use Practices for Use of Respirators
- ☐ SWP DCN 5-29 Respirator Qualitative Fit Testing Procedures

Tasks Performed At Job Site that are NOT Covered by SWPs

NOTE: Many AHA's can be found on the Health & Safety intranet site at:
<http://home.ttemi.com/C18/Activity%20Hazard%20Analysis%20Docum/default.aspx>

Attach Activity Hazard Analysis (AHA) for each non-covered task

- ☒ Sampling of indoor and ambient air
- ☒ Observation of Drill Rig or Heavy Equipment
- ☒ Sub Slab Depressurization System Installation and Operation
- ☒ Residential Inventory Assessment
- ☒ Personal and Ambient Air Sampling

Tetra Tech Employee Training and Medical Requirements:
Basic Training and Medical

- ☒ Initial 40 Hour Training
- ☒ 8-Hour Supervisor Training (one-time)
- ☒ Current 8-Hour Refresher Training
- ☐ Current Medical Clearance (including respirator use)
- ☒ Current First Aid Training
- ☒ Current CPR Training
- ☐ Current Respirator Fit-Test

Other Specific Training and Medical Surveillance Requirements

- ☐ Confined Space Training
- ☐ Level A Training
- ☐ Radiation Training
- ☐ OSHA 10-hour Construction Safety Training
- ☐ OSHA 30-hour Construction Safety Training
- ☐ Asbestos Awareness Training
- ☐ Asbestos B-Reader X-Ray
- ☐ Blood Lead Level and ZPP Pre, during and Post-Project
- ☐ Urinary Arsenic Level Pre and Post-Project
- ☐ Other _____
- ☐ Other _____

Materials Present or Suspected at Site	Highest Observed Concentration (specify units and sample medium)	Exposure Limit (specify ppm or mg/m ³)	IDLH Level (specify ppm or mg/m ³)	Primary Hazards of the Material (explosive, flammable, corrosive, toxic, volatile, radioactive, biohazard, oxidizer, or other)	Symptoms and Effects of Acute Exposure	Photoionization Potential (eV)
Benzene	Unknown	PEL = 1 ppm REL = TLV = [Skin] Hazard <input checked="" type="checkbox"/>	500 ppm CARC	Flammable, Toxic; ; potential occupational carcinogen	Severe irritant (skin, eye); reproductive toxin, CNS narcotic	9.24
Toluene	Unknown	PEL = 100 ppm REL = TLV = [Skin] Hazard <input checked="" type="checkbox"/>	500 ppm	Flammable, Toxic	Severe irritant (skin, eye); reproductive toxin, CNS narcotic, fatigue, weakness, dizziness, headache	8.82
Ethyl Benzene	Unknown	PEL = 100 ppm REL = TLV = [Skin] Hazard <input checked="" type="checkbox"/>	800 ppm	Flammable	Severe irritant (skin, eye, mucous membranes), headache, narcosis	8.76
Xylenes (ortho, meta, para)	Unknown	PEL = 100 ppm REL = TLV = [Skin] Hazard <input checked="" type="checkbox"/>	900 ppm	Flammable, Toxic	Irritant (skin, eye, throat), reproductive toxin, CNS narcotic	8.44-8.56
Perchloroethene (PCE)	Unknown	PEL = 0.5 mg/m ³ REL = 0.5 mg/m ³ TLV = [Skin] Hazard <input checked="" type="checkbox"/>	2.5 0.5 mg/m ³	Non Combustible Solid	irritation eyes, nose, throat; sneezing, cough; lassitude (weakness, exhaustion), anorexia, weight loss; sweating; headache, dizziness; nausea, vomiting; dyspnea (breathing difficulty), chest pain; high fever; dermatitis	N/A
Silica Crystalline	Unknown	PEL = Calculated post sampling REL = CARC 0.05 mg/m ³ TLV = 0.025 mg/m ³ [Skin] Hazard <input type="checkbox"/>	25 mg/m ³ CARC	Irritant; potential occupational carcinogen	Cough, dyspnea (breathing difficulty), wheezing; decreased pulmonary function, progressive respiratory symptoms (silicosis); irritation eyes; [potential occupational carcinogen]	ND

Specify Information Sources: NIOSH Pocket Guide to Hazardous Chemicals, September 2005 and American Conference of Governmental Industrial Hygienists (ACGIH). "Threshold Limit Values and Biological Exposure Indices for 2012."

Note: In the Exposure Limit column, include Ceiling (C) and Short-Term Exposure Limits (STEL) if they are available. Also, use the following short forms and abbreviations to complete the table above.

A = Air
CARC = Carcinogenic
eV = Electron volt
U = Unknown

IDLH = Immediately dangerous to life or health
mg/m³ = Milligram per cubic meter
NA = Not available
NE = None established

PEL = Permissible exposure limit
ppm = Part per million
REL = Recommended exposure limit
S = Soil

TLV = Threshold limit value

Note: If no contingency level of protection is selected, all employees covered under this plan must evacuate the immediate site area if air contaminant levels require upgrading PPE. Level A field work requires a Level 3 HASP. This information is available on the chemical hazards page of this HASP.

Field Activities Covered Under this HASP:

Task Description	Level of Protection ¹		Date of Activities
	Primary	Contingency	
1 Oversight of VMS Initial Site Visit	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input checked="" type="checkbox"/> D	Level C is NOT authorized	2/13 to 2/14
2 Oversight of VMS Installation	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input checked="" type="checkbox"/> D	Level C is NOT authorized	2/13 to 2/14
3 Crystalline Silica sampling (first three residences)	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input checked="" type="checkbox"/> D	Level C is NOT authorized	2/13 to 2/14
4	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D	
5	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D	

Site Personnel and Responsibilities (include subcontractors):

Employee Name and Office Code / Location	Task(s)	Responsibilities
Jeremy Travis, Reston, VA	1, 2	<ul style="list-style-type: none"> Project Manager: Manages the overall project, makes site safety coordinator (SSC) aware of pertinent project developments and plans, and maintains communications with client as necessary. Additionally, For projects lasting longer than one consecutive week on-site, the PM is responsible for conducting one field audit using Form AF-1.
Jeremy Travis, Reston, VA	1, 2	<ul style="list-style-type: none"> Field Team Leader: Directs field activities, makes site safety coordinator (SSC) aware of pertinent project developments and plans, and maintains communications with the Project Manager and the client as necessary
Jeremy Travis, Reston, VA	1, 2	<ul style="list-style-type: none"> Site Safety Coordinator (SSC): Ensures that appropriate personal protective equipment (PPE) is available, enforces proper use of PPE by on-site personnel and subcontractors; suspends investigative work if personnel are or may be exposed to an immediate health hazard; implements and enforces the HASP; identifies and controls site hazards when possible; communicates site hazards to all personnel; and reports any deviations observed from anticipated conditions described in the health and safety plan to the health and safety representative.
Jimmy Kehs, Reston, VA	1, 2	<ul style="list-style-type: none"> Alternate Site Safety Coordinator (if any)
Jimmy Kehs, Reston, VA		
Jeremy Travis, Reston, VA	1, 2	<ul style="list-style-type: none"> Field Personnel: Completes tasks as directed by the project manager, field team leader, and SSC, and follows the HASP and all SWPs and guidelines established in the Tetra Tech, Inc., Health and Safety Manual.
RCP, Inc. TBD	1, 2	<ul style="list-style-type: none"> Tetra Tech-hired subcontractor personnel on site (a subcontract SSC MUST be identified by name): Completes tasks as outlined in the project scope of work in accordance with the contract. Participates in all Tetra Tech on-site safety meetings and follows all procedures and guidelines established in this HASP, as well as the company health and safety plan and program.

Note:

1. See next page for details on levels of protection

NOTE: Contingency level of protection section should be completed only if the upgraded level of protection is immediately available at the job site. If no contingency level of protection is denoted, all employees covered under this HASP must evacuate the immediate site area if air contaminant levels would require an upgrade of PPE.

Protective Equipment: (Indicate type or material as necessary for each task.)

Tas k	Primary Level of Protection (A,B,C,D)	PPE Component Description (Primary)	Contingency Level of Protection (A, B, C, D)	PPE Component Description (Contingency)
1	D	Respirator type: Not needed Cartridge type (if applicable): CPC material: Not needed Glove material(s): Nitrile, Surgical Boot material: Steel-toe, Steel-shank Other: Safety Glasses, Hard Hat, First Aid Kit, Overboots, Portable Eyewash, Ear Plugs as needed, safety vest	N/A	Level C is NOT authorized. If monitoring results indicate or conditions warrant, evacuate the area and notify the PM and RSO immediately.
2	D	Respirator type: Not needed Cartridge type (if applicable): CPC material: Not needed Glove material(s): Nitrile, Surgical Boot material: Steel-toe, Steel-shank Other: Safety Glasses, Hard Hat, First Aid Kit, Overboots, Portable Eyewash, Ear Plugs as needed, safety vest	N/A	Level C is NOT authorized. If monitoring results indicate or conditions warrant, evacuate the area and notify the PM and RSO immediately.
3	D	Respirator type: Not needed Cartridge type (if applicable): CPC material: Not needed Glove material(s): Nitrile, Surgical Boot material: Steel-toe, Steel-shank Other: Safety Glasses, Hard Hat, First Aid Kit, Overboots, Portable Eyewash, Ear Plugs as needed, safety vest	N/A	Level C is NOT authorized. If monitoring results indicate or conditions warrant, evacuate the area and notify the PM and RSO immediately.
4		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other:		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other:
5		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other:		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other:

Respirator Notes:

Respirator cartridges may only be used for a maximum time of 8 hours or one work shift, whichever is less, and must be discarded at that time. For job sites with organic vapors, respirator cartridges may be used as described in this note as long as the concentration is less than 200 parts per million (ppm), the boiling point is greater than 70 °Celsius, and the relative humidity is less than 85 percent. If any of these levels are exceeded, a site-specific respirator cartridge change-out schedule must be developed and included in the HASP using Tetra Tech Form RP-2 (Respiratory Hazard Assessment Form)

Notes:

All levels of protection must include eye, head, and foot protection.

CPC = Chemical protective clothing

Thermoluminescent Dosimeter (TLD) Badges must be worn during all field activities on sites with radiation hazards. TLDs must be worn under CPC.

Monitoring Equipment: All monitoring equipment on site must be calibrated before and after each use and results recorded in the site logbook				
Instrument (Check all required)	Task	Instrument Reading	Action Guideline	Comments
<input type="checkbox"/> Combustible gas indicator model:	<input type="checkbox"/> 1	0 to 10% LEL	Monitor; evacuate if confined space	
	<input type="checkbox"/> 2			
	<input type="checkbox"/> 3	10 to 25% LEL	Potential explosion hazard; notify SSC	
	<input type="checkbox"/> 4			
	<input type="checkbox"/> 5	>25% LEL	Explosion hazard; interrupt task; evacuate site; notify SSC	
<input type="checkbox"/> Oxygen meter model:	<input type="checkbox"/> 1	>23.5% Oxygen	Potential fire hazard; evacuate site	
	<input type="checkbox"/> 2			
	<input type="checkbox"/> 3	23.5 to 19.5% Oxygen	Oxygen level normal	
	<input type="checkbox"/> 4			
	<input type="checkbox"/> 5	<19.5% Oxygen	Oxygen deficiency; interrupt task; evacuate site; notify SSC	
<input checked="" type="checkbox"/> Photoionization detector model: <input type="checkbox"/> 11.7 eV <input checked="" type="checkbox"/> 10.6 eV <input type="checkbox"/> 10.2 eV <input type="checkbox"/> 9.8 eV <input type="checkbox"/> Other (specify): _____	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5	Any response above background to 0.5 ppm above background	Level C is NOT authorized	1. Use Level D PPE, 2. Obtain initial and periodic background (BG) levels, monitor source areas (such as open excavations, DPT boreholes and concrete core holes or saw cuts) using PID, 3. If PID readings above of 0.5 ppm or more above BG are observed at a source area, monitor worker breathing zone (BZ) areas, 4. If BZ readings exceed 1 ppm for more than 3 minutes, evacuate the area, retreat upwind to a safe area (where BG levels exist) and allow work area to ventilate to OUTDOORS using mechanical means (fans, pumps) if possible. Alternately, (see below) if a chemical-specific means of monitoring for benzene is available, such as Drager tube (tube 6728561) or benzene-specific PID, use of them to confirm or the presence or absence of benzene. 5. Re-approach work area while monitoring with PID. If BG levels have been regained in the BZ, resume work and continue monitoring. 6. If BZ readings remain above BG, retreat upwind and contact Health and Safety for further direction.
<input checked="" type="checkbox"/> Other (specify): If available, use benzene-specific Drager tube (such as 6728561) with a lower detection limit of AT LEAST 0.5 ppm	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5	Specify: Benzene-specific Drager tube (such as 6728561) with a lower detection limit of AT LEAST 0.5 ppm	Specify: Any discernible color change	If available
<input checked="" type="checkbox"/> Other (specify): UltraRAE or similar benzene-specific PID (if available)	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5	Specify: 0.5 to 250 ppm benzene reading >250 ppm	Specify: Level C Evacuate; notify SSC	If available

Notes:

eV= electron volt

LEL=Lower explosive limit

mrem=Millirem

PEL=Permissible exposure limit

ppm=Part per million

a. Level B is required when chemical hazards are present, but are uncharacterized. Level C may be acceptable for certain tasks in some situations. If you are uncertain, consult your RSO.

Project-Specific Industrial Hygiene Requirements	Emergency Contacts: Telephone No.																																										
OSHA-Regulated Chemicals*: <i>Check any present on the job site in any medium (air, water, soil)</i> <ul style="list-style-type: none"> <input type="checkbox"/> No chemicals below are located on the job site <input type="checkbox"/> Friable Asbestos <input checked="" type="checkbox"/> Silica, crystalline <input type="checkbox"/> alpha-Naphthylamine <input type="checkbox"/> Methyl chloromethyl ether <input type="checkbox"/> 3,3'-Dichlorobenzidine (and its salts) <input type="checkbox"/> bis-Chloromethyl ether <input type="checkbox"/> beta-Naphthylamine <input type="checkbox"/> Benzidine <input type="checkbox"/> 4-Aminodiphenyl <input type="checkbox"/> Ethyleneimine <input type="checkbox"/> beta-Propiolactone <input type="checkbox"/> 2-Acetylaminoflourene <input type="checkbox"/> 4-Dimethylaminoazobenzene <input type="checkbox"/> N-nitrosomethylamine <input type="checkbox"/> Vinyl chloride <input type="checkbox"/> Inorganic arsenic <input type="checkbox"/> Lead <input type="checkbox"/> Chromium (VI) <input type="checkbox"/> Cadmium <input checked="" type="checkbox"/> Benzene <input type="checkbox"/> Coke oven emissions <input type="checkbox"/> 1,2-Dibromo-3-chloropropane <input type="checkbox"/> Acrylonitrile <input type="checkbox"/> Ethylene oxide <input type="checkbox"/> Formaldehyde <input type="checkbox"/> Methylenedianiline <input type="checkbox"/> 1,3-Butadiene <input type="checkbox"/> Methylene chloride <p style="margin-top: 10px;">* NOTE: Many states, including California and New Jersey, have chemical-specific worker protection requirements and standards for many chemicals and known or suspected carcinogens.</p>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">WorkCare and Incident Intervention</td> <td style="width: 30%; text-align: right;">888.449.7787, or 800.455.6155</td> </tr> <tr> <td>Tetra Tech EMI 24-hour Anonymous Hazard Reporting Line</td> <td style="text-align: right;">866.383.8070</td> </tr> <tr> <td>U.S. Coast Guard National Response Center</td> <td style="text-align: right;">800.424.8802</td> </tr> <tr> <td>InfoTrac</td> <td style="text-align: right;">800.535.5053</td> </tr> <tr> <td>Poison Control</td> <td style="text-align: right;">800.222.1222</td> </tr> <tr> <td>Fire department</td> <td style="text-align: right;">911 or 202.727.9000</td> </tr> <tr> <td>Police department</td> <td style="text-align: right;">911 or 202.727.9099</td> </tr> </table> Personnel Call-Down List: <table style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr> <th style="width: 35%;">Job Title or Position:</th> <th style="width: 30%;">Name</th> <th style="width: 35%;">Cell Phone:</th> </tr> </thead> <tbody> <tr> <td>Regional Safety Officer</td> <td>Chris Draper</td> <td style="text-align: right;">615-969-1334</td> </tr> <tr> <td>Project Manager:</td> <td>Jeremy Travis</td> <td style="text-align: right;">703-472-1109</td> </tr> <tr> <td>Field Team Leader:</td> <td>Jeremy Travis</td> <td style="text-align: right;">703-472-1109</td> </tr> <tr> <td>Site Safety Coordinator (SSC):</td> <td>Jeremy Travis</td> <td style="text-align: right;">703-472-1109</td> </tr> <tr> <td>Subcontractor SSC:</td> <td>TBD</td> <td></td> </tr> </tbody> </table> Medical and Site Emergencies: <p style="margin-top: 10px;">Signal a site or medical emergency with three blasts of a loud horn (car horn, fog horn, or similar device). Site personnel should evacuate to the area of safe refuge designated on the site map.</p> <table style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 30%;">Hospital Name:</td> <td>Providence Hospital</td> </tr> <tr> <td>Address:</td> <td>1150 Varnum Street, NE, Washington, DC 20017-2180</td> </tr> </table> <table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 60%;">General Phone:</td> <td style="text-align: right;">202.269.7135</td> </tr> <tr> <td>Emergency Phone:</td> <td style="text-align: right;">911 or 202.269.7001</td> </tr> <tr> <td>Ambulance Phone:</td> <td style="text-align: right;">911</td> </tr> </table> <p>Hospital called to verify emergency services are offered? YES <input checked="" type="checkbox"/> NO <input type="checkbox"/></p> <p>Step-by-step Route to Hospital: (see Page 11 of 12 for route map)</p>	WorkCare and Incident Intervention	888.449.7787, or 800.455.6155	Tetra Tech EMI 24-hour Anonymous Hazard Reporting Line	866.383.8070	U.S. Coast Guard National Response Center	800.424.8802	InfoTrac	800.535.5053	Poison Control	800.222.1222	Fire department	911 or 202.727.9000	Police department	911 or 202.727.9099	Job Title or Position:	Name	Cell Phone:	Regional Safety Officer	Chris Draper	615-969-1334	Project Manager:	Jeremy Travis	703-472-1109	Field Team Leader:	Jeremy Travis	703-472-1109	Site Safety Coordinator (SSC):	Jeremy Travis	703-472-1109	Subcontractor SSC:	TBD		Hospital Name:	Providence Hospital	Address:	1150 Varnum Street, NE, Washington, DC 20017-2180	General Phone:	202.269.7135	Emergency Phone:	911 or 202.269.7001	Ambulance Phone:	911
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Note: This page must be posted on site.

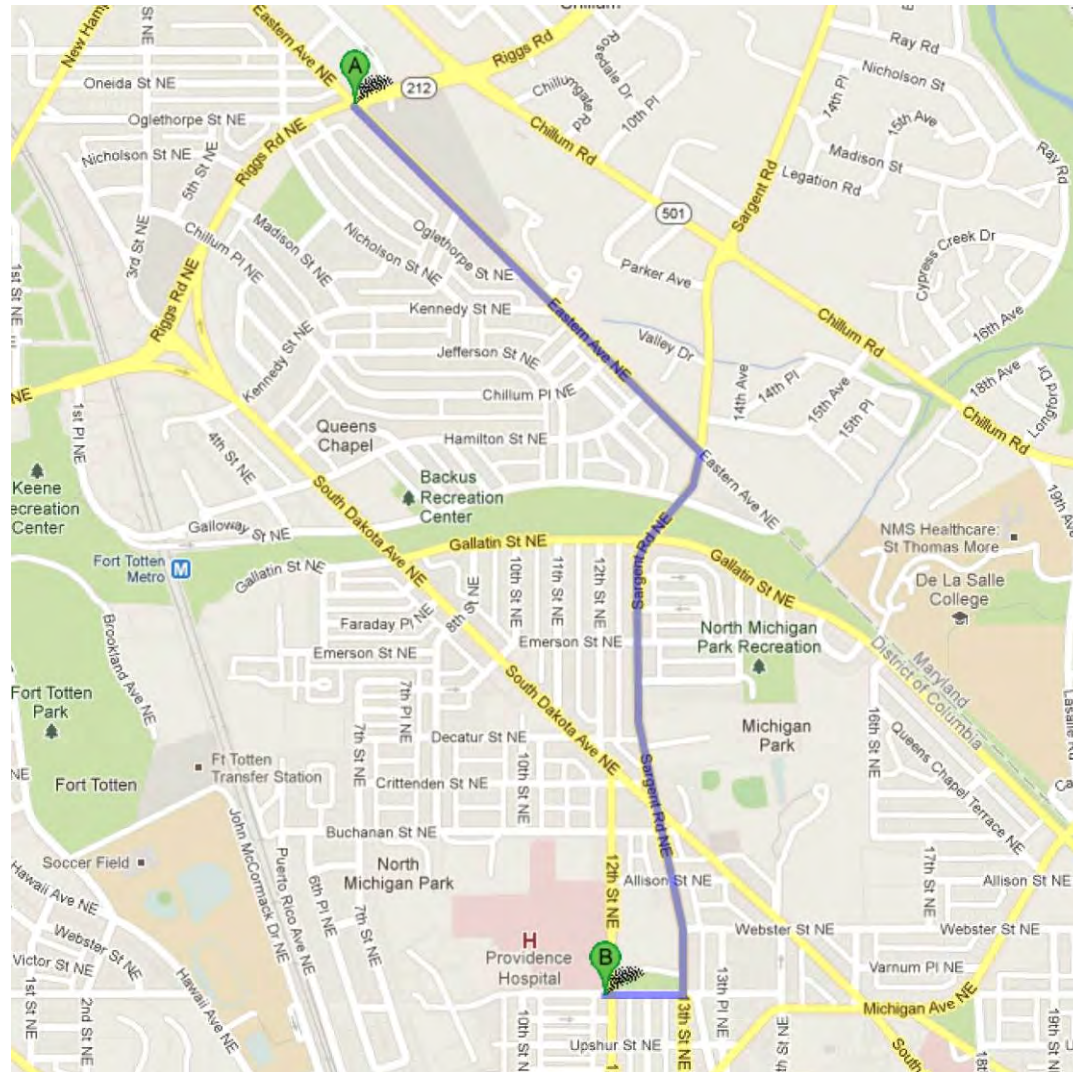
Decontamination Procedures		Emergency Response Planning
<p>The site safety coordinator oversees implementation of project decontamination procedures and is responsible for ensuring they are effective.</p>		<p>During the pre-work briefing and daily tailgate safety meetings, all on-site employees will be trained in the provisions of emergency response planning, site communication systems, and site evacuation routes.</p>
<p>Personnel Decontamination</p> <p>Level D Decon - <input type="checkbox"/> Wet <input checked="" type="checkbox"/> Dry</p> <p>Level C Decon - <input type="checkbox"/> Wet <input type="checkbox"/> Dry</p> <p>Level B Decon – Briefly outline the level B decontamination methods to be used on a separate page attached to this HASP.</p> <p>Level A Decon – A Level 3 HASP is required. Notify your regional health and safety representative and health and safety director.</p> <p>Equipment Decontamination</p> <p>All tools, equipment, and machinery from the Exclusion Zone (hot) or Contamination Reduction Zone (warm) are decontaminated in the CRZ before they are removed to the Support Zone (cold). Equipment decontamination procedures are designed to minimize the potential for hazardous skin or inhalation exposure, cross-contamination, and chemical incompatibilities.</p> <p>Respirator Decontamination</p> <p>Respirators are decontaminated in compliance with SWP 5-27 and should be included with this HASP.</p> <p>Waste Handling for Decontamination</p> <p>Procedures for decontamination waste disposal meet all applicable local, state, and federal regulations.</p>	<p>Decontamination Equipment</p> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input type="checkbox"/> Washtubs <input type="checkbox"/> Buckets <input type="checkbox"/> Scrub brushes <input type="checkbox"/> Pressurized sprayer <input type="checkbox"/> Detergent [Type] <input type="checkbox"/> Solvent [Type] <input type="checkbox"/> Household bleach solution Concentration/Dilution: _____ </div> <div style="width: 50%;"> <input type="checkbox"/> Deionized water <input type="checkbox"/> Disposable sanitizer wipes <input type="checkbox"/> Facemask sanitizer powder <input type="checkbox"/> Wire brush <input checked="" type="checkbox"/> Spray bottle <input type="checkbox"/> Tubs / pools <input type="checkbox"/> Banner/barrier tape <input checked="" type="checkbox"/> Plastic sheeting <input type="checkbox"/> Tarps and poles <input checked="" type="checkbox"/> Trash bags <input type="checkbox"/> Trash cans <input type="checkbox"/> Duct tape <input checked="" type="checkbox"/> Paper towels <input type="checkbox"/> Folding chairs <input type="checkbox"/> Other </div> </div>	
<p>In the event of an emergency that necessitates evacuation of a work task area or the site, the following procedures will take place.</p> <ul style="list-style-type: none"> • The Tetra Tech SSC will contact all nearby personnel using the on-site communications to advise the personnel of the emergency. • The personnel will proceed along site roads to a safe distance upwind from the hazard source. • The personnel will remain in that area until the SSC or an authorized individual provides further instructions. <p>In the event of a severe spill or a leak, site personnel will follow the procedures listed below.</p> <ul style="list-style-type: none"> • Evacuate the affected area and relocate personnel to an upwind location. • Inform the Tetra Tech SSC, a Tetra Tech office, and a site representative immediately. • Locate the source of the spill or leak, and stop the flow if it is safe to do so. • Begin containment and recovery of spilled or leaked materials. • Notify appropriate local, state, and federal agencies. <p>In the event of severe weather, site personnel will follow the procedures listed below.</p> <ul style="list-style-type: none"> • Site work shall not be conducted during severe weather, including high winds and lightning. • In the event of severe weather, stop work, lower any equipment (drill rigs) and evacuate the affected area. • Severe weather may cause heat or cold stress. Refer to SWPs 5-15 and 5-16 for information on both. <p>All work-related incidents must be reported. According to TtEMI's reporting procedures, for non-emergency incidents you should:</p> <ul style="list-style-type: none"> • Notify WorkCare and Incident Intervention at 888.449.7787, or 800.455.6155 • Notify your Project Manager or Regional Safety Officer (RSO) via phone immediately. • Complete a "Tetra Tech Incident Report" (Form IR) within 24 hours and send it to your RSO. If an injury or illness has occurred, the Form IR-A and the WorkCare HIPAA form must be completed at the same time the Form IR is completed. 		

Site Map (May be drawn after crews arrive onsite or inserted using aerial photographs, site figures, etc.):



Hospital Route Map (attach or insert):

Providence Hospital, 1150 Varnum Street Northeast, Washington, DC 20017. Head southeast on Eastern Avenue toward 8th Street NE (0.7 mile). Turn right onto Sargent Road NE (0.7 mile). Continue onto 13th Street NE (0.1 mile). Turn right onto Varnum Street NE (0.1 mile). Destination will be on the right.



Note: A dry-run should be conducted to establish a physical location associated with the map included in the HASP. Verbal verification from the hospital emergency room should also be obtained to ensure that the hospital will accept chemically contaminated patients.

APPROVAL AND SIGN-OFF FORM

Project No.: _____

I have read, understood, and agree with the information set forth in this Health and Safety Plan and will follow the direction of the Site Safety Coordinator (SSC) as well as procedures and guidelines established in the Tetra Tech, Inc., Health and Safety Manual. I understand the training and medical requirements for conducting field work and have met these requirements.

Tetra Tech has prepared this plan solely for the purpose of the health and safety protection of Tetra Tech employees. Subcontractors, visitors, and others at the site, while required to read and follow the provisions outlined in this plan at a minimum, should refer to their safety program for specific information related to their health and safety protection.

Name	Company / Agency / Organization	Signature	Date

I have read, understood, and agree with the information set forth in this Health and Safety Plan and comply with and will enforce this HASP, as well as procedures and guidelines established in the Tetra Tech, Inc., Health and Safety Manual.

Name	Project-Specific Position	Signature	Date
Jeremy Travis, Reston, TN	Project Manager		
Jeremy Travis, Reston, VA	Field Team Leader		
Jeremy Travis, Reston, VA	Site Safety Coordinator		
RCP, Inc. TBD	Subcontractor SSC		

Tetra Tech has prepared this plan solely for the purpose of the health and safety protection of Tetra Tech employees. Subcontractors, visitors, and others at the site, while required to read, acknowledge and follow the provisions outlined in this plan at a minimum, should refer to their safety program for specific information related to health and safety.

Note: Use Additional sheets as necessary to ensure that all personnel sign and affirm this document.

VOLUNTARY PROTECTION PROGRAM



Management Leadership

Lead by example. Good managers recognize the benefits of a strong safety program and ensure that their personnel and subcontractors have the right tools, equipment, and attitude to work safely.

Some areas where effective management leadership for safety can be demonstrated include:

- Provide visible safety leadership - start meetings with a safety topic, integrate safety into planning, scheduling, and budgeting processes, take personal action to resolve safety issues.
- Become involved in incident reporting, investigation, corrective action - share lessons learned.
- Include subcontractors in your safety program and oversee their work.

Employee Involvement

Get involved! Take personal action and work directly with your supervisor daily to identify, control, or eliminate potential safety hazards.

Other ways to become involved in the safety program and improve work conditions include:

- Initiate hazard reports to identify hazards, suggest improvements, and recognize safe behaviors
- Participate in safety meetings and worksite safety inspections (daily, weekly, monthly, and quarterly)
- Participate in incident reports, investigations, corrective actions, and Lessons Learned

Worksite Analysis

The process of identifying and evaluating potential hazards is a critical element in achieving zero incidents and creating low risk and hazard-free work areas.

Worksite analysis methods used to identify and evaluate potential hazards include:

- Safety inspections (daily, weekly, monthly, and quarterly)
- Develop or review safe work procedures, AHAs, and the HASP
- Monitoring for air quality, heat stress, noise, ergonomics and other job hazards

Hazard Prevention and Control

Eliminating hazards from your job, preventing new hazards, and controlling known hazards are fundamental parts of the projects safety program.

Important points include:

- Control hazards by:
 - Installing and maintaining **Engineering Controls**
 - Following **Administrative/Work Practice Controls** (HASP, AHAs, and safe work practices)
 - Specifying and wearing **Personal Protective Equipment** where needed
- Perform integrated safety reviews for new or modified work tasks
- Consult with qualified medical and safety professionals as needed

Safety and Health Training

Effective safety training is an important element in incident prevention. Remember, if you are unfamiliar with the work or feel that you don't have the necessary training, speak up and notify your team leader or project manager.

Safety training methods that may be used at the project include:

- New employee orientation, including HASP and task-specific training
- Project meetings, daily briefings, and/or task briefings
- Lessons learned and monthly safety communications

Emergency Contacts

WorkCare - For issues requiring an Occupational Health Physician; assistance is available 24 hours per day, 7 days per week.

InfoTrac - For issues related to incidents involving the transportation of hazardous chemicals; this hotline provides accident assistance 24 hours per day, 7 days per week

U.S. Coast Guard National Response Center - For issues related to spill containment, cleanup, and damage assessment; this hotline will direct spill information to the appropriate state or region

Poison Control Center – For known or suspected poisoning.

Limitations:

The Level-Two HASP is not appropriate in some cases:

- Projects involving unexploded ordnance (UXO), radiation sources as the primary hazard, or known chemical/biological weapons site must employ the Level 3 HASP
- Projects of duration longer than 90 days may need a Level 3 HASP (consult your RSO)

Decontamination:

Decontamination Solutions for Chemical and Biological Warfare Agents^a: PPE and equipment can be decontaminated using 0.5 percent bleach (1 gallon laundry bleach to 9 gallons water) for biological agents (15 minutes of contact time for anthrax spores; 3 minutes for others) followed by water rinse for chemical and biological agents. In the absence of bleach, dry powders such as soap detergents, earth, and flour can be used. The powders should be applied and then wiped off using wet tissue paper. Finally, water and water/soap solutions can be used to physically remove or dilute chemical and biological agents. Do not use bleach solution on bare skin; use soap and water instead. Protect decontamination workers from exposure to bleach.

Decontamination for Radiological and Other Chemicals: Primary decontamination should use Alconox and water unless otherwise specified in chemical specific information resources. The effectiveness of radiation decontamination should be checked using a radiation survey instrument. Decontamination procedures should be repeated until the radiation meter reads less than 100 counts per minute over a 100-square-centimeter area when the probe is held 1 centimeter from the surface and moving slower than 2.5 centimeters per second.

Decontamination Corridor: The decontamination setup can be adjusted to meet the needs of the situation. The decontamination procedures can be altered to meet the needs of the specific situation when compound- and site-specific information is available.

Decontamination Waste: All disposable equipment, clothing, and decontamination solutions will be double-bagged or containerized in an acceptable manner and disposed of with investigation-derived waste.

Decontamination Personnel: Decontamination personnel should dress in the same level of PPE or one level below the entry team PPE level.

All investigation-derived waste should be left on site with the permission of the property owner and the EPA on-scene coordinator. In some instances, another contractor will dispose of decontamination waste and investigation-derived waste. DO NOT place waste in regular trash. DO NOT dispose of waste until proper procedures are established.

Notes:

^a Source: Jane's Information Group. 2002. *Jane's Chem-Bio Handbook*. Page 39.



TETRA TECH, INC.
DAILY TAILGATE SAFETY MEETING FORM

Date: _____ Time: _____ Project No.: _____

Client: _____ Site Location: _____

Site Activities Planned for Today: _____

Weather Conditions: _____

Safety Topics Discussed	
Protective clothing and equipment:	
Chemical and physical hazards:	
Emergency procedures:	
Equipment hazards:	
Other:	
Attendees	
Printed Name	Signature

Meeting Conducted by:

Name

Signature



TETRA TECH EM INC.
HEALTH AND SAFETY PLAN AMENDMENT

Site Name: _____

Amendment Date: _____

Purpose or Reason for Amendment: _____

Required Additional Safe Work Practices or Activity Hazard Analyses: _____

Required Changes in PPE: _____

Action Level Changes: _____

AMENDMENT APPROVAL

RSO or Designee	_____	_____	_____
	Name	Signature	Date

Site Safety Coordinator	_____	_____	_____
	Name	Signature	Date

Date presented during daily site safety meeting: _____



TETRA TECH, INC.
FIELD AUDIT CHECKLIST

Project Name: _____ Project No.: _____

Field Location: _____ Completed by: _____

Project Manager: _____ Site Safety Coordinator: _____

General Items		In Compliance?		
Health and Safety Plan Requirements		Yes	No	NA
1	Approved health and safety plan (HASP) on site or available			
2	Names of on-site personnel recorded in field logbook or daily log			
3	HASP compliance agreement form signed by all on-site personnel			
4	Material Safety Data Sheets on site or available			
5	Designated site safety coordinator physically present on jobsite			
6	Daily tailgate safety meetings conducted and documented on Form HST-2			
7	Documentation available proving compliance with HASP requirements for medical examinations, fit testing, and training (including subcontractors)			
8	HASP onsite matches scope of work being conducted			
9	Emergency evacuation plan in place and hospital located			
10	Exclusion, decontamination, and support zones delineated and enforced			
11	HASP attachments present onsite (VPP sheet, audit checklist, AHA, etc.)			
12	Illness and injury prevention program reports completed (California only)			
Emergency Planning				
13	Emergency telephone numbers posted			
14	Emergency route to hospital posted			
15	Local emergency providers notified of site activities			
16	Adequate safety equipment inventory available			
17	First aid provider and supplies available			
18	Eyewash solution available when corrosive chemicals are present			
Air Monitoring				
19	Monitoring equipment specified in HASP available and in working order			
20	Monitoring equipment calibrated and calibration records available			
21	Personnel know how to operate monitoring equipment and equipment manuals available on site			
22	Environmental and personnel monitoring performed as specified in HASP			

Safety Items		In Compliance?		
Personal Protection		Yes	No	NA
23	Splash suit, if required			
24	Chemical protective clothing, if required			
25	Safety glasses or goggles (always required)			
26	Gloves, if required			
27	Overboots, if required			
28	Hard hat (always required)			
29	High visibility vest, if required			
30	Hearing protection, if required			
31	Full-face respirator, if required			
Instrumentation				
32	Combustible gas meter and calibration notes			
33	Oxygen meter and calibration notes			
34	Organic vapor analyzer and calibration notes			
Supplies				
35	Decontamination equipment and supplies			
35	Fire extinguishers			
37	Spill cleanup supplies			
Corrective Action Taken During Audit:				

Note: NA = Not applicable

Auditor's Signature

Site Safety Coordinator's Signature

Date

**ACTIVITY HAZARD ANALYSIS (AHA)**

Tetra Tech EM Inc.

Air Sampling**Task Description**

This Activity Hazard Analysis (AHA) applies to collection of grab air samples. It has been developed and approved by the Health and Safety Department. The AHA identifies potential hazards posed by each major step in this task, lists procedures to control hazards, and presents required safety equipment, inspections, and training.

Hazards		Actions
<u>Task Steps</u> Site preparation	<u>Potential Hazards</u> SLIP/TRIP/FALL LIFTING – SPRAIN/STRAIN	<u>Critical Safety Procedures and Controls</u> <ul style="list-style-type: none">• Visually inspect the area for slippery spots or debris and correct if found• Wear steel-toed, non-skid boots in accordance with Tetra Tech EMI policy• Use proper lifting techniques (lift with legs not back)
Open well and measure depth to water and/or bottom	EMPLOYEE EXPOSURE LACERATION	<ul style="list-style-type: none">• Use PID or FID to monitor well for vapors in well head and breathing zone.• Wear safety glasses and nitrile gloves• Use proper lifting techniques, including obtaining help with heavy coolers• Handle SUMMA canisters carefully
<u>Equipment to be Used</u> <ul style="list-style-type: none">• Specified PPE• Sampling equipment,• Air monitoring equipment IAW site HASP• First aid kit & eye wash	<u>Inspection Requirements</u> <ul style="list-style-type: none">• PPE prior to use• Inspect and calibrate any monitoring equipment	<u>Training Requirements</u> <ul style="list-style-type: none">• As specified in site HASP



ACTIVITY HAZARD ANALYSIS (AHA)

Tetra Tech EM Inc.

Sub Slab Depressurization System Installation and Operation

(see also Hollow Stem Auger Sampling and Operation Near Drill Rigs and Heavy Equipment AHAs)

Task Description

This Activity Hazard Analysis (AHA) applies to collection of grab groundwater samples. It has been developed and approved by the Health and Safety Department. The AHA identifies potential hazards posed by each major step in this task, lists procedures to control hazards, and presents required safety equipment, inspections, and training.

Hazards		Actions
Task Steps	Potential Hazards	Critical Safety Procedures and Controls
Site preparation	SLIP/TRIP/FALL LIFTING – SPRAIN/STRAIN	<ul style="list-style-type: none"> Visually inspect the area for slippery spots or debris and correct if found Wear steel-toed, non-skid boots in accordance with Tetra Tech EMI policy Use proper lifting techniques (lift with legs not back)
Installation of sub-slab depressurization system (see also Hollow Stem Auger Sampling and Operation Near Drill Rigs and Heavy Equipment AHAs)	SLIP/TRIP/FALL BACK STRAIN/SPRAIN NOISE HAZARD EMPLOYEE EXPOSURE STRUCK BY INCIDENTS	<ul style="list-style-type: none"> Visually inspect the area for slippery spots or debris and correct if found Wear steel-toed, non-skid boots in accordance with Tetra Tech EMI policy Use proper lifting techniques (lift with legs not back) Wear hearing protection at all times near operating equipment No loose-fitting clothing; wear hardhat, safety glasses, high-visibility (Class II) vest/shirt and nitrile gloves; upgrade to Level C IAW HASP requirements Ensure communication with the operator prior to approaching equipment; ensure the operator is aware of your position at all times; stay out of the swing radius or operational area
Operation and Air Sampling	NOISE HAZARD ELECTRICAL SYSTEMS PRESSURIZED AIR SYSTEM AND LINES EMPLOYEE EXPOSURE POTENTIAL FLAMMABLE ATMOSPHERES LIFTING – SPRAIN/STRAIN	<ul style="list-style-type: none"> Wear hearing protection Tetra Tech personnel are NOT authorized to perform ANY work on energized electrical or pressurized air systems; all initial citing and electrical work and system set-up MUST be performed by an approved high-hazard subcontractor
Sampling and sample handling	EMPLOYEE EXPOSURE LACERATION SLIP/TRIP/FALL	<ul style="list-style-type: none"> Wear safety glasses and nitrile gloves Handle glass containers carefully; dispose of any broken glass shards Wear steel-toed, non-skid boots in accordance with Tetra Tech EMI policy

	BACK STRAIN/SPRAIN	<ul style="list-style-type: none"> • Use proper lifting techniques, including obtaining help with heavy coolers
<u>Equipment to be Used</u> <ul style="list-style-type: none"> • Specified PPE • Sampling equipment, pumps, bottle ware, etc. • Air monitoring equipment IAW site HASP • First aid kit & eye wash 	<u>Inspection Requirements</u> <ul style="list-style-type: none"> • PPE prior to use • Inspect and calibrate any monitoring equipment • Subcontractor MUST inspect drill prior to operation • Subcontractor and/or local codes inspector MUST inspect electrical systems • Inspect air compressors, all lines and fittings prior to operation of air sparge system 	<u>Training Requirements</u> <ul style="list-style-type: none"> • As specified in site HASP

**ACTIVITY HAZARD ANALYSIS (AHA)**

Tetra Tech EM Inc.

Observation Near Drill Rigs and Heavy Equipment**Task Description**

This Activity Hazard Analysis (AHA) applies to collection of grab groundwater samples. It has been developed and approved by the Health and Safety Department. The AHA identifies potential hazards posed by each major step in this task, lists procedures to control hazards, and presents required safety equipment, inspections, and training.

Hazards		Actions
<u>Task Steps</u> Observe Near Drill Rigs and Heavy Equipment	<u>Potential Hazards</u> SLIP/TRIP/FALL BACK STRAIN/SPRAIN NOISE HAZARD EMPLOYEE EXPOSURE STRUCK BY INCIDENTS	<u>Critical Safety Procedures and Controls</u> <ul style="list-style-type: none">• Visually inspect the area for slippery spots or debris and correct if found• Wear steel-toed, non-skid boots in accordance with Tetra Tech EMI policy• Use proper lifting techniques (lift with legs not back)• Wear hearing protection at all times near operating equipment• No loose-fitting clothing; wear hardhat, safety glasses, high-visibility (Class II) vest/shirt and nitrile gloves; upgrade to Level C IAW HASP requirements• Ensure communication with the operator prior to approaching equipment; ensure the operator is aware of your position at all times; stay out of the swing radius or operational area
<u>Equipment to be Used</u> <ul style="list-style-type: none">• Specified PPE• Air monitoring equipment IAW site HASP• First aid kit & eye wash	<u>Inspection Requirements</u> <ul style="list-style-type: none">• PPE prior to use• Inspect and calibrate any monitoring equipment• Subcontractor MUST inspect drill prior to operation	<u>Training Requirements</u> <ul style="list-style-type: none">• As specified in site HASP



ACTIVITY HAZARD ANALYSIS (AHA)

Tetra Tech EM Inc.

Personal and Ambient Air Sampling

Task Description

This Activity Hazard Analysis (AHA) applies to the collection of personal and ambient air samples. It has been developed and approved by the Director of Health and Safety for Tetra Tech EMI. The AHA contains potential hazards posed by each major step in this task, lists procedures to control hazards, and presents required equipment (including safety equipment), inspections, and training.

Hazards		Actions
<u>Task Steps</u> Site preparation	<u>Potential Hazards</u> SLIP/TRIP/FALL BACK STRAIN/SPRAIN	<u>Critical Safety Procedures and Controls</u> <ul style="list-style-type: none"> Visually inspect the area for slippery spots or debris and correct if found Wear steel-toed, non-skid boots in accordance with Tetra Tech EMI policy Use proper lifting techniques (lift with legs not back)
Sample collection and handling	EMPLOYEE EXPOSURE PINCHES LACERATION SLIP/TRIP/FALL BACK STRAIN/SPRAIN	<ul style="list-style-type: none"> Wear respirator, safety glasses, and nitrile gloves Handle forceps with care Handle all glass containers carefully Carefully dispose of any broken shards in the event of container breakage Use proper lifting techniques, including obtaining help with heavy coolers
Store sample containers in coolers and load onto vehicles	SLIP/TRIP/FALL BACK STRAIN/SPRAIN	<ul style="list-style-type: none"> Ensure all debris has been removed from the path of travel Use proper lifting techniques, including obtaining help with heavy coolers
<u>Equipment to be Used</u> <ul style="list-style-type: none"> Level C PPE (respirator, steel-toed boots, safety glasses, nitrile gloves) Reflective safety vest if in areas of vehicle traffic First Aid Kit Gillian pumps 	<u>Inspection Requirements</u> Inspect and clean respirator in accordance with Tetra Tech Policy	<u>Training Requirements</u> <ul style="list-style-type: none"> Safe Lifting Procedures Personal Protective Equipment Hazardous Waste Operations and Emergency Response (40-hour and current 8-hour update) CPR/First Aid (one employee on-site must have current CPR/First Aid training) Initial 40 Hour Training Current Medical Clearance (including respirator use) Current Respirator Fit-Test Hazard communication



ACTIVITY HAZARD ANALYSIS (AHA)

Tetra Tech EM Inc.

Residential Inventory Assessment

Task Description

This Activity Hazard Analysis (AHA) applies to conducting Phase I ESAs. It has been developed and approved by the Director of Health and Safety for Tetra Tech EMI. The AHA contains potential hazards posed by each major step in this task, lists procedures to control hazards, and presents required safety equipment, inspections, and training.

Hazards		Actions
<u>Task Steps</u>	<u>Potential Hazards</u>	<u>Critical Safety Procedures and Controls</u>
Locate the nearest hospital to the jobsite location	SLOW ACCESS TO MEDICAL CARE	<ul style="list-style-type: none">• Attach the hospital route map to this AHA and take to the site for reference during on-site work. If an employee on this site has any special allergies (bee stings, penicillin, etc.), list them on this paperwork
Perform computer-based research on property being assessed	ERGONOMIC INJURY	<ul style="list-style-type: none">• Take at least a 5-minute break each hour and stretch hands, arms, neck and shoulders
Visually assess interior areas of basement	SLIP/TRIP/FALL	<ul style="list-style-type: none">• Wear boots appropriate to the hazards encountered. Work in wet areas requires tall, waterproof boots• Ensure a cover is available for any cutting tool used to access jobsite areas (sheaths). In wooded areas wear leather gloves.• Ensure water is available at all times during the site walkthrough. Take sufficient breaks. Wear sunscreen if the potential for sunburn exists.• Employees with allergies to bee stings should have proper medication with them at all times. Use insect repellant containing DEET. Perform tick-check at end of each day.• Use safety glasses in wooded areas at all times due to high amounts of vegetation and branches. Use a reflective safety vest on roadways and in wooded areas to increase visibility to both automobiles and any hunters that may be present in the area.• Observe chemical containers from a safe distance. If large quantities of containers or above-ground/below-ground storage tanks are observed, retreat from the site and obtain additional guidance from the Tt Project Manager. Do not operate cell phones in the
	LACERATION	
	HEAT	
	BIOLOGICAL	
	STRUCK AGAINST	
	EMPLOYEE EXPOSURE	

	STRUCK BY	<p>vicinity of containers with unknown contents.</p> <ul style="list-style-type: none"> Wear a hard hat when in wooded areas, or when inside enclosed buildings where objects falling from overhead or head-bump hazards may be present.
<p><u>Equipment to be Used</u></p> <ul style="list-style-type: none"> Appropriate Boots Safety Glasses Leather Gloves Hard Hat Sheath or cover for any blades or other brush-cutting instruments First Aid Kit Water or Gatorade 	<p><u>Inspection Requirements</u></p> <ul style="list-style-type: none"> Hospital map must be attached to this document 	<p><u>Training Requirements</u></p> <ul style="list-style-type: none"> Tetra Tech Safety Program Orientation Personal Protective Equipment Hazard Communication



ACTIVITY HAZARD ANALYSIS (AHA)

RCP, Inc.

Concrete Coring and Vapor Mitigation System Installation

Task Description

This Activity Hazard Analysis (AHA) applies to the installation of Vapor Mitigation Systems at approximately 43 residences located in the Riggs Park Community in northeast Washington, DC. This AHA identifies potential hazards posed by each major step in this task, lists procedures to control hazards, and presents required safety equipment, inspections, and training.

Task Element	Potential Hazard(s)	Required Controls (engineering, administrative or PPE)
Site preparation	Slip/Trip/Fall Lifting – Sprain/Strain	<ul style="list-style-type: none">• Visually inspect each residence for slippery spots or debris and correct if found• Wear steel-toed, non-skid boots in accordance with Tetra Tech policy• Use proper lifting techniques (lift with legs not back) when transporting all equipment to the basement of the residence
Cut concrete core, differential pressure points, and exterior wall for installation of VMS systems	Flying dust and debris High noise Entanglement Slip/Trip/Fall Lifting – Sprain/Strain	<ul style="list-style-type: none">• Wear face-shield AND safety glasses when operating drill• Have water available for eyewash• Wear Tyvek or similar long-sleeved coverall when operating drill• Keep residents and other unauthorized personnel out of the area• Wear hearing protection with a minimum noise reduction rating of 27 when operation drill• No loose clothing, jewelry or long hair• Visually inspect each residence for slippery spots or debris and correct if found• Wear steel-toed, non-skid boots in accordance with Tetra Tech policy
Installation of vapor mitigation fan/blower and PVC riser	Electrical systems Slip/Trip/Fall Lifting – Sprain/Strain Elevated Work	<ul style="list-style-type: none">• Tetra Tech personnel are NOT authorized to perform ANY work on energized electrical or pressurized air systems; all initial citing and electrical work and system set-up MUST be performed by an approved high-hazard sub-contractor• Visually inspect each residence for slippery spots or debris and correct if found• Wear steel-toed, non-skid boots in accordance with Tetra Tech policy• Ensure the ladder used is capable of carrying the load intended and make sure a spotter is located at the bottom of the ladder to stabilize and prevent any falls



ACTIVITY HAZARD ANALYSIS (AHA)

RCP, Inc.

Concrete Coring and Vapor Mitigation System Installation

Equipment to be used:

- Shop Vac
- Magnahelic gauge
- PVC40 piping
- Hydraulic cement
- Concrete coring drill
- Fantech HP 190 fan

Inspection Requirements

- PPE prior to use
- Subcontractor must inspect drill prior to operation
- Electrician must inspect electrical systems

Training Requirements

As specified in site HASP

APPENDIX G
STANDARD OPERATING PROCEDURES

Title: **Volatile Organic Compound Building Survey**

1.0 BACKGROUND

Volatile organic compounds (VOCs) are common ingredients in many household products and may interfere with indoor air sampling results. This standard operating procedure (SOP) presents how to conduct a brief building survey to assess and establish baseline VOC levels, prior to the collection of indoor air samples from residences. Additionally, homeowners should be provided information regarding how VOCs located in the sample areas may affect analytical results and general guidelines they can follow during sampling events.

1.1 PURPOSE

The purpose of this SOP is to provide guidance for conducting a brief building survey to assess VOC contents in basements of residential properties, prior to sampling indoor air.

1.2 SCOPE

This SOP applies to all personnel conducting a building survey for the documentation of VOCs inside a residence.

1.3 DEFINITIONS

Volatile organic compounds (VOCs): VOCs are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects. VOCs are emitted by a wide array of products numbering in the thousands. Examples include: paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, permanent markers, and photographic solutions.

1.4 REQUIREMENTS AND RESOURCES

When conducting the building survey, the following will be required:

- A digital camera to document the occurrence of known or potential sources of VOCs and conditions prior to installation activities.
- Field forms including access agreements, a Field Data Sheet for VOC Inventory (Figure 1), and a sheet providing information to the occupants regarding steps to reduce or eliminate VOC interferences prior to the sampling event (see Resident Guidelines for Indoor Air

Title: **Volatile Organic Compound Building Survey**

Sampling included as Figure 2).

- Form of identification (Business card).

2.0 PROCEDURES

This section discusses the procedures to use when entering residences to assess VOC content.

2.1 ENTERING THE HOMES

Prior to entering the residences, personnel should ensure all documents and identification are present including business cards, introduction letters, and access agreements. Personnel are entering people's residences and should be respectful of their belongings. Do not touch anything without the resident's permission. If residents are hesitant to allow or restrict access, personnel should document this fact, report to the District, and move on to the next residence.

2.2 VOC SURVEY

A camera should be brought with all personnel to document any potential sources of VOCs in the basement of the residences. Additionally, photos should be taken to document the condition of the basement slab to ensure no preferential pathways are present for vapors to enter the home. Personnel should identify cracks or holes in the basement slab, as well as identifying any penetrations through the slab. If the basement is carpeted, this should be noted in the survey form as well as common VOCs (paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, petroleum products, permanent markers and photographic solutions). Personnel should also document the location of all occurrences of potential VOC background sources on a field form provided as Figure 1.

2.3 RESIDENT GUIDELINES

Tetra Tech will contact residents to determine the best time for sampling events to occur. When the resident is notified that indoor air sampling will be occurring inside their home, all previously identified VOC containers should be removed from the sampling area for at least 24 hours prior to the sampling event. This will help ensure that samples are indicative of only VOCs emanating from sub-slab sources. If the District is not allowed on the premises, it will delay the installation of the VMS system.

FIGURE 1
FIELD DATA SHEET

**EXAMPLE
FIELD DATA SHEET
FOR VOC INVENTORY**

Date: _____ Site Address: _____

Time: _____ Project No.: _____

Type of VOC	No. of Containers	Quality of Container	Container Location

Notes: _____

FIGURE 2
RESIDENT GUIDELINES FOR INDOOR AIR SAMPLING

RESIDENT GUIDELINES FOR INDOOR AIR SAMPLING

Air testing for specific chemical compounds is an investigative tool used to characterize the nature and extent of contaminants in air and to determine whether contaminant sources affect indoor air quality. The purpose of this document is to outline the recommended procedure for testing indoor air for volatile chemicals. A definition of volatile organic compounds (VOCs) is provided here:

<http://www.epa.gov/iaq/voc.html>.

During indoor air sampling, potential interference from products or activities releasing volatile chemicals may need to be controlled. Removing the source from the indoor environment prior to testing is the most effective means of reducing the interference. The resident should consider the possibility chemical may adsorb onto porous materials and may take time to dissipate.

Once interfering conditions are corrected (if applicable), ventilation of the space may be required prior to testing to eliminate residual contamination from indoor air. If ventilation is appropriate, it should be completed at least 24 hours prior to the scheduled sampling time. Where applicable, ventilation can be accomplished by operating the building's heating ventilation and air conditioning (HVAC) system to maximize outside air intake. Opening windows and doors and operating exhaust fans may also help or may be needed if the building has no HVAC system.

For 24 hours prior to sampling, all reasonable measures should be taken to avoid:

1. Opening any windows, fireplace dampers, openings, or vents;
2. Operating ventilation fans unless special arrangements are made;
3. Smoking in the house;
4. Painting;
5. Using wood stoves, fireplaces or other auxiliary heating equipment (e.g. kerosene heaters);
6. Operating or storing automobiles in an attached garage;
7. Allowing containers of gasoline or oil to remain within the house, except for fuel oil tanks;
8. Cleaning, waxing, or polishing furniture or floors with petroleum- or oil-based products;
9. Using air fresheners or odor eliminators;
10. Engaging in any hobbies that use materials containing VOCs including: paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, petroleum products, permanent markers and photographic solutions.
11. Using cosmetics, including hairspray, nail polish, nail polish removers, perfume/cologne; and
12. Applying pesticides.

1.0 BACKGROUND

To ensure sub-slab vapors are being vented away from the building, a vapor mitigation system (VMS) including a fan or blower will be installed at each of the residences. This Standard Operating Procedure (SOP) presents procedures for measuring air flow rate after the VMS fan or blower has been installed. The fan will be installed during VMS installation activities and these readings will ensure the fan is effectively directing vapors away from the residences.

1.1 PURPOSE

The purpose of this SOP is to provide guidance for the measurement of air flow rate associated with the VMS at each of the residences.

1.2 SCOPE

This SOP applies to all personnel measuring air flow rate from the VMS installed at each of the residences. The site-specific work plan and sampling plan should be followed during air flow rate sampling activities.

1.3 DEFINITIONS

Hot-wire Anemometers: A device used to measure air flow rate by electrically heating a very fine wire to a temperature above ambient air. Air flowing past the wire has a cooling effect on the wire. Because the electrical resistance of most metals is dependent upon the temperature of the metal, a relationship can be obtained between the resistance of the wire and the air flow speed.

1.4 REQUIREMENTS AND RESOURCES

When measuring air flow rate, a hot-wire anemometer and tubing will be used to connect with an existing fitting already installed on the discharge stack during the VMS installation.

2.0 PROCEDURES

This section describes how an air flow measuring port will be installed during the VMS installation and how air flow will be measured at each of the residences after the fan or blower has been installed.

2.1 AIR FLOW PORT INSTALLATIONS

During the VMS installation, a 3/4" hole will be drilled directly into the polyvinyl chloride (PVC) schedule 40 riser equipped with a rubber stopper. The hole will be drilled approximately 10 inches above the mitigation fan installed in the VMS. The hole will be equipped with a fitting and an airtight rubber stopper that will not allow any vapors to leave the vapor stack prior to the roof line. The rubber stopper will be removed during air flow measurement activities.

2.2 AIR FLOW MEASUREMENT

Hot-wire anemometers will be used to measure the air flow from the discharge stack(s) of the VMS at each residence. Each air flow rate will be recorded in notes maintained for each residence to ensure efficiency of the VMS. The rates should be substantial enough to ensure vapors are being pumped through the discharge stack; otherwise the VMS must be adjusted.

3.0 CAUTIONS

Residents are not required to be present at the time of air flow measurement. Tetra Tech will contact residents approximately one week prior to Tetra Tech sampling activities. In addition, Tetra Tech personnel will ring the doorbell on the day of sampling activities of each residence to attempt to inform the resident of activities occurring. If residents or other members of the community become obstinate, personnel should refer them to the toll-free Riggs Park voice message service at 1-855-384-0092 or email address at RiggsParkVMS@tetrattech.com. A response will be returned to them within two business days. If residents do not allow access, note it and report it to the District.

1.0 BACKGROUND

To ensure that sub-slab vapors are being vented away from the building, the differential pressure must be evaluated. This Standard Operating Procedure (SOP) presents procedures for measuring differential pressure across the basement slab. During vapor mitigation system (VMS) installation, differential pressure measuring ports will be installed on the exterior wall of the building to ensure personnel will not have to enter the residence to measure the pressure in the future.

1.1 PURPOSE

The purpose of this SOP is to provide guidance for the measurement of differential pressure at each residence where VMS installation occurs.

1.2 SCOPE

This SOP applies to all personnel measuring differential pressure at residences where VMS have been installed. The site-specific work plan and sampling plan should be followed during differential pressure recording activities.

1.3 DEFINITIONS

Differential Pressure: The difference in pressure between two points.

1.4 REQUIREMENTS AND RESOURCES

When measuring differential pressure, a manometer and tubing will be used to connect with piping installed during the VMS installation.

2.0 PROCEDURES

This section describes how differential pressure ports will be installed during the VMS installation and how to measure differential pressure across the basement slab to ensure a negative pressure field is present beneath the sub-slab of the residences.

2.1 DIFFERENTIAL PRESSURE PORT INSTALLATION

During the VMS installation, 1/2" diameter holes will be drilled through the slab at appropriate intervals. By applying a known negative pressure to one hole and measuring the pressure drop with distance from the other hole using a manometer, sub-slab airflow permeability will be calculated. A vacuum will be applied to a test suction point, then, the vacuum pressure will be measured at small observation holes located across the basement away from the suction point. Because the vapors have the potential to be contaminated, the exhaust from the differential pressure test shall be vented outside the residence. Two (2) stainless steel 1/4" tubes that can be accessed and read from the exterior of the residence with a magnehelic (pressure) gauge will be installed through the exterior foundation wall. One of the tubes will be placed above the basement slab to measure indoor air pressure at breathing level in the basement and one will extend beneath the basement slab to measure sub-slab pressure. The tubes will be installed in the same location within the basement for comparative accuracy.

2.2 DIFFERENTIAL PRESSURE MEASUREMENT

Magnehelic gauges will be connected with polyethylene tubing to the exterior metal tubing at each residence. This will allow personnel to observe differential pressure at each of the residence prior to planned sampling indoor air and soil gas. Prior to sampling, personnel will note the pressure of indoor air and sub slab to ensure that a negative pressure field is present beneath the residence. This will also ensure vapors are flowing through the VMS and not into the basement of the residence. If a positive pressure field exists prior to sampling, personnel should adjust the VMS to ensure that it is operating properly prior to the sampling event. Personnel should be equipped with an extra magnehelic gauge in case the gauge left on the exterior of the residence has been damaged or lost.

3.0 CAUTIONS

Residents are not required to be present at the time of differential pressure measurement. Tetra Tech will contact residents approximately one week prior to Tetra Tech sampling activities. In addition, Tetra Tech personnel will ring the doorbell on the day of sampling activities of each residence to attempt to inform the resident of activities occurring. If residents or other members of the community become obstinate, personnel should refer them to the toll-free Riggs Park voice message service at 1-855-384-0092 or email address at RiggsParkVMS@tetrattech.com. A response will be returned to them within two business days. If residents do not allow access, note it and report it to the District.

1.0 BACKGROUND

Indoor air samples can be collected using various methods and equipment. This standard operating procedure (SOP) presents sample collection procedures for collecting indoor air samples in stainless-steel Summa canisters. Summa canisters are best means for collecting samples to be shipped/transported to a full-service laboratory while maintaining sample integrity.

1.1 PURPOSE

The purpose of this SOP is to provide guidance for the use of Summa canisters for indoor air sample collection.

1.2 SCOPE

This SOP applies to all personnel collecting indoor air samples using Summa canisters. The site-specific work plan and sampling plan should be followed during indoor air sampling activities.

1.3 DEFINITIONS

Indoor Air: The gases or atmosphere filling the buildings. These gases may all be of natural origin, but manmade contaminants or byproducts may be present in detectable quantities.

Summa Canister: a stainless steel electropolished (or "summa" polished) passivated (non-reactive) vessel used to collect a whole air sample.

1.4 REQUIREMENTS AND RESOURCES

When using Summa canisters to collect indoor air samples, the following items are needed:

- A supply of laboratory certified clean, evacuated Summa canisters with a pressure gauge to verify internal pressure and a flow controller (integrated flow controller pressure gauge may be used).
- Tygon[®] or equivalent tubing of appropriate size for connecting the sampling port to the Summa canister (during sample collection).
- Swagelok "T" fitting for duplicate sample collection.
- Leak check compounds such as isopropanol, butane, helium, or 1,1-difluoroethane. Material Safety Data Sheets are attached for each compound because indoor air will be sampled from a point on the exterior of each residence.

2.0 PROCEDURES

This section describes selection of indoor air sampling locations and general preparation of the sampling system to be used. This section also provides detailed procedures for collecting samples using Summa canisters. Finally, this section discusses additional considerations that affect indoor air sampling — including duplicate sample collection and sample transfer.

2.1 SAMPLING LOCATION SELECTION

Sampling locations should be selected and prepared for sampling as described in a site-specific quality assurance project plan and field sampling plan. Indoor air samples should be collected between approximately 4 to 6 feet above ground to represent a person's typical breathing level. The location should also be cleared of any known or potential volatile organic compounds (VOCs) which are not emanating from soil vapor (i.e., paints, cleaning compounds, etc.) to the extent practicable prior to sample collection.

2.2 SAMPLE COLLECTION USING SUMMA CANISTERS

Indoor air shall be collected for chemical analysis in a stainless steel, evacuated canister, or Summa canister.

The canister sampling train is connected directly to the purged Tygon[®] or equivalent sampling tube. To prevent ambient air from entering the canister during sample collection, all connections must be airtight. To collect indoor air samples using this method, the following procedures are used:

1. Confirm the valve is closed and remove the brass cap. Attach the pressure gauge and flow controller (integrated system) to the canister. Attach the tube to the sample train with Tygon[®] or equivalent tubing.
2. Record the canister pressure reading and time. Then, open the canister valve, which will allow the evacuated (under vacuum) canister to draw-in indoor air.
3. Monitor sampling progress periodically. When target sample collection time of 8 hours has been reached, close the canister valve and record the time and post-sampling pressure reading on the canister pressure valve.

WARNING: a residual vacuum of approximately 5 inches of mercury should remain in the canister at the completion of the sampling event. If no residual vacuum is recorded, the data collected from this summa

canister may not be representative of the site actual conditions.

4. Remove the canister from the sample train and replace the brass cap.
5. Follow the leak check procedures described in Section 2.4.
6. Label the canister and its corresponding field data sheet (Figure 1) with the sample number.
7. Complete the field data sheet and sample chain of custody.
8. Ship samples to the laboratory for analysis. Summa samples do not need to be chilled after collection or during transportation.

2.3 DUPLICATE SAMPLE COLLECTION

Duplicate indoor air samples will be collected at each site as required in the site-specific quality assurance project plan and field sampling plan. Each duplicate is collected in conjunction with a corresponding environmental sample. Generally, one duplicate sample will be collected for every ten samples (every tenth residence) collected.

To collect duplicate samples in canisters, a Swagelok “T” will be connected to two canisters. Purging and sample collection will proceed as described above. After collection, one sample will be labeled as the environmental sample and one as the duplicate.

2.4 LEAK CHECK PROCEDURES

Leakage during indoor air sampling may dilute samples with ambient air and produce results that underestimate the actual site concentrations, or may contaminate the sample with external contaminants. Leak tests should be conducted to determine whether leakage is occurring. Leak detection is performed using the following procedures:

1. Leak tests should be conducted at every indoor air sampling location.
2. Tracer compounds such as isopropanol, butane, helium, or 1,1-difluoroethane may be used as leak check compounds. These compounds may be contained in common products such as Dust-Off and rubbing alcohol. Ensure the tracer compound used does not contain chemicals or impurities that may be present as a site contaminant.

3. Place tracer compounds around all connections in the aboveground sampling system train. Tracer compound is emplaced by wetting or spraying a paper towel or rag and wrapping around the area of the connection where leaks could occur.
4. Collect samples as describe in previous sections and use analytical results to determine if the tracer compound has leaked into the sample.

2.5 DECONTAMINATION

All canisters should be provided by the laboratory as certified clean as specified by appropriate EPA methods.

If Y-branched tubing or any other sampling equipment is to be reused, it must also be decontaminated between sampling locations.

2.6 SAMPLE TRANSFER

After collection, each sample container will be transported to the designated laboratory for analysis.

3.0 CAUTIONS

Variations in temperature, pressure, and moisture content of the air being sampled have a great effect on how samples are collected. Extremes in these conditions can compromise sample integrity and cause problems with sample collection. Summa canisters are designed to collect samples at near ambient temperature and should not be subjected to temperatures above 100°C or below 0°C. In addition, severe temperature swings will affect the flow rate of flow controllers, and should be avoided. The altitude at which samples are collected affects the local barometric pressure, which in turn affects gauge vacuum and pressure readings. A canister gauge that reads -29.9” Hg at sea level will read -25” Hg at 5,000 feet elevation because gauges are calibrated to read at sea level. Generally speaking, every 1,000-foot rise in elevation results in a 1” drop in gauge pressure. Indoor air samples should not be subjected to changes in ambient pressure. Samples to be analyzed off site should not be shipped by air. If condensation is observed in the sample container, the sample should be discarded and a new sample collected.

Residents are not required to be present at the time of indoor air sampling. Tetra Tech will contact residents approximately one week prior to sampling activities. In addition, Tetra Tech personnel will ring the doorbell on the day of sampling activities of each residence to attempt to inform the resident of

Title: **Indoor Air Sampling Methods**

activities occurring. If residents or other members of the community become obstinate, personnel should refer them to the toll-free Riggs Park voice message service at 1-855-384-0092 or email address at RiggsParkVMS@tetrattech.com. A response will be returned to them within two business days. If residents do not allow access, note it and report it to the District.

APPENDIX A
MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheet



1,1-Difluoroethane (Halocarbon 152A)

Section 1. Chemical product and company identification

Product name : 1,1-Difluoroethane (Halocarbon 152A)
Supplier : AIRGAS INC., on behalf of its subsidiaries
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253
Product use : Synthetic/Analytical chemistry.
Synonym : algofrene type 67; difluoroethane; ethylene fluoride; ethylidene difluoride; ethylidene fluoride; fc 152a; genetron 100; genetron 152a; ethene, 1,1-trifluoro
MSDS # : 001090
Date of Preparation/Revision : 4/23/2010.
In case of emergency : 1-866-734-3438

Section 2. Hazards identification

Physical state : Gas. [COLORLESS]
Emergency overview : WARNING!
FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
CONTENTS UNDER PRESSURE.
Keep away from heat, sparks and flame. Do not puncture or incinerate container. Use only with adequate ventilation. Keep container closed.
Contact with rapidly expanding gases can cause frostbite.
Routes of entry : Inhalation
Potential acute health effects
Eyes : Contact with rapidly expanding gas may cause burns or frostbite.
Skin : Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation : Acts as a simple asphyxiant.
Ingestion : Ingestion is not a normal route of exposure for gases
Potential chronic health effects : **CARCINOGENIC EFFECTS:** Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
Medical conditions aggravated by over-exposure : Acute or chronic respiratory conditions may be aggravated by overexposure to this gas.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

<u>Name</u>	<u>CAS number</u>	<u>% Volume</u>	<u>Exposure limits</u>
1,1-Difluoroethane (Halocarbon 152A)	75-37-6	100	AIHA WEEL (United States, 1/2009). TWA: 1000 ppm 8 hour(s).

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

- Flammability of the product** : Flammable.
- Flammable limits** : Lower: 3.7% Upper: 18%
- Products of combustion** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds
carbonyl halides
- Fire-fighting media and instructions** : In case of fire, use water spray (fog), foam or dry chemical.
- In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.
- Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

1,1-Difluoroethane (Halocarbon 152A)

- Storage** : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Personal protection

- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

1,1-difluoroethane

AIHA WEEL (United States, 1/2009).
TWA: 1000 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

- Molecular weight** : 66.06 g/mole
- Molecular formula** : C₂H₄F₂
- Boiling/condensation point** : 11.3°C (52.3°F)
- Melting/freezing point** : -117°C (-178.6°F)
- Critical temperature** : 113.5°C (236.3°F)
- Vapor pressure** : 63 (psig)
- Vapor density** : 2.4 (Air = 1)
- Specific Volume (ft³/lb)** : 5.8514
- Gas Density (lb/ft³)** : 0.1709

Section 10. Stability and reactivity

- Stability and reactivity** : The product is stable.
- Incompatibility with various substances** : Extremely reactive or incompatible with the following materials: oxidizing materials.
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
- Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure
1,1-difluoroethane	LDLo Oral	Rat	>1500 mg/kg	-

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

- Carcinogenic effects** : No known significant effects or critical hazards.
Mutagenic effects : No known significant effects or critical hazards.
Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Products of degradation : Products of degradation: carbon oxides (CO, CO₂) and water, halogenated compounds.

Environmental fate : Not available.



Environmental hazards : No known significant effects or critical hazards.

Toxicity to the environment : Not available.


Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1030	1,1-DIFLUOROETHANE OR REFRIGERANT GAS R 152A	2.1	Not applicable (gas).		<p>Limited quantity Yes.</p> <p>Packaging instruction Passenger aircraft Quantity limitation: Forbidden.</p> <p>Cargo aircraft Quantity limitation: 150 kg</p> <p>Special provisions T50</p>
TDG Classification	UN1030	1,1-DIFLUOROETHANE; OR REFRIGERANT GAS R 152A	2.1	Not applicable (gas).		<p>Explosive Limit and Limited Quantity Index 0.125</p> <p>ERAP Index</p>

1,1-Difluoroethane (Halocarbon 152A)

						3000 Passenger Carrying Road or Rail Index Forbidden
Mexico Classification	UN1030	1,1- DIFLUOROETHANE OR REFRIGERANT GAS R 152A	2.1	Not applicable (gas).		-

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information

United States

U.S. Federal regulations

United States inventory (TSCA 8b): This material is listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: 1,1-difluoroethane
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: 1,1-difluoroethane: Fire hazard, Sudden release of pressure, Delayed (chronic) health hazard
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.
Clean Air Act (CAA) 112 accidental release prevention: 1,1-difluoroethane
Clean Air Act (CAA) 112 regulated flammable substances: 1,1-difluoroethane
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

State regulations

Connecticut Carcinogen Reporting: This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is not listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is not listed.
Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada)

Class A: Compressed gas.
Class B-1: Flammable gas.
CEPA Toxic substances: This material is listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Label requirements : FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
CONTENTS UNDER PRESSURE.

Canada

Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.

Hazardous Material Information System (U.S.A.)

Health	1
Flammability	4
Physical hazards	0

National Fire Protection Association (U.S.A.)



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet



N-Butane

Section 1. Chemical product and company identification

Product name	: N-Butane
Supplier	: AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	: Synthetic/Analytical chemistry.
Synonym	: n-Butane; Diethyl; Freon 600; Liquefied petroleum gas; LPG; n-C ₄ H ₁₀ ; Butanen; Butani; Methylethylmethane; UN 1011; UN 1075; A-17; Bu-Gas.
MSDS #	: 001007
Date of Preparation/Revision	: 11/10/2010.
In case of emergency	: 1-866-734-3438

Section 2. Hazards identification

Physical state	: Gas. [COLORLESS LIQUEFIED COMPRESS GAS WITH GASOLINE-LIKE ODOR.]
Emergency overview	: WARNING! FLAMMABLE GAS. MAY CAUSE FLASH FIRE. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CONTENTS UNDER PRESSURE. Keep away from heat, sparks and flame. Do not puncture or incinerate container. May cause target organ damage, based on animal data. Use only with adequate ventilation. Keep container closed. Contact with rapidly expanding gases can cause frostbite.
Target organs	: May cause damage to the following organs: central nervous system (CNS).
Routes of entry	: Inhalation
Potential acute health effects	
Eyes	: Contact with rapidly expanding gas may cause burns or frostbite.
Skin	: Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	: Acts as a simple asphyxiant.
Ingestion	: Ingestion is not a normal route of exposure for gases
Potential chronic health effects	: CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available.
Medical conditions aggravated by over-exposure	: Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

<u>Name</u>	<u>CAS number</u>	<u>% Volume</u>	<u>Exposure limits</u>
N-Butane	106-97-8	100	ACGIH TLV (United States, 2/2010). TWA: 1000 ppm 8 hour(s). NIOSH REL (United States, 6/2009). TWA: 1900 mg/m ³ 10 hour(s). TWA: 800 ppm 10 hour(s). OSHA PEL 1989 (United States, 3/1989). TWA: 1900 mg/m ³ 8 hour(s). TWA: 800 ppm 8 hour(s).

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

- Flammability of the product** : Flammable.
- Auto-ignition temperature** : 286.85°C (548.3°F)
- Flash point** : Closed cup: -60.15°C (-76.3°F).
- Flammable limits** : Lower: 1.6% Upper: 8.5%
- Products of combustion** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
- Fire hazards in the presence of various substances** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.
- Fire-fighting media and instructions** : In case of fire, use water spray (fog), foam or dry chemical.

In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.

Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
- Storage** : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.
- Personal protection**
- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
- The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

Butane

ACGIH TLV (United States, 2/2010).

TWA: 1000 ppm 8 hour(s).

NIOSH REL (United States, 6/2009).TWA: 1900 mg/m³ 10 hour(s).

TWA: 800 ppm 10 hour(s).

OSHA PEL 1989 (United States, 3/1989).TWA: 1900 mg/m³ 8 hour(s).

TWA: 800 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

- Molecular weight** : 58.14 g/mole
- Molecular formula** : C₄-H₁₀
- Boiling/condensation point** : -0.6°C (30.9°F)
- Melting/freezing point** : -135.4°C (-211.7°F)
- Critical temperature** : 151.9°C (305.4°F)
- Vapor pressure** : 16.3 (psig)
- Vapor density** : 2 (Air = 1)

N-Butane

Specific Volume (ft ³/lb) : 6.435
Gas Density (lb/ft ³) : 0.1554

Section 10. Stability and reactivity

Stability and reactivity : The product is stable.
Incompatibility with various substances : Extremely reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure
Butane	LC50 Inhalation Vapor	Rat	658000 mg/m3	4 hours

Chronic effects on humans : May cause damage to the following organs: central nervous system (CNS).
Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.
Mutagenic effects : No known significant effects or critical hazards.
Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity


Not available.

Products of degradation : Products of degradation: carbon oxides (CO, CO₂) and water.
Environmental fate : Not available.
Environmental hazards : No known significant effects or critical hazards.
Toxicity to the environment : Not available.



Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation.Return cylinders with residual product to Airgas, Inc.Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1011	BUTANE	2.1	Not applicable (gas).		Limited quantity Yes. Packaging instruction Passenger aircraft Quantity limitation: Forbidden. Cargo aircraft Quantity limitation:

N-Butane

						150 kg Special provisions 19, T50
TDG Classification	UN1011	BUTANE	2.1	Not applicable (gas).		Explosive Limit and Limited Quantity Index 0.125 ERAP Index 3000 Passenger Carrying Ship Index Forbidden Passenger Carrying Road or Rail Index Forbidden Special provisions 29
Mexico Classification	UN1011	BUTANE	2.1	Not applicable (gas).		-

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information**United States****U.S. Federal regulations**

United States inventory (TSCA 8b): This material is listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Butane
SARA 311/312 MSDS distribution - chemical inventory - hazard identification:
Butane: Fire hazard, Sudden release of pressure
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.
Clean Air Act (CAA) 112 accidental release prevention: Butane
Clean Air Act (CAA) 112 regulated flammable substances: Butane
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

State regulations

Connecticut Carcinogen Reporting: This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.

N-Butane

Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is not listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada)

: Class A: Compressed gas.
Class B-1: Flammable gas.
CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Label requirements

: FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CONTENTS UNDER PRESSURE.

Canada

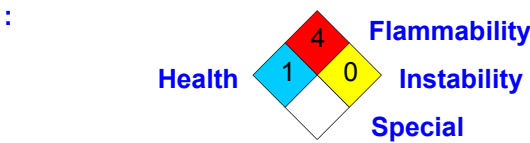
Label requirements

: Class A: Compressed gas.
Class B-1: Flammable gas.

**Hazardous Material
Information System (U.S.A.)**

Health	*	1
Flammability		4
Physical hazards		0

**National Fire Protection
Association (U.S.A.)**



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet



Helium

Section 1. Chemical product and company identification

Product name	: Helium
Supplier	: AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	: Synthetic/Analytical chemistry.
Synonym	: helium (dot); Helium-4; He; o-Helium; UN 1046; UN 1963; Liquid Helium; Helium, Refrigerated Liquid
MSDS #	: 001025
Date of Preparation/Revision	: 8/27/2010.
In case of emergency	: 1-866-734-3438

Section 2. Hazards identification

Physical state	: Gas. [Colorless, Odorless Gas, Cryogenic liquid and gas]
Emergency overview	: WARNING! GAS: CONTENTS UNDER PRESURE. Do not puncture or incinerate container. Can cause rapid suffocation. May cause severe frostbite. LIQUID: Extremely cold liquid and gas under pressure. Can cause rapid suffocation. May cause severe frostbite. Do not puncture or incinerate container. Contact with rapidly expanding gases or liquids can cause frostbite.
Routes of entry	: Inhalation
Potential acute health effects	
Eyes	: Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns.
Skin	: Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns.
Inhalation	: Acts as a simple asphyxiant.
Ingestion	: Ingestion is not a normal route of exposure for gases. Contact with cryogenic liquid can cause frostbite and cryogenic burns.
Potential chronic health effects	: CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available.
Medical conditions aggravated by over-exposure	: Acute or chronic respiratory conditions may be aggravated by overexposure to this gas.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

<u>Name</u>	<u>CAS number</u>	<u>% Volume</u>	<u>Exposure limits</u>
Helium	7440-59-7	100	Oxygen Depletion [Asphyxiant]

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : None expected.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

- Flammability of the product** : Non-flammable.
- Products of combustion** : No specific data.
- Fire-fighting media and instructions** : Use an extinguishing agent suitable for the surrounding fire.

Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.
Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
Never allow any unprotected part of the body to touch uninsulated pipes or vessels that contain cryogenic liquids. Prevent entrapment of liquid in closed systems or piping without pressure relief devices. Some materials may become brittle at low temperatures and will easily fracture.

Helium

- Storage** : Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).
For additional information concerning storage and handling refer to Compressed Gas Association pamphlets P-1 Safe Handling of Compressed Gases in Containers and P-12 Safe Handling of Cryogenic Liquids available from the Compressed Gas Association, Inc.

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Personal protection

- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

When working with cryogenic liquids, wear a full face shield.

- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Insulated gloves suitable for low temperatures

- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

helium

Oxygen Depletion [Asphyxiant]

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

- Molecular weight** : 4 g/mole
Molecular formula : He
Boiling/condensation point : -268.9°C (-452°F)
Melting/freezing point : -272.2°C (-458°F)
Critical temperature : -267.9°C (-450.2°F)
Vapor density : 0.14 (Air = 1) Liquid Density@BP: 7.8 lb/ft³ (125 kg/m³)
Specific Volume (ft³/lb) : 96.1538
Gas Density (lb/ft³) : 0.0104

Section 10. Stability and reactivity

- Stability and reactivity** : The product is stable.
Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Environmental fate : Not available.



Environmental hazards : No known significant effects or critical hazards.


Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1046	HELIUM, COMPRESSED	2.2	Not applicable (gas).		Limited quantity Yes.
	UN1963	Helium, refrigerated liquid				Packaging instruction Passenger aircraft Quantity limitation: 75 kg Cargo aircraft Quantity limitation: 150 kg
TDG Classification	UN1046	HELIUM, COMPRESSED	2.2	Not applicable (gas).		Explosive Limit and Limited Quantity Index 0.125
	UN1963	Helium, refrigerated liquid				Passenger Carrying Road or Rail Index 75

Helium						
Mexico Classification	UN1046	HELIUM, COMPRESSED	2.2	Not applicable (gas).		-
	UN1963	Helium, refrigerated liquid				

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information

United States

- U.S. Federal regulations

:
United States inventory (TSCA 8b): This material is listed or exempted.
SARA 302/304/311/312 **extremely hazardous substances**: No products were found.
SARA 302/304 **emergency planning and notification**: No products were found.
SARA 302/304/311/312 **hazardous chemicals**: helium
SARA 311/312 **MSDS distribution - chemical inventory - hazard identification**: helium: Sudden release of pressure
Clean Water Act (CWA) **307**: No products were found.
Clean Water Act (CWA) **311**: No products were found.
Clean Air Act (CAA) **112 accidental release prevention**: No products were found.
Clean Air Act (CAA) **112 regulated flammable substances**: No products were found.
Clean Air Act (CAA) **112 regulated toxic substances**: No products were found.
- State regulations

:
Connecticut **Carcinogen Reporting**: This material is not listed.
Connecticut **Hazardous Material Survey**: This material is not listed.
Florida **substances**: This material is not listed.
Illinois **Chemical Safety Act**: This material is not listed.
Illinois **Toxic Substances Disclosure to Employee Act**: This material is not listed.
Louisiana **Reporting**: This material is not listed.
Louisiana **Spill**: This material is not listed.
Massachusetts **Spill**: This material is not listed.
Massachusetts **Substances**: This material is listed.
Michigan **Critical Material**: This material is not listed.
Minnesota **Hazardous Substances**: This material is not listed.
New Jersey **Hazardous Substances**: This material is listed.
New Jersey **Spill**: This material is not listed.
New Jersey **Toxic Catastrophe Prevention Act**: This material is not listed.
New York **Acutely Hazardous Substances**: This material is not listed.
New York **Toxic Chemical Release Reporting**: This material is not listed.
Pennsylvania **RTK Hazardous Substances**: This material is listed.
Rhode Island **Hazardous Substances**: This material is not listed.

Canada

- WHMIS (Canada)

:
Class A: Compressed gas.
CEPA **Toxic substances**: This material is not listed.
Canadian **ARET**: This material is not listed.
Canadian **NPRI**: This material is not listed.
Alberta **Designated Substances**: This material is not listed.
Ontario **Designated Substances**: This material is not listed.
Quebec **Designated Substances**: This material is not listed.

Section 16. Other information

United States

Helium

Label requirements

: GAS:
CONTENTS UNDER PRESURE.
Do not puncture or incinerate container.
Can cause rapid suffocation.
May cause severe frostbite.
LIQUID:
Extremely cold liquid and gas under pressure.
Can cause rapid suffocation.
May cause severe frostbite.

Canada

Label requirements

: Class A: Compressed gas.

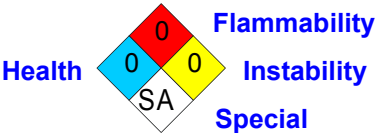
Hazardous Material
Information System (U.S.A.)

Health	1
Flammability	0
Physical hazards	0

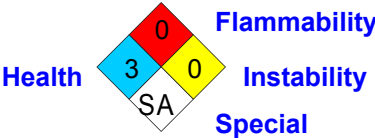
liquid:

Health	3
Fire hazard	0
Reactivity	0
Personal protection	

National Fire Protection
Association (U.S.A.)



liquid:



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Material Safety Data Sheet

Isopropanol

ACC# 95533

Section 1 - Chemical Product and Company Identification

MSDS Name: Isopropanol

Catalog Numbers: AC149320000, AC149320050, AC149320100, AC149320200, AC167880000, AC184130000, AC184130025, AC184130051, AC184130250, AC326960000, AC326960010, AC326961000, AC326962500, AC327270000, AC327270010, AC327930000, AC327930010, AC364400000, AC364400010, AC364401000, AC383910000, AC383910010, AC383910025, AC383920000, AC383920025, AC389710000, AC389710025, AC389710100, AC389710250, AC412790000, AC412790040, AC423830000, AC611110040, 14932-0010, 14932-0025, 14932-0250, 16788-0010, 18413-0010, 41279-5000, 42383-0010, 42383-0040, 42383-0200, 42383-5000, 61008-0040, 61043-1000, A415-20, A415-4, A416-1, A416-20, A416-200, A416-200LC, A416-4, A416-4LC, A416-500, A416FB-115, A416FB-19, A416FB-200, A416FB-50, A416J-500, A416P-4, A416RB-115, A416RB-200, A416RB-50, A416RS-115, A416RS-200, A416RS-28, A416RS-50, A416S-4, A416SK-4, A416SS-115, A416SS-200, A416SS-28, A416SS-50, A417-1, A417-4, A419-1, A419-4, A419RS-115, A419RS-200, A419RS-28, A419SS-115, A419SS-200, A419SS-28, A419SS-50, A426P-4, A426PJ4, A426S-20, A426S-200, A426S-4, A451-1, A451-4, A451CU50, A451J1, A451N219, A451POP19, A451RS-115, A451RS-19, A451RS-200, A451RS-50, A451SK-1, A451SK-4, A451SS-200, A464-4, A464-4LC, A464J4, A464RS-200, A464SK-4, A516-20, A516-200, A516-4, A516-500, A519-4, A520-4, A520RS-200, A520SS-115, A520SS-200, A520SS-28, A520SS-50, A522-20, A522-4, A522SAM1, A522SAM2, A522SAM3, BP2621100, BP2632-4, NC9135800, NC9284977, NC9349372, NC9386241, NC9445090, NC9535770, NC9535771, NC9557098, NC9562752, NC9670945, NC9846796, S77795HPLC, S77795SPEC

Synonyms: Isopropanol; Dimethylcarbinol; sec-Propyl alcohol; Rubbing alcohol; Petrohol; 1-Methylethanol; 1-Methylethyl alcohol; 2-Hydroxypropane; 2-Propyl alcohol; Isopropyl alcohol; Propan-2-ol; IPA; 2-Propanol.

Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100**Emergency Number:** 201-796-7100**For CHEMTREC assistance, call:** 800-424-9300**For International CHEMTREC assistance, call:** 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
67-63-0	2-Propanol	>= 99.5	200-661-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid. Flash Point: 11.7 deg C.

Warning! Flammable liquid and vapor. Causes respiratory tract irritation. Breathing vapors

may cause drowsiness and dizziness. Causes eye irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. Prolonged or repeated contact causes defatting of the skin with irritation, dryness, and cracking. This material has been reported to be susceptible to autoxidation and therefore should be classified as peroxidizable. May cause central nervous system depression. May form explosive peroxides. Hygroscopic (absorbs moisture from the air).

Target Organs: Central nervous system, respiratory system, eyes, skin.

Potential Health Effects

Eye: Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury. May cause transient corneal injury. In the eyes of a rabbit, 0.1 ml of 70% isopropyl alcohol caused conjunctivitis, iritis, and corneal opacity.

Skin: May cause irritation with pain and stinging, especially if the skin is abraded. Isopropanol has a low potential to cause allergic skin reactions; however, rare cases of allergic contact dermatitis have been reported. May be absorbed through intact skin. Dermal absorption has been considered toxicologically insignificant. The cases of deep coma associated with skin contact are thought to be a consequence of gross isopropanol vapor inhalation in rooms with inadequate ventilation, rather than being attributable to percutaneous absorption of isopropanol per se.

Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea. May cause kidney damage. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. The probable oral lethal dose in humans is 240 ml (2696 mg/kg), but ingestion of only 20 ml (224 mg/kg) has caused poisoning.

Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. May cause narcotic effects in high concentration. Causes upper respiratory tract irritation. Inhalation of vapors may cause drowsiness and dizziness.

Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid.

Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.

Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician: Urine acetone test may be helpful in diagnosis. Hemodialysis should be considered in severe intoxication. Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. May form explosive peroxides. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

Extinguishing Media: Water may be ineffective. Do NOT use straight streams of water. For large fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray. For small fires, use carbon dioxide, dry chemical, dry sand, or alcohol-resistant foam. Cool containers with flooding quantities of water until well after fire is out.

Flash Point: 11.7 deg C (53.06 deg F)

Autoignition Temperature: > 350 deg C (> 662.00 deg F)

Explosion Limits, Lower: 2.0 vol %

Upper: 12.7 @ 93°C

NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Use water spray to dilute spill to a non-flammable mixture. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Take precautionary measures against static discharges. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Avoid breathing vapor or mist. Do not allow to evaporate to near dryness.

Storage: Keep away from heat, sparks, and flame. Do not store in direct sunlight. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. After opening, purge container with nitrogen before reclosing. Periodically test for peroxide formation on long-term storage. Addition of water or appropriate reducing materials will lessen peroxide formation. Store protected from moisture. Containers should be dated when opened and tested periodically for the presence of peroxides. Should crystals form in a peroxidizable liquid, peroxidation may have occurred and the product should be considered extremely dangerous. In this instance, the container should only be opened remotely by professionals. All peroxidizable substances should be stored away from heat and light and be protected from ignition sources.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
---------------	-------	-------	-------------------

2-Propanol	200 ppm TWA; 400 ppm STEL	400 ppm TWA; 980 mg/m3 TWA 2000 ppm IDLH (10% LEL)	400 ppm TWA; 980 mg/m3 TWA
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OSHA Vacated PELs: 2-Propanol: 400 ppm TWA; 980 mg/m3 TWA

Personal Protective Equipment

Eyes: Wear chemical splash goggles.

Skin: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: colorless

Odor: alcohol-like

pH: Not available.

Vapor Pressure: 33 mm Hg @ 20 deg C

Vapor Density: 2.1 (Air=1)

Evaporation Rate: 1.7 (n-butyl acetate=1)

Viscosity: 2.27 mPas @ 20C

Boiling Point: 82 deg C @ 760 mmHg

Freezing/Melting Point: -88 deg C

Decomposition Temperature: Not available.

Solubility: Miscible.

Specific Gravity/Density: 0.7850 (water=1)

Molecular Formula: C₃H₈O

Molecular Weight: 60.1

Section 10 - Stability and Reactivity

Chemical Stability: Under normal storage conditions, peroxidizable compounds can form and accumulate peroxides which may explode when subjected to heat or shock. This material is most hazardous when peroxide levels are concentrated by distillation or evaporation. Isopropanol is susceptible to autoxidation and therefore should be classified as peroxidizable.

Conditions to Avoid: Light, ignition sources, excess heat, exposure to moist air or water.

Incompatibilities with Other Materials: Strong oxidizing agents, strong acids, strong bases, amines, ammonia, ethylene oxide, isocyanates, acetaldehyde, chlorine, phosgene, Attacks some forms of plastics, rubbers, and coatings., aluminum at high temperatures.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:

CAS# 67-63-0: NT8050000

LD50/LC50:

CAS# 67-63-0:

Draize test, rabbit, eye: 100 mg Severe;
 Draize test, rabbit, eye: 10 mg Moderate;
 Draize test, rabbit, eye: 100 mg/24H Moderate;
 Draize test, rabbit, skin: 500 mg Mild;
 Inhalation, mouse: LC50 = 53000 mg/m³;
 Inhalation, rat: LC50 = 16000 ppm/8H;
 Inhalation, rat: LC50 = 72600 mg/m³;
 Oral, mouse: LD50 = 3600 mg/kg;
 Oral, mouse: LD50 = 3600 mg/kg;
 Oral, rabbit: LD50 = 6410 mg/kg;
 Oral, rat: LD50 = 5045 mg/kg;
 Oral, rat: LD50 = 5000 mg/kg;
 Skin, rabbit: LD50 = 12800

Carcinogenicity:

CAS# 67-63-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found**Teratogenicity:** A rat & rabbit developmental toxicity study showed no teratogenic effects at doses that were clearly maternally toxic. In a separate rat study, no evidence of developmental neurotoxicity was associated with gestational exposures to IPA up to 1200 mg/kg/d.**Reproductive Effects:** See actual entry in RTECS for complete information.**Mutagenicity:** See actual entry in RTECS for complete information.**Neurotoxicity:** In rats exposed to isopropanol by inhalation, acute neurotoxicity was noted at 1 and 6 hours at 5000 ppm, but only minimal effects were seen at 1500 ppm and the animals recovered within 5 hours. No toxicity was noted at 500 ppm.**Other Studies:**

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: >1000 ppm; 96h; LC50Daphnia: >1000 ppm; 96h; LC50Fish: Gold orfe: 8970-9280 ppm; 48h; LC50 IPA has a high biochemical oxygen demand and a potential to cause oxygen depletion in aqueous systems, a low potential to affect aquatic organisms, a low potential to affect secondary waste treatment microbial metabolism, a low potential to affect the germination of some plants, a high potential to biodegrade (low persistence) with unacclimated microorganisms from activated sludge.

Environmental: No information available.**Physical:** THOD: 2.40 g oxygen/gCOD: 2.23 g oxygen/gBOD-5: 1.19-1.72 g oxygen/g**Other:** No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.**RCRA U-Series:** None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	ISOPROPANOL	ISOPROPANOL
Hazard Class:	3	3
UN Number:	UN1219	UN1219
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 67-63-0 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 67-63-0: Effective 12/15/86, Sunset 12/15/96

Chemical Test Rules

CAS# 67-63-0: 40 CFR 799.2325

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 67-63-0: immediate, delayed, fire.

Section 313

This material contains 2-Propanol (CAS# 67-63-0, $\geq 99.5\%$), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 67-63-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XI F

Risk Phrases:

- R 11 Highly flammable.
- R 36 Irritating to eyes.
- R 67 Vapours may cause drowsiness and dizziness.

Safety Phrases:

- S 16 Keep away from sources of ignition - No smoking.
- S 24/25 Avoid contact with skin and eyes.
- S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- S 7 Keep container tightly closed.

WGK (Water Danger/Protection)

CAS# 67-63-0: 1

Canada - DSL/NDSL

CAS# 67-63-0 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 67-63-0 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information
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MSDS Creation Date: 7/27/1999

Revision #17 Date: 2/18/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

FIGURE 1
EXAMPLE FIELD DATA SHEET

**EXAMPLE
FIELD DATA SHEET
FOR INDOOR AIR SAMPLING METHODS**

Date/Temperature/Weather: _____ Site/Facility Address: _____

Time: _____ Project No.: _____

Barometric Pressure: _____

Summa Canister Information: _____

Sampling location and height: _____

Start Pressure/Time: _____

End Pressure/Time: _____

Description of location: _____

Sample relinquished by: _____ Date/Time: _____

Sample received by: _____ Date/Time: _____

Attach field copy of sample label or write in sample number:

Notes: _____

1.0 BACKGROUND

Indoor air and ambient (outdoor) air samples can be collected using several methods which are described in the Indoor Air Sampling Methods standard operating procedure (SOP). Performing the indoor air and ambient air sampling concurrently allows the differentiation of background contamination from outdoor air. This SOP presents sample collection procedures for collecting indoor air and ambient air samples while vapor mitigation systems (VMS) are operating at each of the residences, as well as after an equilibration period (while VMS is off). A sampling port will be installed on the exterior of the building to sample indoor air without entering the residence. A valve and fitting will be installed to allow for collection indoor air into sampling apparatus, without allowing outdoor air into the building. Additionally, a power switch will be placed within a locked box on the exterior of the residence to allow the VMS to be turned on and off by sampling personnel without entering the residence.

1.1 PURPOSE

The purpose of this SOP is to provide guidance for collection of indoor and ambient air samples while VMS systems are operating, as well as sampling indoor air and ambient air after an equilibration period (while VMS is off).

1.2 SCOPE

This SOP applies to all personnel collecting indoor and ambient air samples. The site-specific work plan and sampling plan should be followed during air sampling activities.

1.3 DEFINITIONS

Ambient Air: The gases or atmosphere outside of buildings.

Indoor Air: The gases or atmosphere inside buildings. These gases may all be of natural origin, but manmade contaminants or byproducts may be present in detectable quantities.

Summa Canister: a stainless steel electropolished (or "summa" polished) passivated (non-reactive) vessel used to collect a whole air sample.

1.4 REQUIREMENTS AND RESOURCES

When using Summa canisters to collect indoor air, the following items are needed:

- A supply of laboratory certified clean, evacuated Summa canisters with a pressure gauge to verify internal pressure and a flow controller (integrated flow controller pressure gauge may be used).
- Tygon[®] or equivalent tubing of appropriate size for connecting the sampling port to the Summa canister (during sample collection).
- Swagelok “T” fitting for duplicate sample collection.
- Leak check compounds such as isopropanol, butane, helium, or 1,1-difluoroethane. Material Safety Data Sheets are attached in Appendix A for each compound because indoor air will be sampled from a point on the exterior of each residence.

2.0 PROCEDURES

This section describes how indoor and ambient air samples are collected, while ensuring the VMS is operating, as well as after an equilibration period when the VMS is off. Access to the inside of the residence is not required because an indoor air sampling port will be installed on the exterior wall of the residence during the VMS installation. This section also provides detailed procedures for collecting samples using Summa canisters. Finally, this section discusses additional considerations that may affect indoor air sampling — including duplicate sample collection, decontamination, and sample transfer.

2.1 VMS OPERATION SAMPLES

Prior to indoor and ambient air sampling, the VMS system should be inspected to ensure the fan is operating as designed. A VMS power switch will be located in a locked box on the exterior of the residence and can be turned on or off as needed during the sampling event; however, the system should be operating at all times. This will ensure that indoor air data collected are representative of residences while VMS are operating. This will allow the sampling to continue without entry into the residence.

2.2 INDOOR AIR SAMPLING

The indoor air will be collected from the indoor air sampling point located on the exterior wall of each residence. Tygon[®] or tubing similar will be connected to the indoor air sampling point. The sampling will follow procedures included in the Indoor Air Sampling Methods SOP.

2.3 AMBIENT AIR SAMPLING

Ambient air will be collected outdoors, adjacent to the exterior of the residence to establish baseline data to be compared to indoor air data. Performing the indoor air and ambient air sampling concurrently allows the differentiation of background contamination from outdoor air. Samples will be collected from a point approximately 2 to 3 feet above ground surface, preferably away from heavy traffic and upwind, and collected using the equipment and techniques described in the Indoor Air Sampling Methods SOP, dependent on the sampling device used.

2.4 INDOOR AND AMBIENT AIR SAMPLING AFTER EQUILIBRATION PERIOD

Indoor air and ambient air samples will also be collected after an equilibration period (while the VMS system is shut off). This data will allow the District to determine how effectively the VMS system is operating by comparing sampling data during operation of the VMS to data collected while the VMS is

Title: **Air Sampling Methods While VMS Operating and After Equilibration**

off. The process is similar to that followed for sampling indoor and ambient air while the VMS is turned on, with the exception of asking the resident to turn off the VMS for at least 24 hours prior to the collection of the equilibration indoor air samples. Letters should be sent to residents prior to the collection of equilibration samples to inform them the VMS system should be turned off during the potential dates of sampling. If the VMS is not off when sampling personnel arrive, personnel will be able to turn off the VMS from the switch located on the exterior of the residence. The sampling event will be postponed for 24 hours for equilibrium to occur. This will allow the sampling to continue without entering the residence.

2.5 SAMPLE COLLECTION USING SUMMA CANISTERS

Indoor and ambient air samples shall be collected for chemical analysis in a laboratory certified clean stainless steel, evacuated canister, or Summa canister.

The canister sampling train is connected directly to the purged Tygon® or equivalent sampling tube. To prevent ambient air from entering the canister during sample collection, all connections must be airtight. To collect indoor and ambient air samples using this method, the following procedures are used:

1. Confirm the valve is closed and remove the brass cap. Attach the pressure gauge and flow controller (integrated system) to the canister. Attach the tube to the sample train with Tygon® or equivalent tubing.
2. Record the canister pressure reading and time. Then, open the canister valve, which will allow the evacuated (under vacuum) canister to draw-in air.
3. Monitor sampling progress periodically. When target sample collection time of 8 hours has been reached, close the canister valve and record the time and post-sampling pressure reading on the canister pressure valve.

WARNING: a residual vacuum of approximately 5 inches of mercury should remain in the canister at the completion of the sampling event. If no residual vacuum is recorded, the data collected from this summa canister may not be representative of the site actual conditions.

4. Remove the canister from the sample train and replace the brass cap.
5. Follow the leak check procedures described in Section 2.7.
6. Label the canister and its corresponding field data sheet (Figure 1) with the sample number.
7. Complete the field data sheet and sample chain of custody.

Title: **Air Sampling Methods While VMS Operating and After Equilibration**

8. Ship samples to the laboratory for analysis. Summa samples do not need to be chilled after collection or during transportation.

2.6 DUPLICATE SAMPLE COLLECTION

Duplicate indoor air samples will be collected at each site as required in the site-specific quality assurance project plan and field sampling plan. Each duplicate is collected in conjunction with a corresponding environmental sample. Generally, one duplicate sample will be collected for every ten samples (every tenth residence) collected.

To collect duplicate samples in canisters, a Swagelok “T” will be connected to two canisters. Purging and sample collection will proceed as described above. After collection, one sample will be labeled as the environmental sample and one as the duplicate.

2.7 LEAK CHECK PROCEDURES

Leakage during indoor air sampling may dilute samples with ambient air and produce results that underestimate the actual site concentrations, or may contaminate the sample with external contaminants. Leak tests should be conducted to determine whether leakage is occurring. Leak detection is performed using the following procedures:

1. Leak tests should be conducted at every indoor air sampling location.
2. Tracer compounds such as isopropanol, butane, helium, or 1,1-difluoroethane may be used as leak check compounds. These compounds may be contained in common products such as Dust-Off and rubbing alcohol. Ensure the tracer compound used does not contain chemicals or impurities that may be present as a site contaminant.
3. Place tracer compounds around all connections in the aboveground sampling system train. Tracer compound is emplaced by wetting or spraying a paper towel or rag and wrapping around the area of the connection where leaks could occur.
4. Collect samples as describe in previous sections and use analytical results to determine if the tracer compound has leaked into the sample.

2.8 DECONTAMINATION

All canisters should be provided as laboratory certified clean specified by appropriate EPA methods.

Title: **Air Sampling Methods While VMS Operating and After Equilibration**

If Y-branched tubing or any other sampling equipment is to be reused, it must also be decontaminated between sampling locations.

2.9 SAMPLE TRANSFER

After collection, each sample container will be transported to the designated laboratory for analysis.

3.0 CAUTIONS

Variations in temperature, pressure, and moisture content of the air being sampled have a great effect on how samples are collected. Extremes in these conditions can compromise sample integrity and cause problems with sample collection. Summa canisters are designed to collect samples at near ambient temperature and should not be subjected to temperatures above 100°C or below 0°C. In addition, severe temperature swings will affect the flow rate of flow controllers, and should be avoided. The altitude at which samples are collected affects the local barometric pressure, which in turn affects gauge vacuum and pressure readings. A canister gauge that reads -29.9” mercury (Hg) at sea level will read -25” Hg at 5,000 feet elevation because gauges are calibrated to read at sea level. Generally speaking, every 1,000-foot rise in elevation results in a 1” drop in gauge pressure. Indoor air samples should not be subjected to changes in ambient pressure. Samples to be analyzed off site should not be shipped by air. If condensation is observed in the sample container, the sample should be discarded and a new sample collected.

Residents are not required to be present at the time of indoor air sampling. Tetra Tech will contact residents approximately one week prior to sampling activities. In addition, Tetra Tech personnel will ring the doorbell on the day of sampling activities of each residence to attempt to inform the resident of activities occurring. If residents or other members of the community become obstinate, personnel should refer them to the toll-free Riggs Park voice message service at 1-855-384-0092 or email address at RiggsParkVMS@tetrattech.com. A response will be returned to them within two business days. If residents do not allow access, note it and report it to the District

APPENDIX A
MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheet



1,1-Difluoroethane (Halocarbon 152A)

Section 1. Chemical product and company identification

Product name	: 1,1-Difluoroethane (Halocarbon 152A)
Supplier	: AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	: Synthetic/Analytical chemistry.
Synonym	: algofrene type 67; difluoroethane; ethylene fluoride; ethylidene difluoride; ethylidene fluoride; fc 152a; genetron 100; genetron 152a; ethene, 1,1-trifluoro
MSDS #	: 001090
Date of Preparation/Revision	: 4/23/2010.
In case of emergency	: 1-866-734-3438

Section 2. Hazards identification

Physical state	: Gas. [COLORLESS]
Emergency overview	: WARNING! FLAMMABLE GAS. MAY CAUSE FLASH FIRE. CONTENTS UNDER PRESSURE. Keep away from heat, sparks and flame. Do not puncture or incinerate container. Use only with adequate ventilation. Keep container closed. Contact with rapidly expanding gases can cause frostbite.
Routes of entry	: Inhalation
Potential acute health effects	
Eyes	: Contact with rapidly expanding gas may cause burns or frostbite.
Skin	: Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	: Acts as a simple asphyxiant.
Ingestion	: Ingestion is not a normal route of exposure for gases
Potential chronic health effects	: CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available.
Medical conditions aggravated by over-exposure	: Acute or chronic respiratory conditions may be aggravated by overexposure to this gas.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

<u>Name</u>	<u>CAS number</u>	<u>% Volume</u>	<u>Exposure limits</u>
1,1-Difluoroethane (Halocarbon 152A)	75-37-6	100	AIHA WEEL (United States, 1/2009). TWA: 1000 ppm 8 hour(s).

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

- Flammability of the product** : Flammable.
- Flammable limits** : Lower: 3.7% Upper: 18%
- Products of combustion** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds
carbonyl halides
- Fire-fighting media and instructions** : In case of fire, use water spray (fog), foam or dry chemical.
- In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.
- Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

1,1-Difluoroethane (Halocarbon 152A)

- Storage** : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Personal protection

- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

1,1-difluoroethane

AIHA WEEL (United States, 1/2009).
TWA: 1000 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

- Molecular weight** : 66.06 g/mole
- Molecular formula** : C₂H₄F₂
- Boiling/condensation point** : 11.3°C (52.3°F)
- Melting/freezing point** : -117°C (-178.6°F)
- Critical temperature** : 113.5°C (236.3°F)
- Vapor pressure** : 63 (psig)
- Vapor density** : 2.4 (Air = 1)
- Specific Volume (ft³/lb)** : 5.8514
- Gas Density (lb/ft³)** : 0.1709

Section 10. Stability and reactivity

- Stability and reactivity** : The product is stable.
- Incompatibility with various substances** : Extremely reactive or incompatible with the following materials: oxidizing materials.
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
- Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name

1,1-difluoroethane

Result

LDLo Oral

Species

Rat

Dose

>1500 mg/kg

Exposure

-

Other toxic effects on humans

: No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects

: No known significant effects or critical hazards.

Mutagenic effects

: No known significant effects or critical hazards.

Reproduction toxicity

: No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Products of degradation

: Products of degradation: carbon oxides (CO, CO₂) and water, halogenated compounds.

Environmental fate

: Not available.

Environmental hazards

: No known significant effects or critical hazards.



Toxicity to the environment

: Not available.


Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1030	1,1-DIFLUOROETHANE OR REFRIGERANT GAS R 152A	2.1	Not applicable (gas).		Limited quantity Yes. Packaging instruction Passenger aircraft Quantity limitation: Forbidden. Cargo aircraft Quantity limitation: 150 kg Special provisions T50
TDG Classification	UN1030	1,1-DIFLUOROETHANE; OR REFRIGERANT GAS R 152A	2.1	Not applicable (gas).		Explosive Limit and Limited Quantity Index 0.125 ERAP Index

1,1-Difluoroethane (Halocarbon 152A)

						3000 Passenger Carrying Road or Rail Index Forbidden
Mexico Classification	UN1030	1,1- DIFLUOROETHANE OR REFRIGERANT GAS R 152A	2.1	Not applicable (gas).		-

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information

United States

U.S. Federal regulations

United States inventory (TSCA 8b): This material is listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: 1,1-difluoroethane
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: 1,1-difluoroethane: Fire hazard, Sudden release of pressure, Delayed (chronic) health hazard
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.
Clean Air Act (CAA) 112 accidental release prevention: 1,1-difluoroethane
Clean Air Act (CAA) 112 regulated flammable substances: 1,1-difluoroethane
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

State regulations

Connecticut Carcinogen Reporting: This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is not listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is not listed.
Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada)

Class A: Compressed gas.
Class B-1: Flammable gas.
CEPA Toxic substances: This material is listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Label requirements : FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
CONTENTS UNDER PRESSURE.

Canada

Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.

Hazardous Material Information System (U.S.A.)

Health	1
Flammability	4
Physical hazards	0

National Fire Protection Association (U.S.A.)



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet



N-Butane

Section 1. Chemical product and company identification

Product name	: N-Butane
Supplier	: AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	: Synthetic/Analytical chemistry.
Synonym	: n-Butane; Diethyl; Freon 600; Liquefied petroleum gas; LPG; n-C ₄ H ₁₀ ; Butanen; Butani; Methylethylmethane; UN 1011; UN 1075; A-17; Bu-Gas.
MSDS #	: 001007
Date of Preparation/Revision	: 11/10/2010.
In case of emergency	: 1-866-734-3438

Section 2. Hazards identification

Physical state	: Gas. [COLORLESS LIQUEFIED COMPRESS GAS WITH GASOLINE-LIKE ODOR.]
Emergency overview	: WARNING! FLAMMABLE GAS. MAY CAUSE FLASH FIRE. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CONTENTS UNDER PRESSURE. Keep away from heat, sparks and flame. Do not puncture or incinerate container. May cause target organ damage, based on animal data. Use only with adequate ventilation. Keep container closed. Contact with rapidly expanding gases can cause frostbite.
Target organs	: May cause damage to the following organs: central nervous system (CNS).
Routes of entry	: Inhalation
Potential acute health effects	
Eyes	: Contact with rapidly expanding gas may cause burns or frostbite.
Skin	: Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	: Acts as a simple asphyxiant.
Ingestion	: Ingestion is not a normal route of exposure for gases
Potential chronic health effects	: CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available.
Medical conditions aggravated by over-exposure	: Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

<u>Name</u>	<u>CAS number</u>	<u>% Volume</u>	<u>Exposure limits</u>
N-Butane	106-97-8	100	ACGIH TLV (United States, 2/2010). TWA: 1000 ppm 8 hour(s). NIOSH REL (United States, 6/2009). TWA: 1900 mg/m ³ 10 hour(s). TWA: 800 ppm 10 hour(s). OSHA PEL 1989 (United States, 3/1989). TWA: 1900 mg/m ³ 8 hour(s). TWA: 800 ppm 8 hour(s).

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

- Flammability of the product** : Flammable.
- Auto-ignition temperature** : 286.85°C (548.3°F)
- Flash point** : Closed cup: -60.15°C (-76.3°F).
- Flammable limits** : Lower: 1.6% Upper: 8.5%
- Products of combustion** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
- Fire hazards in the presence of various substances** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.
- Fire-fighting media and instructions** : In case of fire, use water spray (fog), foam or dry chemical.
- In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.
- Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
- Storage** : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.
- Personal protection**
- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
- The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

Butane

ACGIH TLV (United States, 2/2010).

TWA: 1000 ppm 8 hour(s).

NIOSH REL (United States, 6/2009).TWA: 1900 mg/m³ 10 hour(s).

TWA: 800 ppm 10 hour(s).

OSHA PEL 1989 (United States, 3/1989).TWA: 1900 mg/m³ 8 hour(s).

TWA: 800 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

- Molecular weight** : 58.14 g/mole
- Molecular formula** : C₄-H₁₀
- Boiling/condensation point** : -0.6°C (30.9°F)
- Melting/freezing point** : -135.4°C (-211.7°F)
- Critical temperature** : 151.9°C (305.4°F)
- Vapor pressure** : 16.3 (psig)
- Vapor density** : 2 (Air = 1)

N-Butane

Specific Volume (ft ³/lb) : 6.435
Gas Density (lb/ft ³) : 0.1554

Section 10. Stability and reactivity

Stability and reactivity : The product is stable.
Incompatibility with various substances : Extremely reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure
Butane	LC50 Inhalation Vapor	Rat	658000 mg/m3	4 hours

Chronic effects on humans : May cause damage to the following organs: central nervous system (CNS).
Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.
Mutagenic effects : No known significant effects or critical hazards.
Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity


Not available.

Products of degradation : Products of degradation: carbon oxides (CO, CO₂) and water.
Environmental fate : Not available.
Environmental hazards : No known significant effects or critical hazards.
Toxicity to the environment : Not available.



Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation.Return cylinders with residual product to Airgas, Inc.Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1011	BUTANE	2.1	Not applicable (gas).		Limited quantity Yes. Packaging instruction Passenger aircraft Quantity limitation: Forbidden. Cargo aircraft Quantity limitation:

N-Butane

						150 kg Special provisions 19, T50
TDG Classification	UN1011	BUTANE	2.1	Not applicable (gas).		Explosive Limit and Limited Quantity Index 0.125 ERAP Index 3000 Passenger Carrying Ship Index Forbidden Passenger Carrying Road or Rail Index Forbidden Special provisions 29
Mexico Classification	UN1011	BUTANE	2.1	Not applicable (gas).		-

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information**United States****U.S. Federal regulations**

United States inventory (TSCA 8b): This material is listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Butane
SARA 311/312 MSDS distribution - chemical inventory - hazard identification:
Butane: Fire hazard, Sudden release of pressure
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.
Clean Air Act (CAA) 112 accidental release prevention: Butane
Clean Air Act (CAA) 112 regulated flammable substances: Butane
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

State regulations

Connecticut Carcinogen Reporting: This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.

N-Butane

Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is not listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada)

: Class A: Compressed gas.
Class B-1: Flammable gas.
CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Label requirements

: FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CONTENTS UNDER PRESSURE.

Canada

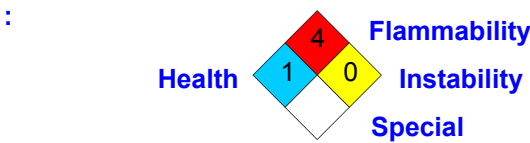
Label requirements

: Class A: Compressed gas.
Class B-1: Flammable gas.

**Hazardous Material
Information System (U.S.A.)**

Health	*	1
Flammability		4
Physical hazards		0

**National Fire Protection
Association (U.S.A.)**



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet



Helium

Section 1. Chemical product and company identification

Product name	: Helium
Supplier	: AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	: Synthetic/Analytical chemistry.
Synonym	: helium (dot); Helium-4; He; o-Helium; UN 1046; UN 1963; Liquid Helium; Helium, Refrigerated Liquid
MSDS #	: 001025
Date of Preparation/Revision	: 8/27/2010.
In case of emergency	: 1-866-734-3438

Section 2. Hazards identification

Physical state	: Gas. [Colorless, Odorless Gas, Cryogenic liquid and gas]
Emergency overview	: WARNING! GAS: CONTENTS UNDER PRESURE. Do not puncture or incinerate container. Can cause rapid suffocation. May cause severe frostbite. LIQUID: Extremely cold liquid and gas under pressure. Can cause rapid suffocation. May cause severe frostbite. Do not puncture or incinerate container. Contact with rapidly expanding gases or liquids can cause frostbite.
Routes of entry	: Inhalation
Potential acute health effects	
Eyes	: Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns.
Skin	: Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns.
Inhalation	: Acts as a simple asphyxiant.
Ingestion	: Ingestion is not a normal route of exposure for gases. Contact with cryogenic liquid can cause frostbite and cryogenic burns.
Potential chronic health effects	: CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available.
Medical conditions aggravated by over-exposure	: Acute or chronic respiratory conditions may be aggravated by overexposure to this gas.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

<u>Name</u>	<u>CAS number</u>	<u>% Volume</u>	<u>Exposure limits</u>
Helium	7440-59-7	100	Oxygen Depletion [Asphyxiant]

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : None expected.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

- Flammability of the product** : Non-flammable.
- Products of combustion** : No specific data.
- Fire-fighting media and instructions** : Use an extinguishing agent suitable for the surrounding fire.

Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.
Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
Never allow any unprotected part of the body to touch uninsulated pipes or vessels that contain cryogenic liquids. Prevent entrapment of liquid in closed systems or piping without pressure relief devices. Some materials may become brittle at low temperatures and will easily fracture.

Helium

- Storage** : Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).
For additional information concerning storage and handling refer to Compressed Gas Association pamphlets P-1 Safe Handling of Compressed Gases in Containers and P-12 Safe Handling of Cryogenic Liquids available from the Compressed Gas Association, Inc.

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Personal protection

- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

When working with cryogenic liquids, wear a full face shield.

- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Insulated gloves suitable for low temperatures

- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

helium

Oxygen Depletion [Asphyxiant]

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

- Molecular weight** : 4 g/mole
Molecular formula : He
Boiling/condensation point : -268.9°C (-452°F)
Melting/freezing point : -272.2°C (-458°F)
Critical temperature : -267.9°C (-450.2°F)
Vapor density : 0.14 (Air = 1) Liquid Density@BP: 7.8 lb/ft³ (125 kg/m³)
Specific Volume (ft³/lb) : 96.1538
Gas Density (lb/ft³) : 0.0104

Section 10. Stability and reactivity

- Stability and reactivity** : The product is stable.
Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Environmental fate : Not available.



Environmental hazards : No known significant effects or critical hazards.


Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1046	HELIUM, COMPRESSED	2.2	Not applicable (gas).		Limited quantity Yes.
	UN1963	Helium, refrigerated liquid				Packaging instruction Passenger aircraft Quantity limitation: 75 kg Cargo aircraft Quantity limitation: 150 kg
TDG Classification	UN1046	HELIUM, COMPRESSED	2.2	Not applicable (gas).		Explosive Limit and Limited Quantity Index 0.125
	UN1963	Helium, refrigerated liquid				Passenger Carrying Road or Rail Index 75

Helium						
Mexico Classification	UN1046	HELIUM, COMPRESSED	2.2	Not applicable (gas).		-
	UN1963	Helium, refrigerated liquid				

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information

United States

- U.S. Federal regulations

: United States inventory (TSCA 8b): This material is listed or exempted.
 SARA 302/304/311/312 extremely hazardous substances: No products were found.
 SARA 302/304 emergency planning and notification: No products were found.
 SARA 302/304/311/312 hazardous chemicals: helium
 SARA 311/312 MSDS distribution - chemical inventory - hazard identification: helium: Sudden release of pressure
 Clean Water Act (CWA) 307: No products were found.
 Clean Water Act (CWA) 311: No products were found.
 Clean Air Act (CAA) 112 accidental release prevention: No products were found.
 Clean Air Act (CAA) 112 regulated flammable substances: No products were found.
 Clean Air Act (CAA) 112 regulated toxic substances: No products were found.
- State regulations

: Connecticut Carcinogen Reporting: This material is not listed.
 Connecticut Hazardous Material Survey: This material is not listed.
 Florida substances: This material is not listed.
 Illinois Chemical Safety Act: This material is not listed.
 Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
 Louisiana Reporting: This material is not listed.
 Louisiana Spill: This material is not listed.
 Massachusetts Spill: This material is not listed.
 Massachusetts Substances: This material is listed.
 Michigan Critical Material: This material is not listed.
 Minnesota Hazardous Substances: This material is not listed.
 New Jersey Hazardous Substances: This material is listed.
 New Jersey Spill: This material is not listed.
 New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
 New York Acutely Hazardous Substances: This material is not listed.
 New York Toxic Chemical Release Reporting: This material is not listed.
 Pennsylvania RTK Hazardous Substances: This material is listed.
 Rhode Island Hazardous Substances: This material is not listed.

Canada

- WHMIS (Canada)

: Class A: Compressed gas.
 CEPA Toxic substances: This material is not listed.
 Canadian ARET: This material is not listed.
 Canadian NPRI: This material is not listed.
 Alberta Designated Substances: This material is not listed.
 Ontario Designated Substances: This material is not listed.
 Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Helium

Label requirements

: GAS:
CONTENTS UNDER PRESURE.
Do not puncture or incinerate container.
Can cause rapid suffocation.
May cause severe frostbite.
LIQUID:
Extremely cold liquid and gas under pressure.
Can cause rapid suffocation.
May cause severe frostbite.

Canada

Label requirements

: Class A: Compressed gas.

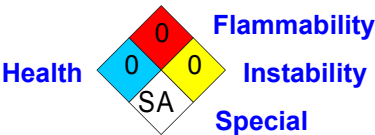
Hazardous Material
Information System (U.S.A.)

Health	1
Flammability	0
Physical hazards	0

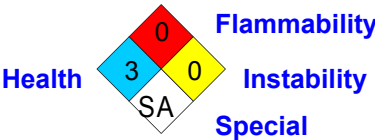
liquid:

Health	3
Fire hazard	0
Reactivity	0
Personal protection	

National Fire Protection
Association (U.S.A.)



liquid:



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

Isopropanol

ACC# 95533

Section 1 - Chemical Product and Company Identification

MSDS Name: Isopropanol

Catalog Numbers: AC149320000, AC149320050, AC149320100, AC149320200, AC167880000, AC184130000, AC184130025, AC184130051, AC184130250, AC326960000, AC326960010, AC326961000, AC326962500, AC327270000, AC327270010, AC327930000, AC327930010, AC364400000, AC364400010, AC364401000, AC383910000, AC383910010, AC383910025, AC383920000, AC383920025, AC389710000, AC389710025, AC389710100, AC389710250, AC412790000, AC412790040, AC423830000, AC611110040, 14932-0010, 14932-0025, 14932-0250, 16788-0010, 18413-0010, 41279-5000, 42383-0010, 42383-0040, 42383-0200, 42383-5000, 61008-0040, 61043-1000, A415-20, A415-4, A416-1, A416-20, A416-200, A416-200LC, A416-4, A416-4LC, A416-500, A416FB-115, A416FB-19, A416FB-200, A416FB-50, A416J-500, A416P-4, A416RB-115, A416RB-200, A416RB-50, A416RS-115, A416RS-200, A416RS-28, A416RS-50, A416S-4, A416SK-4, A416SS-115, A416SS-200, A416SS-28, A416SS-50, A417-1, A417-4, A419-1, A419-4, A419RS-115, A419RS-200, A419RS-28, A419SS-115, A419SS-200, A419SS-28, A419SS-50, A426P-4, A426PJ4, A426S-20, A426S-200, A426S-4, A451-1, A451-4, A451CU50, A451J1, A451N219, A451POP19, A451RS-115, A451RS-19, A451RS-200, A451RS-50, A451SK-1, A451SK-4, A451SS-200, A464-4, A464-4LC, A464J4, A464RS-200, A464SK-4, A516-20, A516-200, A516-4, A516-500, A519-4, A520-4, A520RS-200, A520SS-115, A520SS-200, A520SS-28, A520SS-50, A522-20, A522-4, A522SAM1, A522SAM2, A522SAM3, BP2621100, BP2632-4, NC9135800, NC9284977, NC9349372, NC9386241, NC9445090, NC9535770, NC9535771, NC9557098, NC9562752, NC9670945, NC9846796, S77795HPLC, S77795SPEC

Synonyms: Isopropanol; Dimethylcarbinol; sec-Propyl alcohol; Rubbing alcohol; Petrohol; 1-Methylethanol; 1-Methylethyl alcohol; 2-Hydroxypropane; 2-Propyl alcohol; Isopropyl alcohol; Propan-2-ol; IPA; 2-Propanol.

Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100**Emergency Number:** 201-796-7100**For CHEMTREC assistance, call:** 800-424-9300**For International CHEMTREC assistance, call:** 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
67-63-0	2-Propanol	>= 99.5	200-661-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid. Flash Point: 11.7 deg C.

Warning! Flammable liquid and vapor. Causes respiratory tract irritation. Breathing vapors

may cause drowsiness and dizziness. Causes eye irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. Prolonged or repeated contact causes defatting of the skin with irritation, dryness, and cracking. This material has been reported to be susceptible to autoxidation and therefore should be classified as peroxidizable. May cause central nervous system depression. May form explosive peroxides. Hygroscopic (absorbs moisture from the air).

Target Organs: Central nervous system, respiratory system, eyes, skin.

Potential Health Effects

Eye: Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury. May cause transient corneal injury. In the eyes of a rabbit, 0.1 ml of 70% isopropyl alcohol caused conjunctivitis, iritis, and corneal opacity.

Skin: May cause irritation with pain and stinging, especially if the skin is abraded. Isopropanol has a low potential to cause allergic skin reactions; however, rare cases of allergic contact dermatitis have been reported. May be absorbed through intact skin. Dermal absorption has been considered toxicologically insignificant. The cases of deep coma associated with skin contact are thought to be a consequence of gross isopropanol vapor inhalation in rooms with inadequate ventilation, rather than being attributable to percutaneous absorption of isopropanol per se.

Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea. May cause kidney damage. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. The probable oral lethal dose in humans is 240 ml (2696 mg/kg), but ingestion of only 20 ml (224 mg/kg) has caused poisoning.

Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. May cause narcotic effects in high concentration. Causes upper respiratory tract irritation. Inhalation of vapors may cause drowsiness and dizziness.

Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid.

Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.

Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician: Urine acetone test may be helpful in diagnosis. Hemodialysis should be considered in severe intoxication. Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. May form explosive peroxides. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

Extinguishing Media: Water may be ineffective. Do NOT use straight streams of water. For large fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray. For small fires, use carbon dioxide, dry chemical, dry sand, or alcohol-resistant foam. Cool containers with flooding quantities of water until well after fire is out.

Flash Point: 11.7 deg C (53.06 deg F)

Autoignition Temperature: > 350 deg C (> 662.00 deg F)

Explosion Limits, Lower: 2.0 vol %

Upper: 12.7 @ 93°C

NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Use water spray to dilute spill to a non-flammable mixture. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Take precautionary measures against static discharges. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Avoid breathing vapor or mist. Do not allow to evaporate to near dryness.

Storage: Keep away from heat, sparks, and flame. Do not store in direct sunlight. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. After opening, purge container with nitrogen before reclosing. Periodically test for peroxide formation on long-term storage. Addition of water or appropriate reducing materials will lessen peroxide formation. Store protected from moisture. Containers should be dated when opened and tested periodically for the presence of peroxides. Should crystals form in a peroxidizable liquid, peroxidation may have occurred and the product should be considered extremely dangerous. In this instance, the container should only be opened remotely by professionals. All peroxidizable substances should be stored away from heat and light and be protected from ignition sources.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
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2-Propanol	200 ppm TWA; 400 ppm STEL	400 ppm TWA; 980 mg/m3 TWA 2000 ppm IDLH (10% LEL)	400 ppm TWA; 980 mg/m3 TWA
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OSHA Vacated PELs: 2-Propanol: 400 ppm TWA; 980 mg/m3 TWA

Personal Protective Equipment

Eyes: Wear chemical splash goggles.

Skin: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: colorless

Odor: alcohol-like

pH: Not available.

Vapor Pressure: 33 mm Hg @ 20 deg C

Vapor Density: 2.1 (Air=1)

Evaporation Rate: 1.7 (n-butyl acetate=1)

Viscosity: 2.27 mPas @ 20C

Boiling Point: 82 deg C @ 760 mmHg

Freezing/Melting Point: -88 deg C

Decomposition Temperature: Not available.

Solubility: Miscible.

Specific Gravity/Density: 0.7850 (water=1)

Molecular Formula: C₃H₈O

Molecular Weight: 60.1

Section 10 - Stability and Reactivity

Chemical Stability: Under normal storage conditions, peroxidizable compounds can form and accumulate peroxides which may explode when subjected to heat or shock. This material is most hazardous when peroxide levels are concentrated by distillation or evaporation. Isopropanol is susceptible to autoxidation and therefore should be classified as peroxidizable.

Conditions to Avoid: Light, ignition sources, excess heat, exposure to moist air or water.

Incompatibilities with Other Materials: Strong oxidizing agents, strong acids, strong bases, amines, ammonia, ethylene oxide, isocyanates, acetaldehyde, chlorine, phosgene, Attacks some forms of plastics, rubbers, and coatings., aluminum at high temperatures.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:

CAS# 67-63-0: NT8050000

LD50/LC50:

CAS# 67-63-0:

Draize test, rabbit, eye: 100 mg Severe;
 Draize test, rabbit, eye: 10 mg Moderate;
 Draize test, rabbit, eye: 100 mg/24H Moderate;
 Draize test, rabbit, skin: 500 mg Mild;
 Inhalation, mouse: LC50 = 53000 mg/m³;
 Inhalation, rat: LC50 = 16000 ppm/8H;
 Inhalation, rat: LC50 = 72600 mg/m³;
 Oral, mouse: LD50 = 3600 mg/kg;
 Oral, mouse: LD50 = 3600 mg/kg;
 Oral, rabbit: LD50 = 6410 mg/kg;
 Oral, rat: LD50 = 5045 mg/kg;
 Oral, rat: LD50 = 5000 mg/kg;
 Skin, rabbit: LD50 = 12800

Carcinogenicity:

CAS# 67-63-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found**Teratogenicity:** A rat & rabbit developmental toxicity study showed no teratogenic effects at doses that were clearly maternally toxic. In a separate rat study, no evidence of developmental neurotoxicity was associated with gestational exposures to IPA up to 1200 mg/kg/d.**Reproductive Effects:** See actual entry in RTECS for complete information.**Mutagenicity:** See actual entry in RTECS for complete information.**Neurotoxicity:** In rats exposed to isopropanol by inhalation, acute neurotoxicity was noted at 1 and 6 hours at 5000 ppm, but only minimal effects were seen at 1500 ppm and the animals recovered within 5 hours. No toxicity was noted at 500 ppm.**Other Studies:**

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: >1000 ppm; 96h; LC50Daphnia: >1000 ppm; 96h; LC50Fish: Gold orfe: 8970-9280 ppm; 48h; LC50 IPA has a high biochemical oxygen demand and a potential to cause oxygen depletion in aqueous systems, a low potential to affect aquatic organisms, a low potential to affect secondary waste treatment microbial metabolism, a low potential to affect the germination of some plants, a high potential to biodegrade (low persistence) with unacclimated microorganisms from activated sludge.

Environmental: No information available.**Physical:** THOD: 2.40 g oxygen/gCOD: 2.23 g oxygen/gBOD-5: 1.19-1.72 g oxygen/g**Other:** No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.**RCRA U-Series:** None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	ISOPROPANOL	ISOPROPANOL
Hazard Class:	3	3
UN Number:	UN1219	UN1219
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 67-63-0 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 67-63-0: Effective 12/15/86, Sunset 12/15/96

Chemical Test Rules

CAS# 67-63-0: 40 CFR 799.2325

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 67-63-0: immediate, delayed, fire.

Section 313

This material contains 2-Propanol (CAS# 67-63-0, $\geq 99.5\%$), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 67-63-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XI F

Risk Phrases:

- R 11 Highly flammable.
- R 36 Irritating to eyes.
- R 67 Vapours may cause drowsiness and dizziness.

Safety Phrases:

- S 16 Keep away from sources of ignition - No smoking.
- S 24/25 Avoid contact with skin and eyes.
- S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- S 7 Keep container tightly closed.

WGK (Water Danger/Protection)

CAS# 67-63-0: 1

Canada - DSL/NDSL

CAS# 67-63-0 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 67-63-0 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information
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MSDS Creation Date: 7/27/1999

Revision #17 Date: 2/18/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

FIGURE 1
EXAMPLE FIELD DATA SHEET

**EXAMPLE
FIELD DATA SHEET
FOR INDOOR/AMBIENT AIR SAMPLING METHODS**

Date/Temperature/Weather: _____ Site/Facility Address: _____

Time: _____ Project No.: _____

Barometric Pressure: _____

Summa Canister Information: _____

Sampling location and height: _____

Start Pressure/Time: _____

End Pressure/Time: _____

Description of location: _____

Sample relinquished by: _____ Date/Time: _____

Sample received by: _____ Date/Time: _____

Attach field copy of sample label or write in sample number:

Notes: _____

1.0 BACKGROUND

This standard operating procedure (SOP) presents sample collection procedures for collecting soil gas from the discharge stack of each vapor mitigation system (VMS) installed at residences. During VMS installation, a sampling port will be included on each of the VMS to allow for the collection of soil gas samples without entering each residence. A valve and fitting will be included to allow soil gas into sampling apparatus, without allowing ambient (outside) air into the residence.

1.1 PURPOSE

The purpose of this SOP is to provide guidance for the collection of soil gas samples from the discharge stack of VMS.

1.2 SCOPE

This SOP applies to all personnel collecting soil gas samples. The site-specific work plan and sampling plan should be followed during air sampling activities.

1.3 DEFINITIONS

Soil Gas: The gases or atmosphere filling the void spaces in soils and unconsolidated sediments. These gases may all be of natural origin, but manmade contaminants or byproducts may be present in detectable quantities.

1.4 REQUIREMENTS AND RESOURCES

When using Summa canisters to collect soil gas samples, the following items are needed:

- A supply of laboratory certified clean, evacuated Summa canisters with a pressure gauge to verify internal pressure and flow controller (integrated flow controller pressure gauge may be used).
- Tygon[®] or equivalent tubing of appropriate size for connecting the sampling port to the Summa canister (during sample collection).
- Swagelok “T” for duplicate sample collection.

Title: **Soil Gas Sampling from the Discharge Stack**

- Leak check compounds such as isopropanol, butane, helium, or 1,1-difluoroethane. Material Safety Data Sheets are attached in Appendix A for each compound.

2.0 PROCEDURES

This section describes how soil gas will be sampled from the discharge stack of the VMS. Access to the inside of the residence is not required because a soil gas sampling port will be installed directly to the discharge stack on the outside of the residence during the VMS installation.

2.1 SOIL GAS SAMPLING

During VMS installation, a Swagelok bulkhead fitting with a nut retainer will be installed directly to the discharge stack approximately 6 inches above the exterior egress from the basement. This will allow direct access to sample soil gas from the residences. Tygon[®] tubing or similar tubing will be connected to the soil gas sampling point located on the discharge stack of the VMS system. The sampling will follow procedures included in the Indoor Air Sampling Methods SOP. Residents should be contacted prior to soil gas sampling to ensure they are aware of the impending collection of samples at their house. Residents are not required to be at home during sampling activities. After sampling activities, the tubing will be removed and disposed. The District should record the data required on the attached Field Data Sheet for Soil Gas Sampling Methods (Figure 1).

2.2 SAMPLE COLLECTION USING SUMMA CANISTERS

The canister sampling train is connected directly to the purged Tygon[®] or equivalent sampling tube. To prevent ambient air from entering the canister during sample collection, all connections must be airtight. To collect soil gas samples using this method, the following procedures are used:

1. Confirm the valve is closed and remove the brass cap. Attach the pressure gauge and flow controller (integrated system) to the canister. Attach the tube to the sample train with Tygon[®] or equivalent tubing.
2. Record the canister pressure reading and time. Then, open the canister valve, which will allow the evacuated (under vacuum) canister to draw-in soil gas.
3. Monitor sampling progress periodically. When target sample collection time of 8 hours has been reached, close the canister valve and record the time and post-sampling pressure reading on the canister pressure valve.

Title: **Soil Gas Sampling from the Discharge Stack**

WARNING: A residual vacuum of approximately 5 inches of mercury should remain in the canister at the completion of the sampling event. If no residual vacuum is recorded, the data collected from this summa canister may not be representative of actual site conditions.

4. Remove the canister from the sample train and replace the cap.
5. Follow the leak check procedures described in Section 2.5.
6. Label the canister and its corresponding field data sheet (Figure 1) with the sample number.
7. Complete the field data sheet and sample chain of custody.
8. Ship samples to the laboratory for analysis. Summa samples do not need to be chilled after collection or during transportation.

2.3 DUPLICATE SAMPLE COLLECTION

Duplicate soil gas samples will be collected at each site as required in the site-specific quality assurance project plan and field sampling plan. Each duplicate is collected in conjunction with a corresponding environmental sample. Generally, one duplicate sample will be collected for every ten samples (every tenth residence) collected.

To collect duplicate samples in canisters, a Swagelok “T” will be connected to two canisters. Purging and sample collection will proceed as described above. After collection, one sample will be labeled as the environmental sample and one as the duplicate.

2.4 LEAK CHECK PROCEDURES

Leakage during soil gas sampling may dilute samples with ambient air and produce results that underestimate the actual site concentrations, or may contaminate the sample with external contaminants. Leak tests should be conducted to determine whether leakage is occurring. Leak detection is performed using the following procedures:

1. Leak tests should be conducted at every soil gas sampling location.
2. Tracer compounds such as isopropanol, butane, helium, or 1,1-difluoroethane may be used as leak check compounds. These compounds may be contained in common products such as Dust-Off and rubbing alcohol. Ensure the tracer compound used does not contain chemicals or impurities that may be present as a site contaminant. Leak check compounds such as isopropanol, butane, helium, or 1,1-difluoroethane. Material Safety Data Sheets are attached for each compound

Title: **Soil Gas Sampling from the Discharge Stack**

3. Place tracer compounds around all connections in the aboveground sampling system train. Tracer compound is emplaced by wetting or spraying a paper towel or rag and wrapping around the area of the connection where leaks could occur.
4. Collect samples as describe in previous sections and use analytical results to determine if the tracer compound has leaked into the sample.

2.5 DECONTAMINATION

All canisters must be provided as laboratory certified clean as specified by appropriate EPA methods.

If Y-branched tubing or any other sampling equipment is to be reused, it must also be decontaminated between sampling locations.

2.6 SAMPLE TRANSFER

After collection, each sample container will be transported to the designated laboratory for analysis.

3.0 CAUTIONS

Variations in temperature, pressure, and moisture content of the air being sampled have a great effect on how samples are collected. Extremes in these conditions can compromise sample integrity and cause problems with sample collection. Summa canisters are designed to collect samples at near ambient temperature and should not be subjected to temperatures above 100°C or below 0°C. In addition, severe temperature swings will affect the flow rate of flow controllers, and should be avoided. The altitude at which samples are collected affects the local barometric pressure, which in turn affects gauge vacuum and pressure readings. A canister gauge that reads -29.9” mercury (Hg) at sea level will read -25” Hg at 5,000 feet elevation because gauges are calibrated to read at sea level. Generally speaking, every 1,000-foot rise in elevation results in a 1” drop in gauge pressure. Soil gas samples should not be subjected to changes in ambient pressure. Samples to be analyzed off site should not be shipped by air. If condensation is observed in the sample container, the sample should be discarded and a new sample collected.

Residents are not required to be present at the time of soil gas sampling. Tetra Tech will contact residents approximately one week prior to sampling activities. In addition, Tetra Tech personnel will ring the

Title: **Soil Gas Sampling from the Discharge Stack**

doorbell on the day of sampling activities of each residence to attempt to inform the resident of activities occurring. If residents or other members of the community become obstinate, personnel should refer them to the toll-free Riggs Park voice message service at 1-855-384-0092 or email address at RiggsParkVMS@tetrattech.com. A response will be returned to them within two business days. If residents do not allow access, note it and report it to the District

APPENDIX A
MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheet



1,1-Difluoroethane (Halocarbon 152A)

Section 1. Chemical product and company identification

Product name	: 1,1-Difluoroethane (Halocarbon 152A)
Supplier	: AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	: Synthetic/Analytical chemistry.
Synonym	: alfofrene type 67; difluoroethane; ethylene fluoride; ethylidene difluoride; ethylidene fluoride; fc 152a; genetron 100; genetron 152a; ethene, 1,1-trifluoro
MSDS #	: 001090
Date of Preparation/Revision	: 4/23/2010.
In case of emergency	: 1-866-734-3438

Section 2. Hazards identification

Physical state	: Gas. [COLORLESS]
Emergency overview	: WARNING! FLAMMABLE GAS. MAY CAUSE FLASH FIRE. CONTENTS UNDER PRESSURE. Keep away from heat, sparks and flame. Do not puncture or incinerate container. Use only with adequate ventilation. Keep container closed. Contact with rapidly expanding gases can cause frostbite.
Routes of entry	: Inhalation
Potential acute health effects	
Eyes	: Contact with rapidly expanding gas may cause burns or frostbite.
Skin	: Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	: Acts as a simple asphyxiant.
Ingestion	: Ingestion is not a normal route of exposure for gases
Potential chronic health effects	: CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available.
Medical conditions aggravated by over-exposure	: Acute or chronic respiratory conditions may be aggravated by overexposure to this gas.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

<u>Name</u>	<u>CAS number</u>	<u>% Volume</u>	<u>Exposure limits</u>
1,1-Difluoroethane (Halocarbon 152A)	75-37-6	100	AIHA WEEL (United States, 1/2009). TWA: 1000 ppm 8 hour(s).

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

- Flammability of the product** : Flammable.
- Flammable limits** : Lower: 3.7% Upper: 18%
- Products of combustion** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds
carbonyl halides
- Fire-fighting media and instructions** : In case of fire, use water spray (fog), foam or dry chemical.
- In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.
- Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

1,1-Difluoroethane (Halocarbon 152A)

- Storage** : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Personal protection

- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

1,1-difluoroethane

AIHA WEEL (United States, 1/2009).
TWA: 1000 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

- Molecular weight** : 66.06 g/mole
- Molecular formula** : C₂H₄F₂
- Boiling/condensation point** : 11.3°C (52.3°F)
- Melting/freezing point** : -117°C (-178.6°F)
- Critical temperature** : 113.5°C (236.3°F)
- Vapor pressure** : 63 (psig)
- Vapor density** : 2.4 (Air = 1)
- Specific Volume (ft³/lb)** : 5.8514
- Gas Density (lb/ft³)** : 0.1709

Section 10. Stability and reactivity

- Stability and reactivity** : The product is stable.
- Incompatibility with various substances** : Extremely reactive or incompatible with the following materials: oxidizing materials.
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
- Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name

1,1-difluoroethane

Result

LDLo Oral

Species

Rat

Dose

>1500 mg/kg

Exposure

-

Other toxic effects on humans

: No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects

: No known significant effects or critical hazards.

Mutagenic effects

: No known significant effects or critical hazards.

Reproduction toxicity

: No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Products of degradation

: Products of degradation: carbon oxides (CO, CO₂) and water, halogenated compounds.

Environmental fate

: Not available.

Environmental hazards

: No known significant effects or critical hazards.



Toxicity to the environment

: Not available.


Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1030	1,1-DIFLUOROETHANE OR REFRIGERANT GAS R 152A	2.1	Not applicable (gas).		Limited quantity Yes. Packaging instruction Passenger aircraft Quantity limitation: Forbidden. Cargo aircraft Quantity limitation: 150 kg Special provisions T50
TDG Classification	UN1030	1,1-DIFLUOROETHANE; OR REFRIGERANT GAS R 152A	2.1	Not applicable (gas).		Explosive Limit and Limited Quantity Index 0.125 ERAP Index

1,1-Difluoroethane (Halocarbon 152A)

						3000 Passenger Carrying Road or Rail Index Forbidden
Mexico Classification	UN1030	1,1- DIFLUOROETHANE OR REFRIGERANT GAS R 152A	2.1	Not applicable (gas).		-

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information

United States

U.S. Federal regulations

United States inventory (TSCA 8b): This material is listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: 1,1-difluoroethane
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: 1,1-difluoroethane: Fire hazard, Sudden release of pressure, Delayed (chronic) health hazard
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.
Clean Air Act (CAA) 112 accidental release prevention: 1,1-difluoroethane
Clean Air Act (CAA) 112 regulated flammable substances: 1,1-difluoroethane
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

State regulations

Connecticut Carcinogen Reporting: This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is not listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is not listed.
Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada)

Class A: Compressed gas.
Class B-1: Flammable gas.
CEPA Toxic substances: This material is listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Label requirements : FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
CONTENTS UNDER PRESSURE.

Canada

Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.

Hazardous Material Information System (U.S.A.)

Health	1
Flammability	4
Physical hazards	0

National Fire Protection Association (U.S.A.)



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet



N-Butane

Section 1. Chemical product and company identification

Product name	: N-Butane
Supplier	: AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	: Synthetic/Analytical chemistry.
Synonym	: n-Butane; Diethyl; Freon 600; Liquefied petroleum gas; LPG; n-C ₄ H ₁₀ ; Butanen; Butani; Methylethylmethane; UN 1011; UN 1075; A-17; Bu-Gas.
MSDS #	: 001007
Date of Preparation/Revision	: 11/10/2010.
In case of emergency	: 1-866-734-3438

Section 2. Hazards identification

Physical state	: Gas. [COLORLESS LIQUEFIED COMPRESS GAS WITH GASOLINE-LIKE ODOR.]
Emergency overview	: WARNING! FLAMMABLE GAS. MAY CAUSE FLASH FIRE. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CONTENTS UNDER PRESSURE. Keep away from heat, sparks and flame. Do not puncture or incinerate container. May cause target organ damage, based on animal data. Use only with adequate ventilation. Keep container closed. Contact with rapidly expanding gases can cause frostbite.
Target organs	: May cause damage to the following organs: central nervous system (CNS).
Routes of entry	: Inhalation
Potential acute health effects	
Eyes	: Contact with rapidly expanding gas may cause burns or frostbite.
Skin	: Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	: Acts as a simple asphyxiant.
Ingestion	: Ingestion is not a normal route of exposure for gases
Potential chronic health effects	: CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available.
Medical conditions aggravated by over-exposure	: Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

<u>Name</u>	<u>CAS number</u>	<u>% Volume</u>	<u>Exposure limits</u>
N-Butane	106-97-8	100	ACGIH TLV (United States, 2/2010). TWA: 1000 ppm 8 hour(s). NIOSH REL (United States, 6/2009). TWA: 1900 mg/m ³ 10 hour(s). TWA: 800 ppm 10 hour(s). OSHA PEL 1989 (United States, 3/1989). TWA: 1900 mg/m ³ 8 hour(s). TWA: 800 ppm 8 hour(s).

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

- Flammability of the product** : Flammable.
- Auto-ignition temperature** : 286.85°C (548.3°F)
- Flash point** : Closed cup: -60.15°C (-76.3°F).
- Flammable limits** : Lower: 1.6% Upper: 8.5%
- Products of combustion** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
- Fire hazards in the presence of various substances** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.
- Fire-fighting media and instructions** : In case of fire, use water spray (fog), foam or dry chemical.
- In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.
- Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
- Storage** : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.
- Personal protection**
- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
- The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

Butane

ACGIH TLV (United States, 2/2010).

TWA: 1000 ppm 8 hour(s).

NIOSH REL (United States, 6/2009).TWA: 1900 mg/m³ 10 hour(s).

TWA: 800 ppm 10 hour(s).

OSHA PEL 1989 (United States, 3/1989).TWA: 1900 mg/m³ 8 hour(s).

TWA: 800 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

- Molecular weight** : 58.14 g/mole
- Molecular formula** : C₄-H₁₀
- Boiling/condensation point** : -0.6°C (30.9°F)
- Melting/freezing point** : -135.4°C (-211.7°F)
- Critical temperature** : 151.9°C (305.4°F)
- Vapor pressure** : 16.3 (psig)
- Vapor density** : 2 (Air = 1)

N-Butane

Specific Volume (ft ³/lb) : 6.435
Gas Density (lb/ft ³) : 0.1554

Section 10. Stability and reactivity

Stability and reactivity : The product is stable.
Incompatibility with various substances : Extremely reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure
Butane	LC50 Inhalation Vapor	Rat	658000 mg/m3	4 hours

Chronic effects on humans : May cause damage to the following organs: central nervous system (CNS).
Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.
Mutagenic effects : No known significant effects or critical hazards.
Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity


Not available.

Products of degradation : Products of degradation: carbon oxides (CO, CO₂) and water.
Environmental fate : Not available.
Environmental hazards : No known significant effects or critical hazards.
Toxicity to the environment : Not available.



Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation.Return cylinders with residual product to Airgas, Inc.Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1011	BUTANE	2.1	Not applicable (gas).		Limited quantity Yes. Packaging instruction Passenger aircraft Quantity limitation: Forbidden. Cargo aircraft Quantity limitation:

N-Butane

						150 kg Special provisions 19, T50
TDG Classification	UN1011	BUTANE	2.1	Not applicable (gas).		Explosive Limit and Limited Quantity Index 0.125 ERAP Index 3000 Passenger Carrying Ship Index Forbidden Passenger Carrying Road or Rail Index Forbidden Special provisions 29
Mexico Classification	UN1011	BUTANE	2.1	Not applicable (gas).		-

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information**United States****U.S. Federal regulations**

United States inventory (TSCA 8b): This material is listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Butane
SARA 311/312 MSDS distribution - chemical inventory - hazard identification:
Butane: Fire hazard, Sudden release of pressure
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.
Clean Air Act (CAA) 112 accidental release prevention: Butane
Clean Air Act (CAA) 112 regulated flammable substances: Butane
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

State regulations

Connecticut Carcinogen Reporting: This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.

N-Butane

Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is not listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada)

: Class A: Compressed gas.
Class B-1: Flammable gas.
CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Label requirements

: FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CONTENTS UNDER PRESSURE.

Canada

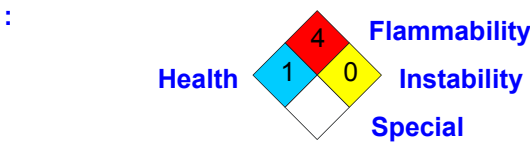
Label requirements

: Class A: Compressed gas.
Class B-1: Flammable gas.

**Hazardous Material
Information System (U.S.A.)**

Health	*	1
Flammability		4
Physical hazards		0

**National Fire Protection
Association (U.S.A.)**



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet



Helium

Section 1. Chemical product and company identification

Product name	: Helium
Supplier	: AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	: Synthetic/Analytical chemistry.
Synonym	: helium (dot); Helium-4; He; o-Helium; UN 1046; UN 1963; Liquid Helium; Helium, Refrigerated Liquid
MSDS #	: 001025
Date of Preparation/Revision	: 8/27/2010.
In case of emergency	: 1-866-734-3438

Section 2. Hazards identification

Physical state	: Gas. [Colorless, Odorless Gas, Cryogenic liquid and gas]
Emergency overview	: WARNING! GAS: CONTENTS UNDER PRESURE. Do not puncture or incinerate container. Can cause rapid suffocation. May cause severe frostbite. LIQUID: Extremely cold liquid and gas under pressure. Can cause rapid suffocation. May cause severe frostbite. Do not puncture or incinerate container. Contact with rapidly expanding gases or liquids can cause frostbite.
Routes of entry	: Inhalation
Potential acute health effects	
Eyes	: Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns.
Skin	: Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns.
Inhalation	: Acts as a simple asphyxiant.
Ingestion	: Ingestion is not a normal route of exposure for gases. Contact with cryogenic liquid can cause frostbite and cryogenic burns.
Potential chronic health effects	: CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available.
Medical conditions aggravated by over-exposure	: Acute or chronic respiratory conditions may be aggravated by overexposure to this gas.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

<u>Name</u>	<u>CAS number</u>	<u>% Volume</u>	<u>Exposure limits</u>
Helium	7440-59-7	100	Oxygen Depletion [Asphyxiant]

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : None expected.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

- Flammability of the product** : Non-flammable.
- Products of combustion** : No specific data.
- Fire-fighting media and instructions** : Use an extinguishing agent suitable for the surrounding fire.

Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.
Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
Never allow any unprotected part of the body to touch uninsulated pipes or vessels that contain cryogenic liquids. Prevent entrapment of liquid in closed systems or piping without pressure relief devices. Some materials may become brittle at low temperatures and will easily fracture.

Helium

- Storage** : Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).
For additional information concerning storage and handling refer to Compressed Gas Association pamphlets P-1 Safe Handling of Compressed Gases in Containers and P-12 Safe Handling of Cryogenic Liquids available from the Compressed Gas Association, Inc.

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Personal protection

- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

When working with cryogenic liquids, wear a full face shield.

- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Insulated gloves suitable for low temperatures

- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

helium

Oxygen Depletion [Asphyxiant]

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

- Molecular weight** : 4 g/mole
Molecular formula : He
Boiling/condensation point : -268.9°C (-452°F)
Melting/freezing point : -272.2°C (-458°F)
Critical temperature : -267.9°C (-450.2°F)
Vapor density : 0.14 (Air = 1) Liquid Density@BP: 7.8 lb/ft³ (125 kg/m³)
Specific Volume (ft³/lb) : 96.1538
Gas Density (lb/ft³) : 0.0104

Section 10. Stability and reactivity

- Stability and reactivity** : The product is stable.
Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Environmental fate : Not available.



Environmental hazards : No known significant effects or critical hazards.


Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1046	HELIUM, COMPRESSED	2.2	Not applicable (gas).		Limited quantity Yes.
	UN1963	Helium, refrigerated liquid				Packaging instruction Passenger aircraft Quantity limitation: 75 kg Cargo aircraft Quantity limitation: 150 kg
TDG Classification	UN1046	HELIUM, COMPRESSED	2.2	Not applicable (gas).		Explosive Limit and Limited Quantity Index 0.125
	UN1963	Helium, refrigerated liquid				Passenger Carrying Road or Rail Index 75

Helium						
Mexico Classification	UN1046	HELIUM, COMPRESSED	2.2	Not applicable (gas).		-
	UN1963	Helium, refrigerated liquid				

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information

United States

- U.S. Federal regulations

: United States inventory (TSCA 8b): This material is listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: helium
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: helium: Sudden release of pressure
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.
Clean Air Act (CAA) 112 accidental release prevention: No products were found.
Clean Air Act (CAA) 112 regulated flammable substances: No products were found.
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.
- State regulations

: Connecticut Carcinogen Reporting: This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is not listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

Canada

- WHMIS (Canada)

: Class A: Compressed gas.
CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is not listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Helium

Label requirements

: GAS:
CONTENTS UNDER PRESURE.
Do not puncture or incinerate container.
Can cause rapid suffocation.
May cause severe frostbite.
LIQUID:
Extremely cold liquid and gas under pressure.
Can cause rapid suffocation.
May cause severe frostbite.

Canada

Label requirements

: Class A: Compressed gas.

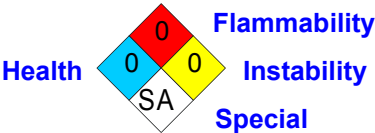
Hazardous Material
Information System (U.S.A.)

Health	1
Flammability	0
Physical hazards	0

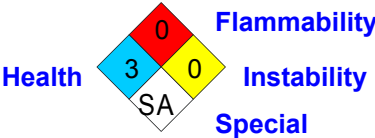
liquid:

Health	3
Fire hazard	0
Reactivity	0
Personal protection	

National Fire Protection
Association (U.S.A.)



liquid:



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

Isopropanol

ACC# 95533

Section 1 - Chemical Product and Company Identification

MSDS Name: Isopropanol

Catalog Numbers: AC149320000, AC149320050, AC149320100, AC149320200, AC167880000, AC184130000, AC184130025, AC184130051, AC184130250, AC326960000, AC326960010, AC326961000, AC326962500, AC327270000, AC327270010, AC327930000, AC327930010, AC364400000, AC364400010, AC364401000, AC383910000, AC383910010, AC383910025, AC383920000, AC383920025, AC389710000, AC389710025, AC389710100, AC389710250, AC412790000, AC412790040, AC423830000, AC611110040, 14932-0010, 14932-0025, 14932-0250, 16788-0010, 18413-0010, 41279-5000, 42383-0010, 42383-0040, 42383-0200, 42383-5000, 61008-0040, 61043-1000, A415-20, A415-4, A416-1, A416-20, A416-200, A416-200LC, A416-4, A416-4LC, A416-500, A416FB-115, A416FB-19, A416FB-200, A416FB-50, A416J-500, A416P-4, A416RB-115, A416RB-200, A416RB-50, A416RS-115, A416RS-200, A416RS-28, A416RS-50, A416S-4, A416SK-4, A416SS-115, A416SS-200, A416SS-28, A416SS-50, A417-1, A417-4, A419-1, A419-4, A419RS-115, A419RS-200, A419RS-28, A419SS-115, A419SS-200, A419SS-28, A419SS-50, A426P-4, A426PJ4, A426S-20, A426S-200, A426S-4, A451-1, A451-4, A451CU50, A451J1, A451N219, A451POP19, A451RS-115, A451RS-19, A451RS-200, A451RS-50, A451SK-1, A451SK-4, A451SS-200, A464-4, A464-4LC, A464J4, A464RS-200, A464SK-4, A516-20, A516-200, A516-4, A516-500, A519-4, A520-4, A520RS-200, A520SS-115, A520SS-200, A520SS-28, A520SS-50, A522-20, A522-4, A522SAM1, A522SAM2, A522SAM3, BP2621100, BP2632-4, NC9135800, NC9284977, NC9349372, NC9386241, NC9445090, NC9535770, NC9535771, NC9557098, NC9562752, NC9670945, NC9846796, S77795HPLC, S77795SPEC

Synonyms: Isopropanol; Dimethylcarbinol; sec-Propyl alcohol; Rubbing alcohol; Petrohol; 1-Methylethanol; 1-Methylethyl alcohol; 2-Hydroxypropane; 2-Propyl alcohol; Isopropyl alcohol; Propan-2-ol; IPA; 2-Propanol.

Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100**Emergency Number:** 201-796-7100**For CHEMTREC assistance, call:** 800-424-9300**For International CHEMTREC assistance, call:** 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
67-63-0	2-Propanol	>= 99.5	200-661-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid. Flash Point: 11.7 deg C.

Warning! Flammable liquid and vapor. Causes respiratory tract irritation. Breathing vapors

may cause drowsiness and dizziness. Causes eye irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. Prolonged or repeated contact causes defatting of the skin with irritation, dryness, and cracking. This material has been reported to be susceptible to autoxidation and therefore should be classified as peroxidizable. May cause central nervous system depression. May form explosive peroxides. Hygroscopic (absorbs moisture from the air).

Target Organs: Central nervous system, respiratory system, eyes, skin.

Potential Health Effects

Eye: Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury. May cause transient corneal injury. In the eyes of a rabbit, 0.1 ml of 70% isopropyl alcohol caused conjunctivitis, iritis, and corneal opacity.

Skin: May cause irritation with pain and stinging, especially if the skin is abraded. Isopropanol has a low potential to cause allergic skin reactions; however, rare cases of allergic contact dermatitis have been reported. May be absorbed through intact skin. Dermal absorption has been considered toxicologically insignificant. The cases of deep coma associated with skin contact are thought to be a consequence of gross isopropanol vapor inhalation in rooms with inadequate ventilation, rather than being attributable to percutaneous absorption of isopropanol per se.

Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea. May cause kidney damage. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. The probable oral lethal dose in humans is 240 ml (2696 mg/kg), but ingestion of only 20 ml (224 mg/kg) has caused poisoning.

Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. May cause narcotic effects in high concentration. Causes upper respiratory tract irritation. Inhalation of vapors may cause drowsiness and dizziness.

Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid.

Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.

Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician: Urine acetone test may be helpful in diagnosis. Hemodialysis should be considered in severe intoxication. Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. May form explosive peroxides. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

Extinguishing Media: Water may be ineffective. Do NOT use straight streams of water. For large fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray. For small fires, use carbon dioxide, dry chemical, dry sand, or alcohol-resistant foam. Cool containers with flooding quantities of water until well after fire is out.

Flash Point: 11.7 deg C (53.06 deg F)

Autoignition Temperature: > 350 deg C (> 662.00 deg F)

Explosion Limits, Lower: 2.0 vol %

Upper: 12.7 @ 93°C

NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Use water spray to dilute spill to a non-flammable mixture. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Take precautionary measures against static discharges. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Avoid breathing vapor or mist. Do not allow to evaporate to near dryness.

Storage: Keep away from heat, sparks, and flame. Do not store in direct sunlight. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. After opening, purge container with nitrogen before reclosing. Periodically test for peroxide formation on long-term storage. Addition of water or appropriate reducing materials will lessen peroxide formation. Store protected from moisture. Containers should be dated when opened and tested periodically for the presence of peroxides. Should crystals form in a peroxidizable liquid, peroxidation may have occurred and the product should be considered extremely dangerous. In this instance, the container should only be opened remotely by professionals. All peroxidizable substances should be stored away from heat and light and be protected from ignition sources.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
---------------	-------	-------	-------------------

2-Propanol	200 ppm TWA; 400 ppm STEL	400 ppm TWA; 980 mg/m3 TWA 2000 ppm IDLH (10% LEL)	400 ppm TWA; 980 mg/m3 TWA
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OSHA Vacated PELs: 2-Propanol: 400 ppm TWA; 980 mg/m3 TWA

Personal Protective Equipment

Eyes: Wear chemical splash goggles.

Skin: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: colorless

Odor: alcohol-like

pH: Not available.

Vapor Pressure: 33 mm Hg @ 20 deg C

Vapor Density: 2.1 (Air=1)

Evaporation Rate: 1.7 (n-butyl acetate=1)

Viscosity: 2.27 mPas @ 20C

Boiling Point: 82 deg C @ 760 mmHg

Freezing/Melting Point: -88 deg C

Decomposition Temperature: Not available.

Solubility: Miscible.

Specific Gravity/Density: 0.7850 (water=1)

Molecular Formula: C₃H₈O

Molecular Weight: 60.1

Section 10 - Stability and Reactivity

Chemical Stability: Under normal storage conditions, peroxidizable compounds can form and accumulate peroxides which may explode when subjected to heat or shock. This material is most hazardous when peroxide levels are concentrated by distillation or evaporation. Isopropanol is susceptible to autoxidation and therefore should be classified as peroxidizable.

Conditions to Avoid: Light, ignition sources, excess heat, exposure to moist air or water.

Incompatibilities with Other Materials: Strong oxidizing agents, strong acids, strong bases, amines, ammonia, ethylene oxide, isocyanates, acetaldehyde, chlorine, phosgene, Attacks some forms of plastics, rubbers, and coatings., aluminum at high temperatures.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:

CAS# 67-63-0: NT8050000

LD50/LC50:

CAS# 67-63-0:

Draize test, rabbit, eye: 100 mg Severe;
 Draize test, rabbit, eye: 10 mg Moderate;
 Draize test, rabbit, eye: 100 mg/24H Moderate;
 Draize test, rabbit, skin: 500 mg Mild;
 Inhalation, mouse: LC50 = 53000 mg/m³;
 Inhalation, rat: LC50 = 16000 ppm/8H;
 Inhalation, rat: LC50 = 72600 mg/m³;
 Oral, mouse: LD50 = 3600 mg/kg;
 Oral, mouse: LD50 = 3600 mg/kg;
 Oral, rabbit: LD50 = 6410 mg/kg;
 Oral, rat: LD50 = 5045 mg/kg;
 Oral, rat: LD50 = 5000 mg/kg;
 Skin, rabbit: LD50 = 12800

Carcinogenicity:

CAS# 67-63-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found**Teratogenicity:** A rat & rabbit developmental toxicity study showed no teratogenic effects at doses that were clearly maternally toxic. In a separate rat study, no evidence of developmental neurotoxicity was associated with gestational exposures to IPA up to 1200 mg/kg/d.**Reproductive Effects:** See actual entry in RTECS for complete information.**Mutagenicity:** See actual entry in RTECS for complete information.**Neurotoxicity:** In rats exposed to isopropanol by inhalation, acute neurotoxicity was noted at 1 and 6 hours at 5000 ppm, but only minimal effects were seen at 1500 ppm and the animals recovered within 5 hours. No toxicity was noted at 500 ppm.**Other Studies:**

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: >1000 ppm; 96h; LC50Daphnia: >1000 ppm; 96h; LC50Fish: Gold orfe: 8970-9280 ppm; 48h; LC50 IPA has a high biochemical oxygen demand and a potential to cause oxygen depletion in aqueous systems, a low potential to affect aquatic organisms, a low potential to affect secondary waste treatment microbial metabolism, a low potential to affect the germination of some plants, a high potential to biodegrade (low persistence) with unacclimated microorganisms from activated sludge.

Environmental: No information available.**Physical:** THOD: 2.40 g oxygen/gCOD: 2.23 g oxygen/gBOD-5: 1.19-1.72 g oxygen/g**Other:** No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.**RCRA U-Series:** None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	ISOPROPANOL	ISOPROPANOL
Hazard Class:	3	3
UN Number:	UN1219	UN1219
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 67-63-0 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 67-63-0: Effective 12/15/86, Sunset 12/15/96

Chemical Test Rules

CAS# 67-63-0: 40 CFR 799.2325

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 67-63-0: immediate, delayed, fire.

Section 313

This material contains 2-Propanol (CAS# 67-63-0, $\geq 99.5\%$), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 67-63-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XI F

Risk Phrases:

- R 11 Highly flammable.
- R 36 Irritating to eyes.
- R 67 Vapours may cause drowsiness and dizziness.

Safety Phrases:

- S 16 Keep away from sources of ignition - No smoking.
- S 24/25 Avoid contact with skin and eyes.
- S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- S 7 Keep container tightly closed.

WGK (Water Danger/Protection)

CAS# 67-63-0: 1

Canada - DSL/NDSL

CAS# 67-63-0 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 67-63-0 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information
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MSDS Creation Date: 7/27/1999**Revision #17 Date:** 2/18/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

FIGURE 1
EXAMPLE FIELD DATA SHEET

**EXAMPLE
FIELD DATA SHEET
FOR SOIL GAS SAMPLING METHODS**

Date/Temperature/Weather: _____ Site/Facility Address: _____

Time: _____ Project No.: _____

Barometric Pressure: _____

Summa Canister Information: _____

Sampling location and height: _____

Start Pressure/Time: _____

End Pressure/Time: _____

Description of location: _____

Sample relinquished by: _____ Date/Time: _____

Sample received by: _____ Date/Time: _____

Attach field copy of sample label or write in sample number:

Notes: _____

APPENDIX H
FINAL REMEDY SELECTION AND RESPONSE TO COMMENTS FOR RIGGS PARK
COMMUNITY, WASHINGTON, D.C.

GOVERNMENT OF THE DISTRICT OF COLUMBIA



DISTRICT DEPARTMENT OF THE ENVIRONMENT

**FINAL REMEDY SELECTION
AND RESPONSE TO COMMENTS**

FOR

RIGGS PARK COMMUNITY, WASHINGTON, D.C.

May 3, 2010

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APPENDIX A: Comments received on the proposed Remedy
Selection, issued February 20, 2009

APPENDIX B: Response to Comments

APPENDIX C: DOH Riggs Park Health Survey Results, dated April
12, 2010

GLOSSARY AND ABBREVIATIONS

ATSDR	The Agency for Toxic Substances and Disease Registry
BTEX	Benzene, toluene, ethylbenzene, and xylenes
COC	Contaminants of Concern
District	District of Columbia
DDOE	District Department of the Environment
DOH	District of Columbia Department of Health
EPA Region 3	The Regional Branch of the U.S. Environmental Protection Agency which includes the District of Columbia, Delaware, Maryland, Pennsylvania, Virginia, and West Virginia
Facility	5801 Riggs Road in Chillum, Prince George's County, Maryland
GMP	Geoprobe Monitoring Port – used to collect soil vapor samples
2009 HHRA	Human Health Risk Assessment supporting the proposed Remedy Selection, issued on February 20, 2009.
2010 HHRA	The revised Human Health Risk Assessment, supporting this Final Remedy Selection document, completed April 2010.
HI	Hazard Index. A summation of the hazard quotients for all chemicals to which an individual is exposed.
HQ	Hazard Quotient. A comparison of an estimated chemical intake (dose) with a reference dose level below which adverse health effects are unlikely. The hazard quotient is expressed as the ratio of the estimated intake to the reference dose. The value is used to evaluate the potential for non-carcinogenic health effects, such as organ damage, from chemical exposures.
MCL	Maximum Contaminant Levels
MTBE	Methyl tertiarybutyl ether
Non-carcinogenic risk	The term used to describe risks associated with non-carcinogenic or non-cancer causing materials. These materials can cause damage to the respiratory system, central nervous system, reproductive system and other internal organs.
PCE	Perchloroethene, also known as Perchlorethylene, Tetrachloroethene or Tetrachloroethylene. An alternate abbreviation for Perchloroethene is PERC.
ppb	Parts per Billion
ppbv	Parts per Billion by Volume
ppm	Parts per Million
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable Maximum Exposure
Soil vapor	Vapor in soil. This can either be subslab soil vapor or subsurface soil vapor.
SSP&A	S. S. Papadopoulos and Associates.
Subslab soil vapor	Soil vapor collected from immediately below the basement slab of a building, usually 0 to 5 feet below the slab
Subsurface soil vapor	Soil vapor collected from below the soil surface.
TMB	Trimethyl benzene

ug/l	Micrograms per liter
U.S. EPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile organic compounds
VMP	Vapor Monitoring Port – used to collect sub slab vapor samples
VMS	Vapor Mitigation System

I. DECISION

On February 20, 2009, the District of Columbia (the "District") issued its proposed Remedy Selection for the Riggs Park community, addressing potential human health risks posed by the release of hazardous materials, including the release of gasoline from underground storage tanks located at a gas station formerly owned by Chevron U.S.A., Inc. ("Chevron"), at 5801 Riggs Road in Chillum, Prince George's County, MD. The District, through the Department of the Environment ("DDOE") and the Department of Health ("DOH"), issued the proposed Remedy Selection pursuant to its authority to protect human health and the environment under the District of Columbia Hazardous Waste Management Act of 1997 (D.C. Official Code §§ 8-1301, 8-1305(a)(9)), the Underground Storage Tank Management Act of 1990 (D.C. Official Code §§ 8-113, 8-113.08(d)), and under the Brownfield Revitalization Amendment Act of 2000 (D.C. Official Code §§ 8-632.01(b), 8-634.02(a)(b)).

The District's proposed "Remedy Selection" (dated February 20, 2009) for the Riggs Park community originally called for the installation and operation of vapor mitigation systems (VMSs) in 45 residences that, according to the 2009 HHRA, exhibited potentially unacceptable risks due to potential vapor intrusion attributable to contaminated groundwater and associated soils.

During the 45-day comment period¹ for the proposed "Remedy Selection" dated February 20, 2009, the District received numerous of comments from the public. The District has considered all comments received and is hereby revising its proposed Remedy Selection pursuant to the comments received as well as a more comprehensive evaluation of the available data (as reflected in the 2010 HHRA). All comments received have been added to the Administrative Record in support of this Final Remedy. This document sets forth the District's "Final Remedy Selection and Response to Comments" ("Final Remedy") for the Riggs Park community, as well as the Department of Health's Health Survey results (Appendix C). Please note that the DOH health survey results are inconclusive due to a low responsiveness level from the community on the health survey. Accordingly, DOH has provided raw data results, but no conclusions have been drawn.

Based on a review and comprehensive evaluation of the various sampling data, as well as the site characterization and the 2010 HHRA generated for the Riggs Park community, the District finds that 22 residences have measured subslab soil vapor concentrations at levels that pose unacceptable potential human health risks; 1 residence has measured soil vapor or groundwater concentrations at levels that pose an unacceptable potential human health risks; and 20 residences have no directly measured data but were evaluated using statistical data extrapolations, and subsequently projected to possibly pose unacceptable potential human health risks. In the final analysis, it was determined that a total of 43 homes qualify for VMS installation.

In arriving at the above-stated conclusions, the District has comprehensively evaluated information obtained from subslab soil vapor samples, geoprobe soil vapor samples, groundwater data, and statistical data interpolation analysis. In general, the soil

vapor results are indicative of contaminants potentially emanating from groundwater and that represent a source of potential indoor vapor intrusion. Within the limits of technical validity, the soil vapor results have also been correlated with the available groundwater data, and only those contaminants of concern which could be reasonably attributed to groundwater contamination were used for the 2010 HHRA (which forms the basis for this Final Remedy Selection).

Finally, as part of the overall remedial action plan for the installation and operation of vapor mitigation systems in 43 residences (that have been identified as meeting the requirements for remedial action), the District's selected remedy includes the following elements or tasks:

- Hazardous Substance Easements, also called Environmental Covenants, at residences or inhabited buildings receiving a VMS, to allow continuous access to DDOE and/or its agents to monitor performance and effectiveness of the VMS's installed.
- Evaluations to determine the most appropriate VMS system to install at each home requiring one.
- Development of a program to monitor and perform maintenance for each VMS installed pursuant to the District's Remedy, while the VMS is in operation.
- Development of a program to determine when there is no further need to operate the VMS installed at the direction of the District.
- The District will determine in conjunction with EPA Region 3 when shutting down the VMS whose installation was required by EPA Region 3 is appropriate.
- Development of a Plan to close all remaining open wells installed by SSP&A, in accordance with D.C. Official Code § 8-103.13(a).
- Response to comments received on the proposed Remedy Selection (Appendix A, and B).

Details on the types of vapor mitigation systems to be installed at the qualifying residences will be provided during the remedial design and installation/operation phase of this project.


Keith Anderson
Interim Director

5/03/10
Date

II. INTRODUCTION

The purpose of this document is to inform the public of the District's 'Final Remedy Selection' which addresses potential vapor intrusion caused by the release of hazardous materials, including gasoline, from underground storage tanks located at a gas station formerly owned by Chevron U.S.A., Inc. ("Chevron"), at 5801 Riggs Road in Chillum, Prince George's County, MD, and to respond to comments received on the District's proposed Remedy Selection during a prior 45-day comment period. During the comment period for the proposed "Remedy Selection" dated February 20, 2009, the District received a number of comments from the public. The District has considered all comments received and is hereby revising its proposed Remedy Selection pursuant to the comments received as well as a comprehensive evaluation of the available data (as reflected in the 2010 HHRA).

The District's proposed Remedy Selection for the Riggs Park community originally called for the installation and operation of vapor mitigation systems (VMSs) in up to 45 residences that, according to the 2009 HHRA, exhibited potentially unacceptable risks due to potential vapor intrusion attributable to contaminated groundwater and associated soils. Subsequently, the District undertook an even more comprehensive evaluation of available information and data in order to produce a final remedial action plan for the Riggs Park community. Based on a review and comprehensive evaluation of the various sampling data, as well as the site characterization, response to comments, and the 2010 HHRA generated for the Riggs Park community, the District hereby presents a final remedial action plan that recommends the installation of VMSs in 43 homes.

The findings presented in this Final Remedy are based primarily on data gathered by SSP&A as well as a comprehensive evaluation of the available data (as presented in the 2010 HHRA). The District has also evaluated the information comprising the Administrative Record for this decision. To gain a more complete understanding of the data and other information upon which the District's remedy decision is based, the District encourages the public to review the documents in the Administrative Record.

This 'Final Remedy' (which also includes the response to comments for the proposed Remedy Selection – dated February 20, 2009), the Administrative Record, and the Administrative Record Index are all available for public review on DDOE's website: <http://ddoe.dc.gov/RiggsPark>. Copies of all these documents will also be available at the document repository established for this site at the Lamond Riggs Branch Library located on 5401 South Dakota Avenue, N.E., Washington, D.C., and on a data DVD which is available by written request from Sharon Cooke at District Department of the Environment, 1200 1st St NE, 5th Floor, Washington, DC 20002.

III. BACKGROUND: SUMMARY OF SITE HISTORY AND INVESTIGATION ACTIVITIES

According to Chevron, after a vehicle accident caused damage to one of Chevron's fuel dispensers in October 1989, Chevron conducted an UST tightness test on its underground storage tanks at a gas station formerly owned by Chevron, located at

5801 Riggs Road, in Chillum, Prince George's County, Maryland, abutting the District. This investigation as well as subsequent investigations confirmed the release of gasoline products from the gas station, and the presence of gasoline-related products in the groundwater. Since 1990, Chevron has been recovering gasoline product from the groundwater by operating a groundwater remediation system at the facility.

In 2001, Chevron discovered that gasoline-contaminated groundwater had migrated into the District, underneath a residential neighborhood known as Riggs Park, in Northeast D.C., Ward 4. Because the gasoline plume impacted two separate political jurisdictions (the State of Maryland and the District), at the request of then-Councilmember Fenty, EPA Region 3 assumed the lead investigatory role for the Facility.

During the summer of 2002, as a result of a site investigation carried out by EPA Region 3 at the impacted areas, perchloroethene (PCE) contamination was detected within part of the groundwater contaminant plume². In an August 2008 'Fact Sheet', EPA Region 3 announced that it had completed its PCE investigation, and concluded that no further action was required relative to PCE at that time³. (For a history of EPA Region 3's PCE investigation, please see EPA's website at http://www.epaos.org/site_profile.asp?site_id=A3Q3%20.)

In December 2002, EPA Region 3 ordered Chevron to perform interim measures to mitigate threats to human health and the environment, to perform a site investigation to determine the nature and extent of petroleum-related contaminants in the groundwater, and to perform a Corrective Measure Study to evaluate alternatives for corrective action necessary to protect human health and the environment. Under the interim measures provision of EPA Region 3's 2002 Unilateral Order, Chevron was required to upgrade the groundwater remediation system to recover additional gasoline product in an impacted parking lot area^{4, 5}. Chevron completed the system upgrade in early 2005. In 2007, EPA Region 3 informed Chevron that an additional expansion of the existing remediation system was required⁶. To date, none of the additional groundwater remediation has been installed, as permit approval for installation is still pending. However, Chevron continues to perform routine testing and monitoring as required by EPA Region 3's order.

In April of 2008, EPA Region 3 issued its 'Final Decision and Response to Comments. This required Chevron to install an additional ground water treatment system within the District, as well as the installation of an oxygen curtain, installation of Vapor Mitigation Systems (VMSs) at 3 homes, and additional testing to be conducted at up to 5 additional homes⁷. As one home-owner elected not to be tested, Chevron tested only 4 additional homes and presented the data to EPA for review. On March 5, 2009, EPA Region 3 informed Chevron it had completed reviewing the data and that installation of VMS in those additional homes was not needed.⁸ As of December 9, 2008, Chevron had completed installing the VMSs in 3 homes.⁹

A February 2009 Indoor Air, Sub-slab Vapor, Soil and Groundwater Sampling and Analysis Report prepared by SSP&A, on behalf of the District, revealed soil vapor

contaminated with PCE, 1,4-dichlorobenzene, chloroform, naphthalene, carbon tetrachloride, and methylene chloride. The EPA Region 3 Administrative Order on Consent states that EPA Region 3 will review and consider the results from the SSP&A study^{10, 11, 12}. EPA has concluded this review (see Response to Comment #125 in Appendix B). The SSP&A report is available for review at the Lamond Riggs Branch Library and on DDOE's Riggs Park website <http://ddoe.dc.gov/RiggsPark>, as well as on DVD upon written request from Sharon Cooke as specified in section I.

The Agency for Toxic Substances and Disease Registry (ATSDR) has concurrently carried out health surveys/evaluations for the impacted areas under investigation. ATSDR's goal has been to help the community affected by the Riggs Park/Chillum site understand the public health implications of the groundwater contamination associated with this site and vicinity. A summary of ATSDR's key findings/conclusions is as follows: *"All of the environmental sampling data sets reviewed to date support ATSDR's overall conclusion that all indoor and outdoor air VOC concentrations detected at this site are at levels below those expected to harm people's health"* (ATSDR "Health Consultation" dated December 30, 2008; ATSDR "Letter Health Consultation" dated November 3, 2009; ATSDR "Environmental Health Newsletter, Issue 3" dated February 2010). Throughout its public health evaluations for this site, ATSDR relied on actual indoor and outdoor air sampling results as the basis for the conclusions about the potential health effects.

Other relevant site investigations and related activities of interest include the following:

- In the summer of 2006, the residents of Riggs Park retained a contractor to obtain independent samples, in order to evaluate the implications of the contaminant plume impacting their neighborhood.
- In 2006, the District's Department of Health ("DOH") initiated an independent indoor air sampling effort based on voluntary participation by the Riggs Park residents. Sampling was conducted by the District's contractor, Building Sciences and Engineering Associates (BSEA). BSEA collected indoor air data from 97 homes in Riggs Park, bounded geographically by four streets: Kennedy Street, Madison Street, Eastern Avenue, and Riggs Road. The results of this sampling were presented in the BSEA Riggs Park Air Quality Study, September 2006¹³.
- In response to concerns expressed by residents, the District retained a second contractor, SSP&A, to conduct additional sampling intended to verify the BSEA results noted above. Over the course of three quarters, in 2008, SSP&A collected samples from a total of 118 homes. Indoor air samples were collected from a total of 115 homes; subsurface soil vapor samples were taken at 106 homes. Outdoor subsurface soil vapor samples were taken at 66 homes. Ambient air samples were taken concurrently with indoor, subsurface, and subsurface samples. Subsurface vapor samples were taken from below the concrete slab of the residence, outdoor subsurface vapor samples were taken from the soil in the vicinity of the home. Ambient air or background samples were taken outside the home. The results of

this sampling were presented in the S.S. Papadopoulos & Associates, Inc.'s 2009 'Riggs Park Indoor Air, Sub-slab Soil Vapor, Soil, and Groundwater Sampling and Analysis Report' (dated February 2009).¹⁴

- In response to a request by Riggs Park residents, the District of Columbia Department of Health conducted a health survey from April 2009 - May 2009.
- Over a period of several months, EPA Region 3 reviewed available indoor air and related data for 151 homes sampled at the Riggs Park community, and in March 2010, concluded that some of the homes may require further sampling in order to arrive at definitive conclusions about potential risks to residents.¹⁵

Further information, including the findings and conclusions on the above, can be found in the administrative record and related supporting documents for this project.

Overall, some areas within the Riggs Park community have been impacted by various organic chemicals present in the contaminated groundwater associated with the Chevron release. The primary chemicals of concern are PCE and its degradation products, as well as gasoline-related contaminants. It should be noted here, however, that the initial site investigations focused mostly on the source and location of petroleum products in groundwater, and their impacts. For a full history of the petroleum investigation, please see DDOE's Riggs Park website at <http://ddoe.dc.gov/RiggsPark>. Subsequently, the investigations were expanded to include other non-petroleum constituents, in order that cumulative health risks could be determined, ensuring the protection of Riggs Park residents' health.

IV. REGULATORY FRAMEWORK AND ACCEPTABLE RISK LEVELS

Pursuant to the District Department of the Environment Establishment Act (D.C. Code §§ 8-151.01, 8-151.07(11)), the Mayor has charged the Director of DDOE with the task of executing and enforcing the provisions of this chapter and the rules and regulations adopted pursuant to this chapter. Accordingly, the Director is hereby selecting corrective action for the Riggs Park site pursuant to three different District of Columbia statutes: (i) the Brownfield Revitalization Amendment Act of 2000 (D.C. Code §§ 8-634.02(a),(b); 8-635.01); (ii) the District of Columbia Hazardous Waste Management Act of 1997 (D.C. Code §§ 8-1301, 8-1311(a)(1); and (iii) the Underground Storage Tank Management Act of 1990 (D.C. Code §§ 8-113, 8-113.09(a)). These statutes all contain provisions which allow the District to require and secure corrective action at this site. In addition, the District's Brownfield Revitalization Act provides the District with the authority to impose the necessary institutional controls at this site, as discussed below in Section IX.A.1 of this Remedy (D.C. Code § 8-635.01).

Pursuant to its authority to secure corrective action, the District is using the National Oil & Hazardous Substances Contingency Plan ("NCP") promulgated by U.S. EPA pursuant to the Comprehensive Environmental Response, Compensation and Liability of 1980, 42 U.S.C. §§ 9601, *et seq.*, and used by U.S. EPA in formulating cleanups under CERCLA, as well as corrective actions under the Resource Conservation

and Recovery Act, 42 U.S.C. §§ 6901, *et seq.* U.S. EPA intended to publish an implementation framework for the RCRA(C) corrective action provision, which was titled RCRA(S), but prior to finalizing it, withdrew RCRA(S) (FR Vol. 64, No. 194 / Thursday, October 7, 1999 / Proposed Rules). Instead, U.S. EPA urged coordination between the RCRA and CERCLA corrective action programs, by implementing guidance and policy which both should follow (RAGS and NCP) (U.S. EPA memorandum from Elliott P. Laws and Steven A. Herman to RCRA/CERCLA Senior Policy Managers, *Use of the Corrective Action Advance Notice of Proposed Rulemaking as Guidance*, January 17, 1997, *see also* FR Vol. 64, No. 194). In addition, RAGS, Part D, encourages the use of RAGS for RCRA corrective action sites (RAGS, Part D, Frequently Asked Questions, Fact Sheet).

The NCP specifies that “*for systematic toxicants, the acceptable exposure levels shall represent concentration levels to which the human population, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime, incorporating an adequate margin of safety.*” 40 C.F.R. § 300.430(e)(2)(i)(A)(1). A U.S. EPA Memorandum, dated April 21, 1991, from Don R. Clay (Assistant Administrator), which provides guidance on the above-cited Section, at page 1 of the Memorandum, quantifies the acceptable non-carcinogenic Hazard Quotient as no greater than 1.

In addition, the NCP specifies that “*for known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound life-time cancer risk to an individual of between 1×10^{-4} and 1×10^{-6} ...*” 40 C.F.R. § 300.430(e)(2)(i)(A)(2). The Don Clay Memo provides that U.S. EPA remedial action is generally not warranted where cancer risk is found to be below 1×10^{-4} unless there are adverse environmental impacts (Page 2). The District has selected a 1×10^{-5} cancer risk level, which is within the range permitted by the NCP.

Consistent with the Federal CERCLA (or Superfund) statute, the NCP (40 CFR §300.430), and the D.C. UST regulations at 20 DCMR § 6206.4, the District determines risk based on a cumulative evaluation of chemicals. Under these authorities, the District would consider appropriate remedies for homes where site-specific soil vapor chemicals of concern have been detected at concentrations that pose an unacceptable potential cumulative cancer and/or non-cancer risk.

Acceptable Risk Levels:

Consistent with the regulatory framework presented above, the District has selected a cumulative hazard index of 1.0 for non-cancer health effects, and a cumulative cancer risk level of 1×10^{-5} (which is within the range permitted under the NCP, i.e., 1×10^{-4} to 1×10^{-6}) to be protective of the current and future residents of Riggs Park.

In addition, the District’s selection of the 1×10^{-5} cancer risk level, which is within the range permitted by the NCP (i.e., 1×10^{-4} to 1×10^{-6}), is also consistent with the level selected by EPA Region 3 in reviewing this same project.

V. RISK ASSESSMENT APPROACH AND RESULTS

In February of 2009, an abbreviated human health risk assessment (HHRA) was completed for homes with sub-slab vapor monitoring data at the Riggs Park community. This 2009 HHRA resulted in a recommendation for the installation and operation of vapor mitigation systems (VMSs) in up to 45 residences that exhibited potentially unacceptable risks due to potential vapor intrusion attributable to contaminated groundwater and associated soils. This then formed the basis for the District's original proposed Remedy Selection, dated February 20, 2009.

Subsequently, a more comprehensive HHRA and risk management evaluation for the Riggs Park community was completed in April 2010 to evaluate current and potential cancer risks and noncancer health hazards associated with potential vapor intrusion into 106 homes located in the Riggs Park neighborhood. The primary goal of the 2010 HHRA was to determine whether detected sub-slab contaminant vapor concentrations associated with contaminated groundwater pose unacceptable non-cancer health hazards or cancer risks based on long-term inhalation exposures. Additional evaluations were also carried out for homes where no sub slab data was collected in the SSP&A study. Ultimately, homes in which health risks are found to be unacceptable are to be targeted for remediation by installation of a VMS.

The methods used in the risk assessment for Riggs Park conform to all key U.S. EPA risk assessment/management guidance and policy. Among other things, U.S. EPA risk assessment guidance and policies require that individual chemical risks be calculated for each detected chemical and that those risks be summed when an individual is exposed simultaneously to multiple chemicals in order to derive the cumulative risk. Health risks must also be calculated for the "reasonable maximum exposure" (RME) individual, which then forms a key basis for making risk management decisions in accordance with U.S. EPA's risk management framework.

DDOE's 2010 HHRA for the Riggs Park community presents, in more detail the following health risk estimates:

- Non-carcinogenic hazard quotient (HQ) for each detected chemical and the cumulative hazard index (HI) for all chemicals detected in the subslab sample based on EPA Region 3 toxicity values; and
- Carcinogenic risk for each chemical and the cumulative carcinogenic risk for all chemicals detected in the subslab sample risk based on EPA Region 3 toxicity values.

These potential health risks were generally calculated on the basis of the vapor concentrations measured in sub-slab samples that were collected in 2008 by the District Department of the Environment's contractor, S. S. Papadopoulos and Associates (SSP&A 2008). Where such data were missing, alternate data sets were utilized in arriving at justifiable risk conclusions for the study areas. By solely focusing on the sub-slab samples, it can be concluded that the detected chemicals are arising from a source under

the home and that there are no ambient household chemicals confounding the sub-slab samples.

A total of 357 vapor monitoring port (VMP) samples were collected in 2008 from 106 Riggs Park homes, and the health hazard and cancer risk were calculated for each of those samples – as detailed in the Human Health Risk Assessment report (DDOE, 2010).

Summary of the 2010 Human Health Risk Assessment Results:

In 2009-2010, the District undertook a more comprehensive evaluation of available information and data in order to produce a definitive remedial action plan for the Riggs Park community. Among other things, a groundwater co-relational assessment was conducted for homes which participated in the SSP&A study, but for which VMP data were not available. Ultimately, a comprehensive HHRA for all the homes which participated in the SSP&A study was completed in April of 2010.

Based on the analytical results described in the 2010 HHRA and other related documents, it was concluded that installation of a VMS system is warranted for a total of 43 Riggs Park homes, as follows:

1. Twenty-two (22) homes qualify for remediation based on the presence of COC's in VMP samples at unacceptable levels and a link to groundwater.
2. Seven (7) homes qualify for remediation under the duplex evaluation.
3. Eight (8) homes qualify for remediation under the kriging evaluation.
4. Five (5) homes qualify for remediation under the duplex evaluation and kriging evaluation.
5. One (1) out of the twelve homes that participated in the study, but had no VMP samples, qualifies for remediation based on GMP data and groundwater.

Specifically, sampling and analysis results show that 22 homes warrant remediation due to contaminant levels measured directly in the sub-slab vapor space under the home (category 1, above). However, not all Riggs Park homes were sampled for this investigation. Although many homeowners were unable to participate in this study, important site-specific results gathered as part of this study must be applied to all homes at Riggs Park that are in the vicinity of the plume to ensure protection of public health for all residents. For this reason, the following two additional analyses were conducted, extending the findings in this study to neighboring or surrounding homes:

- I. The first analysis was conducted to determine whether the adjoining duplexes of each of the 22 homes that are being targeted for remediation were included in the study. This is important since the adjoining duplex (not sampled) would be located over the same contaminated groundwater as the home identified as needing remediation. Since they share the same basement concrete slab, it is reasonable to assume the sub-slab vapor contaminant conditions would be very similar. In this analysis, all available information on the adjoining duplex was

evaluated and, if the VMP samples were collected and the cancer risk for that home was calculated to be acceptable, it was not included in the list of homes requiring remediation. Where the adjacent duplex home was sampled and found to have unacceptable VMP risks, it was simply included as another home requiring VMP installation. Under this analysis, of those adjacent duplex homes that did not participate in this study and were therefore not sampled, seven (7) homes qualify for remediation, as a prudent public health measure (category 2, above).

- II. In the second analysis, the modeling procedure of 'kriging' (which involves statistical interpolation of available data) was performed to determine if remediation was warranted for any other surrounding homes in the area (in addition to the physically attached duplex home previously discussed). As with the "duplex" analysis, this type of analysis was conducted as a prudent measure to fill existing data and information gaps. If the kriging results showed other surrounding homes should be included as a "cluster" of homes, these were also included. Under this analysis, eight (8) homes qualify for remediation, as a prudent public health measure (category 3, above).
- III. Five (5) homes qualify for remediation, as a prudent public health measure, under both, the "duplex" analysis and the 'kriging' analysis (category 4, above).

Finally, for the 12 homes without subslab soil VMP samples that have basements very close to the groundwater table, a critical analysis was conducted using Geoprobe Monitoring Port (GMP) data and data from the nearest groundwater well (where the site-specific subslab chemicals of concern have the potential to pose a cumulative health risk from subslab soil vapor to exceed the DDOE acceptable cancer risk level of 1×10^{-5} or non-cancer hazard index of 1); on that basis, it was determined that one (1) home warrants remediation due to petroleum and chloroform contamination in groundwater above acceptable levels (category 5, above).

In the final analysis, it was determined that a total of 43 homes should be considered for remediation. These homes are listed in Exhibit A below, along with the rationale for taking remedial action. For each home it was assumed that a resident would stay home and breathe the vapors 24 hours a day, 7 days a week, 350 days a year, for 30 years even though most residents will not be in their homes for such extended periods¹⁶.

EXHIBIT A: Summary Table of Riggs Park Homes Recommended for Remediation
(Source: 2010 HHRA Report – DDOE)

Home ID	Rationale
S13	PCE VMP Risk
S30	PCE VMP Risk
S33	PCE VMP Risk
S36	PCE VMP Risk
S37	PCE VMP Risk
S88	PCE VMP Risk

Home ID	Rationale
S96	PCE VMP Risk
S107	PCE VMP Risk
S121	PCE VMP Risk
S143	PCE VMP Risk
S194	PCE VMP Risk
S199	PCE VMP Risk
S239	PCE VMP Risk
S257	PCE VMP Risk
S258	PCE VMP Risk
S322	PCE VMP Risk
S362	PCE VMP Risk
S416	PCE VMP Risk
S419	PCE VMP Risk
S32	Home in Area of Extrapolated PCE Risk
S195	Home in Area of Extrapolated PCE Risk
S196	Home in Area of Extrapolated PCE Risk
S260	Home in Area of Extrapolated PCE Risk
S310	Home in Area of Extrapolated PCE Risk
S363	Home in Area of Extrapolated PCE Risk
S366	Home in Area of Extrapolated PCE Risk
S418	Home in Area of Extrapolated PCE Risk
S11	Duplex of Home S13
S20	Duplex of Home S121
S89	Duplex of Home S362
S100	Duplex of Home S287
S106	Duplex of Home S107
S157	Duplex of Home S96
S324	Duplex of Home S322
S35	Duplex Home of S33 & Home in Area of Extrapolated PCE Risk
S162	Duplex Home of S239 & Home in Area of Extrapolated PCE Risk
S309	Duplex of Home S143 & Home in Area of Extrapolated PCE Risk
S369	Duplex Home of S199 & Home in Area of Extrapolated PCE Risk
S420	Duplex Home of S37 & Home in Area of Extrapolated PCE Risk
S296	Chloroform VMP Risk
S287	Chloroform VMP Risk
S354	Chloroform VMP Risk
S167	Home With No VMP Samples, based on GMP and groundwater results. Petroleum, Chloroform

VI. REMEDIATION DECISION CRITERIA AND OUTCOME

The District's remedy decision consists of installation of a subslab vapor mitigation system, similar to a radon system, in all residences or inhabited buildings in Riggs Park which meet the criteria that follow. To be considered for a VMS, the levels of the contaminants of concern in the subslab soil vapor samples or its surrogate must meet one or more of the following key criteria:

- 1) Exceed a Hazard Index of 1 for cumulative non-cancer risk posed by gasoline constituents, PCE and/or other contaminants detected in the subslab vapor samples. A Hazard Index of 1 is specified in Title 20 of the District of Columbia Municipal Regulations, Section 6206.4(c), (20 DCMR § 6206.4(c)), and U.S. EPA Memorandum, dated April 21, 1991, from Don R. Clay (Assistant Administrator). The Hazard Index is the sum (or cumulative) of the Hazard Quotients for all the chemicals of concern. The Hazard Quotient is a comparison of an estimated chemical intake (dose) with a reference dose level below which adverse health effects are unlikely.
- 2) Exceed a 1×10^{-5} cumulative cancer risk posed by gasoline constituents, PCE and/or other contaminants detected in the subslab vapor samples. The District has selected a 1×10^{-5} cancer risk level, which is mid-way within the range permitted by the NCP.

Furthermore, to receive a VMS, the chemicals of concern in subslab soil vapor or its surrogate must reasonably be attributable to the groundwater contamination of interest. As such, the chemicals of concern in soil vapor must also be attributable to groundwater contamination to demonstrate that the most probable source of the chemical is the groundwater. Homes where soil vapor contamination or its surrogate cannot be attributed to contaminated groundwater will generally not be remediated at the direction of the District.

As more thoroughly presented above, based primarily on the SSP&A data and the corresponding risk assessment, as well as other documents referenced in the Administrative Record, the District finds that 22 residences have measured subslab soil vapor concentrations at levels that pose unacceptable potential human health risks, 20 homes were selected for remediation due to duplex evaluation or statistical data interpolation, and 1 residence has measured soil vapor or groundwater concentrations at levels that pose an unacceptable potential human health risks. Accordingly, a total of 43 homes are recommended for VMS installation.

For most homes, the risk management decision to install a vapor mitigation system (VMS) was straightforward and based on just two criteria. The first criterion required that at least one COC was detected (in at least one subslab sample at a concentration that posed a cancer risk $\geq 1 \times 10^{-5}$ or a hazard index ≥ 1.0). The second was that there must be a demonstrated link between the COC detected in the subslab sample

and groundwater contamination near the home. The rationale underlying the risk management decision to install a VMS only in homes satisfying these two criteria is based on the concept of effective “risk mitigation.” That is, one of the basic assumptions of the risk assessment is that residents must be exposed to chemicals for a lengthy period of time (years) for the risks to be applicable. Without a groundwater source providing a “reservoir” or continuous source, the calculated risks are not truly representative of cancer risk.

VII. IDENTIFICATION OF REMEDIATION ALTERNATIVES

Buildings located above contaminated groundwater are vulnerable to subsurface vapor intrusion coming from the contaminated groundwater and entering basements through cracks, joints and utility openings. This effect is referred to as subsurface vapor intrusion. The scope of remediation in this document is limited to addressing potential vapor intrusion arising from contaminated groundwater and associated soils only.

The following were identified as potentially feasible remedies to adopt in the remediation decisions for the potential vapor intrusion situations identified for the Riggs Park homes investigated here:

- 1) *Basement Sealant* – Sealant products are available on the open market which can be applied to walls and floors which are in contact with soil. The products are intended to seal small cracks and prevent vapor intrusion. The products must be applied to the structural walls and floor, and are therefore not suitable for use in a basement which is already finished. Some of the products are clear, therefore the integrity of the seal cannot be easily monitored in the future. The effectiveness of these products is unknown at this time; therefore the District does not consider this to be protective.
- 2) *Pressurization of Basement* – A system can be installed to increase the overall air pressure in the basement which is intended to decrease vapor intrusion. In order to maintain the pressure, the basement cannot be accessed after the system is installed, rendering the basement non-usable by the homeowner. The results of installations of these systems are inconsistent; therefore the District does not consider this to be protective.
- 3) *Natural Ventilation* – The basement area can be vented using windows and fans. This renders the basement inaccessible to the homeowner except when the weather is pleasing to their taste. The heating and cooling costs for the home will increase significantly unless the basement is insulated from the house. The results are from this method are inconsistent; therefore the District does not consider this to be protective.
- 4) *Subslab Vapor Mitigation System* – A subslab vapor mitigation system, similar to a radon system, can be installed in all residences or inhabited buildings. The effectiveness of this type of system is well known; therefore the District does

consider this to be protective upon proper installation, operation, and maintenance.

VIII. EVALUATION CRITERIA USED FOR REMEDY SELECTION

This section provides a brief description of the criteria used by the DDOE to evaluate and select the appropriate remedy, in accordance with DDOE and federal guidance documents. The criteria were applied in two phases. In the first phase, DDOE evaluated remedy 'threshold criteria' as general goals. In the second phase, DDOE evaluated 'balancing criteria' to confirm that the selected remedy alternative provided the best relative combination of attributes.

A. Threshold Criteria

The District's evaluation of the threshold criteria was as follows:

1. Protect human health and the environment

The primary health concern under current conditions is vapor intrusion into basements. An appropriate and effective remedy requires the installation of a vapor mitigation system in each residence where the criteria specified in Section V are met.

2. Achieve media cleanup objectives

The vapor mitigation systems will achieve the media (indoor air) cleanup objective by preventing subsurface vapor intrusion into homes potentially affected by the groundwater contaminants. This will ensure that contaminants in the contaminated groundwater do not contribute to indoor air levels that will result in an unacceptable cancer or non-cancer risk.

3. Control the source(s)

The District's Remedy does not control the source of the groundwater contaminants. EPA's remedy addresses groundwater. Rather, the District's Remedy (VMS) is intended to limit the hazardous effects at residences or inhabited buildings impacted by the contaminated groundwater until such time as the groundwater is remediated.

B. Balancing Criteria

After satisfying the threshold criteria, DDOE evaluated the following balancing criteria to demonstrate the suitability of the Remedy:

1. Long-term Reliability and Effectiveness

The vapor mitigation systems to be installed in those occupied buildings affected by vapor intrusion, evidenced by results where the criteria specified in Section V are met, are a proven technology which has been adopted from the radon mitigation industry. Similar systems have been installed in millions of homes throughout the nation to mitigate radon intrusion. The systems are expected to be equally reliable and effective because the mechanism to prevent vapor and radon intrusion is identical.

During the design phase of the Remedy, the District will require the development of a monitoring protocol to evaluate individual home vapor mitigation systems.

2. Reduction of Waste Toxicity, Mobility or Volume

The Remedy does not reduce toxicity, mobility, or volume of the contaminants, but limits residents' exposure to vapors emanating from the contaminated groundwater.

3. Short Term Effectiveness

The short term effectiveness criterion is intended to address hazards posed during construction of the Remedy. Short term effectiveness is designed to take into consideration the impact on site workers and nearby residents such as potential for volatilization of contaminants, the spread of contamination through dust generation, and disposal and/or transportation of the wastes.

Workers will be required to comply with the Occupational, Safety and Health Administration rules and to follow the Health and Safety Plans submitted to DDOE.

No short term hazards to the residents were identified for the Remedy.

4. Implementability

The implementability criterion addresses various constraints, such as regulatory constraints, ability to obtain access agreements, technological and practicability limitations, and intrusiveness to residents due to noise, traffic and aesthetic disruptions.

The vapor mitigation system is a proven technology with no significant implementation constraints except obtaining access agreements from homeowners to install, maintain and test the systems. The District will require that all District and EPA Region 3 required permits be acquired before installation.

Installation of the systems in private properties is contingent upon consent from homeowners. At this time, it is unknown if any homeowners will refuse to allow installation of VMS.

5. Cost

The Remedy is cost-effective in meeting the remediation objectives. According to published information, the estimated capital cost to install each vapor mitigation system

ranges from \$800 to \$10,000^{17, 18} with homes near the water table being the most expensive. Homes with finished basements may incur additional cost.

Maintenance is minimal, but may include replacing the fan, which can be performed from outside the home.

The fan draws approximately the same amount of electricity as a 75 watt light bulb. Alternative energy sources (solar panels or wind turbines) may be available.

IX. FINAL REMEDY

A subslab vapor mitigation system, similar to a radon system, will be installed in all residences selected for mitigative action. The effectiveness of this type of system is well known, and therefore the District considers this remedy selection to be protective, upon proper installation, operation, and maintenance.

The VMS will consist of the following key components: one or more slab penetrations, ductwork guiding subslab vapors to the exterior of the building, a fan to actively draw vapors from below the slab, and ductwork to guide the vapors to the proper exhaust height. Actual design specifications may vary from this list and will be determined during the design phase.

In addition to selecting installation and operation of VMSs in up to 43 residences, the District's selected remedy includes the following tasks:

- Hazardous Substance Easements, also called Environmental Covenants, at residences or inhabited buildings receiving VMS, to allow continuous access to DDOE and/or its agents to monitor the VMS operation in each home.
- Evaluations to determine the most appropriate VMS systems to install.
- Development of a program to monitor each VMS installed pursuant to the District's Remedy, while the VMS is in operation.
- Development of a program to determine when there is no further need to operate the VMS installed at the direction of the District.
- The District will determine in conjunction with EPA Region 3 when shutting down the VMS whose installation was required by the EPA Region 3 is appropriate.
- Development of a Plan to close all remaining open wells installed by SSP&A.
- Response to comments received for the Selected Remedy (see Appendix A and B).

A. Installation of Vapor Mitigation System

The District's Final Remedy Selection calls for the installation of a subslab vapor mitigation system, similar to a radon system, in all residences or inhabited buildings

which meet the criteria described in Section V. All installation and testing will be subject to homeowners' consent. The installation of the VMS will be contingent upon acquisition of all necessary permits from the District and/or EPA Region 3 to install and operate the VMS.

B. Additional Tasks Required to Support Selected Remedy

In the course of implementing this Remedy, the following additional evaluations, determinations, and developments will be made:

1) Determine the most appropriate VMS system to install. In particular, the overall impact on background air results due to the operation of 43 VMSs within a limited area must be determined; if the impact will be significant, systems which capture and/or treat the emitted vapors will be required. Also, homes which are in contact with the water table may require a modification of the VMS system to ensure effective functionality. The final design of the VMS will be determined in the design phase.

2) Develop a program to monitor each VMS installed pursuant to the District's Remedy, while the system is in operation. Monitoring protocols will be determined during the design phase.

3) Development of a program to determine when there is no further need to operate the VMS at the direction of the District.

4) The District will determine in conjunction with EPA Region 3 when shutting down the VMS whose installation was required by the EPA Region 3 is appropriate.

5) Develop a plan to close all wells which were opened by the District's contractors to take samples, according to the District's water quality regulatory requirements (D.C. Official Code § 8-103.13(a)).

C. Institutional Controls

DDOE's remedy requires the following institutional controls be implemented to ensure the protection of human health in the future.

Pursuant to D.C. Code § 8-635.01(b)(3), require the recording of Hazardous Substance Easements, also known as Environmental Covenants, with the D.C. Recorder of Deeds for each home with a VMS, to allow continuous access to DDOE and/or its agent to monitor and ensure the continuity of VMS operation in each home.

The District of Columbia's Brownfield Revitalization Amendment Act of 2000 allows the District to place these institutional controls, and to register the documents with the D.C. Recorder of Deeds (D.C. Code § 8-635.01). Other jurisdictions also routinely use these types of institutional controls in hazardous waste sites.

Endnotes

- ¹ The 30-day comment period began on March 6, 2009, and was originally scheduled to end on April 6, 2009, but was then extended to April 20, 2009, pursuant to a request for extension from the public, making it a 45-day comment period.
- ² Chillum PERC Site Fact Sheet #1, July 2003. <http://www.epaosc.org/sites/A3Q3/files/chillum%20fact%20sheet%20-%207-28-03%20final2.pdf>
- ³ Chillum Site Gasoline and PERC Release Administrative Order Issued to Chevron USA: Update on PERC Investigation, August 2008. <http://www.epa.gov/reg3wcmd/pdf/ChillumIPOrderFactSheet.pdf>
- ⁴ EPA letter to Chevron. September 30, 2002. Page 1. <http://www.epa.gov/reg3wcmd/pdf/chev9.pdf>
- ⁵ EPA Unilateral Order. USEPA Docket Number: RCRA-03-2003-0006TH. November 26, 2002. Page 8. <http://www.epa.gov/reg3wcmd/pdf/chevfinal.pdf>
- ⁶ EPA Statement of Basis Chevron Gasoline Release at Chillum Maryland. August 30, 2007. Pages 10 and 11. <http://www.epaosc.net/sites/abc/files/chillumsb.pdf>
- ⁷ EPA Final Decision and Response to Comments, April 2008. Page 6. <http://www.epaosc.org/sites/abc/files/finaldecisionvolume1.pdf>
- ⁸ March 5, 2009 letter from EPA to Chevron re: Interim Measures Report for Indoor Air sampling at Residences, Former Chevron Facility at Chillum, Maryland. <http://ddoe.dc.gov/RiggsPark>
- ⁹ Interim Measures Construction Completion Report for Vapor Mitigation Systems, Gannet Fleming, April 28, 2009. page 2. <http://ddoe.dc.gov/RiggsPark>
- ¹⁰ EPA Administrative Order on Consent. July 10, 2008. USEPA Docket Number: RCRA-03-2008-0355TH. Page 13. <http://www.epaosc.net/sites/abc/files/iporder.pdf>
- ¹¹ EPA Response to Chevron Comments on Administrative Order on Consent – Transmittal, response to comments and fact sheet for the Chillum/Riggs Park Community. January 16, 2009. Page 7. <http://www.epaosc.net/sites/abc/files/finalorderresponsetocomments.pdf>
- ¹² EPA Final Decision and Response to Comments, April 2008. Page 7. <http://www.epaosc.org/sites/abc/files/finaldecisionvolume1.pdf>
- ¹³ BSEA Riggs Park Air Quality Study, September 2006
- ¹⁴ S.S. Papadopoulos & Associates, Inc.'s 2009 'Riggs Park Indoor Air, Sub-slab Soil Vapor, Soil, and Groundwater Sampling and Analysis Report' (dated February 2009). http://ddoe.dc.gov/ddoe/frames.asp?doc=/ddoe/lib/ddoe/information2/public.notices/Riggs_Park_Sampling_Analysis_Report.pdf
- ¹⁵ Comment submitted by EPA on (March 2, 2010). See Appendix B of this document for a copy.
- ¹⁶ EPA Region 3-Risk Based Concentration Table. <http://www.epa.gov/reg3hwmd/risk/human/>
- ¹⁷ Estimates for VMS installation were obtained via web search, document search, and personal communication.
- ¹⁸ Detailed Field Investigation of Vapor Intrusion Processes ESTCP Project ER-0423. September 2008.

Appendix A

Submitted Comments

Cleo Holmes Response to DC Remedy Selection

April 5, 2009

Administrative Order of Consent (AOC)

Chemicals of Concern (COC)

District of Columbia Remedy Selection (DCRS)

Riggs Park, Indoor Air, Sub Slab Vapor, Soil and Groundwater, Sampling and Analysis Rpt. (RPISS&GR)

Risk Based Corrective Action (DC RBCA)

Tetrachloroethene (PERC)

Questions and concerns

RPISS&GR, pg. [REDACTED] Table 8 states soil sample was collected was taken from my property.

Question 1: Why when on Feb 23, 2009 the DC DOE received a FOIA to provide copies of test results of all samples taken at this property, no soil sample results were delivered?

Question 2: Does the District believe this public comment period a fair opportunity for residents to comment when the residents were not allowed to see or review results of soil and groundwater samples taken on their property?

Question 3: Why doe the DCRS not explain the relationship to the depth of the groundwater and the rate of soil vapor movement in different times of the year, as well as what conditions could cause soil vapor to migrate at a faster rate towards the slab of resident homes?

Question 4: Why does the DCRS not mention how many years it would be before the soil would be considered clean of human carcinogenic chemical compounds?

Appendix O: Table 3 Compounds detected indoor Air Samples PERC Maximum Detection is [REDACTED] ppbv, my result for PERC reported at [REDACTED] ppbv.

Question 5: Why are DOE and its contractor only quoting results in ppbv and not in ug/m3, is this being done so that when an unformed read looks at this report they will think these numbers to be small?
Example: 6.24 ppbv is equal to 42.3 ug/m3

Question 6: With the DCRS pg. 14 listing 17 COC as "Human Carcinogens", why does the District feel cumulative cancer risk is not important issue to be evaluated?

The DCRS refer to there being a toxicologist being an expert, the definition of "expert" is , a person with a high degree of skill in or knowledge of a certain subject of field.

Question 7: Did the Districts "expert toxicologist" agree with or advise the District not to address or evaluate the cumulative cancer risk in Riggs Park study?

First quarter VMP 1 PERC result of [REDACTED] ppbv-[REDACTED] ug/m3, increased to a 2nd quarter VMP 1 result of [REDACTED] ppbv - [REDACTED] ug/m3) and my 3rd quarter VMP 1 went to [REDACTED] ppbv to [REDACTED] ug/m3.

Question 8 : Does this increase in numbers warrant the installation of a Vapor Mitigation System at this property?

Question 9: Why hasn't the District applied any indoor air, sub- slab, or soil vapor action levels for this survey?

DCRS Pg, 6 references the District DOH development and administration of a health survey of Riggs Park residents who reside over the plume footprint caused by the leakage of gasoline from the Chevron gas station.

Question 10; Will DCRS direct DOH to correct its development and administration of the RP health survey to include plumes related to PERC and its breakdown products as well?

The Riggs Park Sampling& Analysis Report, Feb. 2009 makes reference to "Ambient air concentrations of Benzene and toluene, and PCE are within ranges observed both at Washington DC's McMillan Reservoir, and within ranges reported in the literature for other urban environments"

Question 11: Why is the District using McMillan ambient numbers in this report and not ambient air samples taken from Riggs Park as the more representative sample collected?

Table two:" Selected information from home surveys" state at my home:

- a "[REDACTED]", the fact is a [REDACTED] installed at least 12 months prior to the SSP&A testing period.

*This report says "[REDACTED]", inaccurate statement placed in the record.

*This report says [REDACTED] done within two weeks prior to testing, inaccurate statement Placed in the record.

Question 12: Are these inaccurate statements being placed in the record to disqualify this property from having a Vapor Mitigation System installed at this property?

Question 13: Why, when in our FOIA request to the DOE for copies of all contractor field note, none were provide in response to the FIAO we submitted?

Page 3 Cleo Holmes response to the District Remedy Selection

Question 14: Since it has been stated in the February 09 public meeting by DOE Director Hawkins, the problem with locating the PERC plume is that the plume is moving from place to place. Would not it be prudent, as a protection to the community, to install Vapor mitigation Systems under each home in Riggs Park that request a system be installed?

Question 15: What date exactly did the District of Columbia repeal its" Risked Based Corrective Action guidance?

Question 16: why, when the SSP&A took groundwater samples from various locations in Riggs Park, did the District decide not to reveal laboratory results and the process DOE used to evaluate these results?

Question 17: Why does the District feel that by testing only 20% of the homes in is sufficient to protect all residents within the boundaries of the gasoline and PERC contaminated areas?

Page 5 Installations and operation of vapor mitigation systems in up to 45 residences with elevated sub-slab soil vapor levels attributable to contaminated groundwater.

Question 18: is the District decision to perform evaluations to confirm that contaminants observed in subslab vapor samples are attributable to groundwater contamination, being done as the result of a prior agreement with chevron?

Question 19: Is the cost of any re evaluation of any property results being paid for by chevron?

Question 20: Has the District agreed to supply Chevron results of any test performed in the design or installation phase of the Papadopoulos study?

Question 21: Has DOE agreed to collaborate with Chevron or EPA prior to installations of VMS at any property?

Question 22: What exactly is the agreed to Consent order between DOE and Chevron?

Question 23: In February 09 public meeting Director Hawkins explained on PEGR contamination is hard to follow because the way this chemical moves in the subsurface, since the DCRS is based of protective solutions why not install VMS devices under all properties in Riggs Park that which this system?

Many of the Riggs Park site related guidance documents since 2001 noted " District of Columbia's Risk Based Corrective Action as "The" guidance document of choice for this site.

Question 24: Why has DC DOE abandon the District's Risk Based Corrective Action Guidance when evaluating the Riggs Park community?

Question 25: Why does the "Regulatory Framework" listed in the DCRS not mention of DC RBCA?

Question 26: Is the DC Risk Based Corrective Action no longer recognized by the District of Columbia?

Question 27: Does the District of Columbia DOE view the DC RBCA as not being adequate protection for the residents of the District?

Question 28: Is DC DOE decision not to follow its own RBCA at this site as a result on a signed AOC between the District and Chevron?

The residents from day one have asserted its concerns to EPA and D C DOE repeatedly around the issue of having the cancer risk evaluated on a cumulative bases?

Question 29: Since the issue of cumulative risk not being addressed as a part of a pre-existing agreement between Doe and Chevron?

Question 30: How can the DOE consider its remedy to be protective of the health of the Riggs Park resident's without a proper evaluation of any cancer, diseases or other illnesses that could occur as a result of the accumulative exposure to multiple toxic chemicals on the resident population of Riggs Park?

Director Hawkins in a Feb. 2009 public meeting stated the intention of DCDOE intention is to make the Riggs Park web page documents available for public review. As you know this community has repeatedly been asking for this web page to be accessible for sometime now.

Question 31: Is the AOC between the District and Chevron the reason why the community has since October 2008, not been able to properly access and view documents on the DOE web page?

In the Feb. 2009 public meeting Director Hawkins stated the District would be open and transparent with the Riggs Park community?

Question 32: Why, in this public meeting, didn't Director Hawkins announce that DDOE and Chevron in January 2008 entered into an AOC?

Question 33: Please explain the parameters of the AOC and how this AOC affects the relationship between DC DOE and the residents of Riggs Park?

Question 34: Has the gasoline plume seem to be diminished because Chevron has been permitted to inject cloaking chemicals (hydrogen proxide) into the Sub- surface?

The DCRS mentions DOH development and Administration of a health survey in Riggs Park for those who reside in the plume footprint caused by the leakage of gasoline from the gasoline station.

Question 35: Does this footprint include carcinogens MTBE and PERC and in breakdown product as well?

Question 36: Is Chevron collaborating through DOE or directly with DOH on the District health survey and its "specific questions" to be asked to the residents of Riggs Park?

Page 5 Cleo Holmes response to the District Remedy Selection

Nowhere in the District Remedy Selection does it mention the continuing oversight of and distribution of chevron regulatory monthly and semi annual groundwater sampling results to and on behalf of the residents of Riggs Park.

Question 37: Will the resident be guaranteed to receive copies of all future test results complete with executive summaries for as long as testing regulatory testing of the groundwater is ordered?

To: Sharon Cooke, Director
Community Outreach Office, District Department of the Environment

From: Mary L. Wilkins
Owner, 672 Nicholson Street, N.E., Washington, D.C. 20011

Date: April 5, 2009

Re: Riggs Park Remedy – 4 Questions

In reference to your e-mail dated March 11, 2009, the following is my response to the District Department of the Environment/Department of Health, Remedy Selection For Riggs Park Community, Washington, D.C. report dated February 20, 2009.

PERC results April, June, and August 2008:

[Below results are in ppbv]

April 2008:

VMP== [REDACTED]

June 2008:

VMP== [REDACTED]

Aug 2008:

VMP== [REDACTED]

Indoor air result April 2008:

April, 2008== [REDACTED]

Question #1:

When the June 2008 VMP increased from [REDACTED] to [REDACTED] why didn't the contractor sample in August 2008 to see if indoor air had increased as well? In fact, the August 2008 VMP went to [REDACTED] ppbv, proving that the contractor erred in his/her responsibility.

Question #2:

Do you intend to put Vapor Mitigation systems on Nicholson Street, N.E.? I'm concerned because the residents on Nicholson Street are so close to the water table. If you are not putting in the vapor remedial systems, how are you guaranteeing the protection of the residents from 500 Nicholson to 808 Nicholson Street, N.E.?

Wilkins' Questions (continued)
Riggs Park Remedy – 4 Questions
Page 2

Question #3:

If my next door neighbor has a crack in her slab, how will this affect the selected remedial system for my property? If there is an alternative remedial system, how will this address the needs of two homes on one slab?

Question #4:

My final question addresses the oversight of the Vapor Mitigation system. Will the District be responsible for the oversight, sampling and operation of this system?

I am requesting that your answers to my questions be made a permanent part of the public record for the Riggs Park Remedy Selection.

Thank you.

Mary L. Wilkins

[REDACTED]
Washington, D.C. 20011

April 5, 2009

Ms. Hazel Lawson

Washington, DC 20011

Comments to District Final Remedy

I am requesting my questions and DOE answers to my questions be published as a part of the DC Remedy Selection.

Here are my SSP&A readings for this chemical.

	Tetrachloroethene	
Feb 08 VMP	████ ppbv	████ ug/m3
April 08 VMP	████ ppbv	████ ug/m3
July 08 VMP	████ ppbv	████ ug/m3

Question: Why is it there are no published numbers that tell the residents what number, i.e. ppbv or ug/m3, is used to qualify their home to receive a vapor mitigation system.

Question: How can your remedy selection be consider adequate if there are no numbers published to tell the residents at what chemical level (reading) this home must receive protection?

Your Remedy mentions to receive a Vapor Mitigation System the chemical of concern must be attributable to groundwater contamination.

Question: In the interest of full disclosure, why hasn't the district released the groundwater test results for the residents to see?

Question: I do not see results for a groundwater sample taken at this property, so given the fact Tetrachloroethene is present in groundwater behind doesn't my hoe being so close to the groundwater qualify my home for the installation of a vapor mitigation system?

Question: With the depth to contaminated groundwater being within feet from my basement and slab, has the District or Papadopulas taken groundwater samples directly under my slab to ascertain the length of time it would take for this contaminated water turned to vapor would take to come in contact with the slab of my home?

Question: Why didn't the Papadopulas measure and report on, the depth to the groundwater under my slab as it is a relevant factor when considering if vapor intrusion is more apt to affect my home?

Question: Why did Papadopulas, after evaluating my Feb. and April results, not take another indoor air sample to find out how much my indoor air was being affected by the increasing tetrachloroethene?

Page 2: Lawson comments to the DC Remedy Selection

Question: Did the District order Papadopoulos not to do a July 08 verifying evaluation of indoor air as part of a pre-existing agreement with Chevron not to take 3rd quarter indoor air samples at any resident?

Question: Does the District consider not performing a third quarter indoor air sample in my home as being protective of health concerns for my home and family?

Question: Why doesn't the District Remedy Selection explain how tetrachloroethene can move from my property to my co slab owner and, under what conditions can the amount of chemical be made to increase to cause harm to my co slab neighbor and her family?

Question: My co slab neighbor has a newborn baby, since our slab has increasing tetrachloroethene VMP readings, what are the possible negative health affects can this chemical cause this child?

Question: With the groundwater being so close to the homes on Oglethorpe Street, how will vapor mitigation systems be installed on Nicholson Street given most of the homes are on the water table?

Question: How many inches or feet off the water table does the contaminant tetrachloroethene begin to turn into contaminated vapor?

Question: Why does the District not mention soil contamination at slab, does this District feel there remedy is complete and validated without a proper evaluation of how many feet of the soil under and around my home is contaminated?

Question: Since the VMP is installed flush with the slab under my home, and the VMP results reveal the presence of contaminate tetrachloroethene, does this mean the soil directly under my home is contaminated as well?

Hazel Lawson



Ethel Archie Comments District Remedy Selection

April 5, 2009

In the Papadopoulos results there is evidence of Tetrachlorethene, Chloroform, Benzene and 1,4 Dichlorobenzene have increased to levels to cause me to have concerns about the possible health affects these chemicals either individually or collectively could have on me and members of my family as well.

I request the questions and answers be published as a part of the Riggs Park District Final Remedy Selection

Question: Can the District explain the decision not to evaluate the cumulative affects these chemicals could have on my family?

Question: I have a new born living in my home; does the District feel the lack of a proper investigation of the cumulative affects is the proper kind of investigation to protect the health of my grand daughter's child living in my home?

Question: Can the District assure me without the protection of a vapor mitigation system the health of my family members will not deteriorate, in the future, as a result of these chemicals toxic chemicals in the sub surface under and around my home?

Question: Did Papadopoulos perform soil and groundwater sampling on my property? If so why weren't the results released to our family for review prior to commencement of the comment period?

Question: I have been a member of the DOE canceled Riggs Park Advisory Committee. Why in monthly meetings RPAC during the past year, after being asked repeatedly, did DOE, a member of RPAC, choose to hide the fact DOE had been in talks with Chevron prior to the start of the District funded Papadopoulos study?

Question: What effect did the agreed to District/Chevron Admin. Consent Order have on the resident not being able to see certain documents that were generated by the testing done by Padadouplos paid for by District taxpayer money?

Thank you

Ethel Archie
Ethel Archie

Washington, DC 20011

April 6, 2009

TO: Victoria North, District Dept. of the Environment
FROM: Tamiko Lofty, Homeowner
SUBJECT: Response to the District's Selected Remedy for the Riggs Park/Chillum Site

I, Tamiko Lofty, reside in Riggs Park at the following address:

[REDACTED]
Washington, D.C. 20011

I am requesting that my house be considered for a vapor mitigation system for the following reasons:

In the March 2008, first quarter results from the Papadopoulos test, Tetrachloroethene, which is a known carcinogen, was detected in high numbers in both the indoor air and subslab test results (See Attachment A). In the July 2008, second quarter results the same carcinogen appeared at a high rate (See Attachment B). In the September 2008, third quarter results, which was also the final testing; the same carcinogen appeared, again, at a high rate (See Attachment C).

Because of the high the numbers which have appeared in each of the tests conducted at my home, I would like DDOE to answer the following questions:

1. Why did DDOE not order additional "indoor air" testing after receiving the high results which appeared in the 1st quarter?
2. What numbers have been set by the District of Columbia to determine action levels?
3. Do high test results of known carcinogens warrant vapor mitigation systems?

It is extremely important that my concerns be addressed and remedied, and I would appreciate immediate attention. Thank you.

Tamiko Lofty

[REDACTED]
Washington, D.C. 20011

Home [REDACTED]

Cell [REDACTED]

Work [REDACTED]

ATTACHMENT A

PAPADOPULOS DATA FIRST QUARTER RESULTS

Collection Date
28-Mar-08

Received
31-Mar-08

(FOLLOWING THIS PAGE)

GOVERNMENT OF THE DISTRICT OF COLUMBIA
Department of Health



April 23, 2008

Dear Riggs Park Resident:

Attached is the data from the first quarter sample collected in your home by S. S. Papadopoulos. The attached data, along with data that will be collected in the second and third quarter of this year, will be analyzed and the findings presented to you in the form of an "Individual Home Test Report" (IHTR) sent to you in the fall 2008. The IHTR will include test results (data) and basic information on testing, including preliminary interpretation of data.

If you have any questions, you can contact Judith Johnson at (202) 442-9335 or Ronald King at (202) 442-8983. DOH will continue to meet you at the Riggs Park Community meeting held on the first Thursday of each month at 6:30 pm at the LaSalle Elementary School.

Sincerely,

A handwritten signature in dark ink, appearing to read "V. Sreenivas", is written over the printed name.

V. Sreenivas, Ph.D., CPM
Chief of Environmental Health Affairs

Enclosure

Selected Material
Redacted for Privacy

ATTACHMENT B

PAPADOPULOS DATA FIRST QUARTER RESULTS

Collection Date
25-Jul-08

Received
28-Jul-08

(FOLLOWING THIS PAGE)

Selected Material
Redacted for Privacy

ATTACHMENT C

PAPADOPULOS DATA FIRST QUARTER RESULTS

Collection Date
12-Sep-08

Received
15-Sep-08

(FOLLOWING THIS PAGE)

Selected Material
Redacted for Privacy

April 4, 2009

Gertrude Johnson S.S. Papadopoulos Home ID # [REDACTED]
[REDACTED]
Washington, DC 20011

RE: DC Remedy Selection

Response to District Remedy Selection for Riggs Park Due April 6, 2009

Let me state for the record I find the manner in which DC Department of the Environment handled their part of the Papadopoulos testing was and continues to be deplorable. I feel this department of the District government should be investigated for violations of the public trust. In the case of my home this department provided no solutions only controversy to this already frustrating situation. I demand my opening statement be published and made apart of the formal record of this contract investigation.

If as quoted in DC Remedy Selection, "the district has based the decision on sub-slab soil vapor samples" and " sub-slab soil vapor results are indicative of contaminants potentially emanating from groundwater and represent a source of potential indoor air vapor intrusion".

Is "Chemical of Concern "Perchloroethene " mentioned of page 5 of DC Remedy another way word for Tetrachloroethene?

Why is the District and its contractor SSPA decide not to do 2nd or 3rd round of Indoor air sampling at my home?

- A.) The February 08 indoor air sample result for chemical compound Tetrachloroethene was [REDACTED] ppbv.
- B.) Tetrachloroethene readings in my VMP went from negative in February 08 to [REDACTED] ppbv in June 08, to [REDACTED] ppbv in August 08?
- C.) Tetrachloroethene readings in PVMP 1 went from [REDACTED] ppbv in February to [REDACTED] ppbv in June and [REDACTED] ppbv in August
- D.) Tetrachloroethene readings in PMVP2 went from [REDACTED] ppbv in February to [REDACTED] ppbv in June 08.

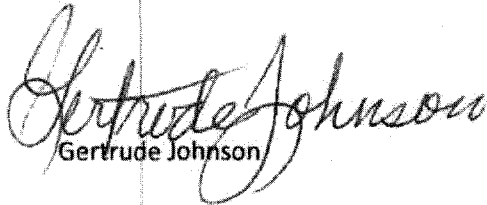
A, B,C, and D. is evidence tetrachloroethene is increasing. Why did the District not perform additional indoor air testing in Q3 to address this obvious concern?

Since EPA and Chevron are not going to clean up the groundwater under my home, why doesn't the District Remedy address the issue of the fact not potentially that Tetrachloroethene, is increasing, in the sub-surface under my home. What does the District plan to do to prevent my home from future exposure?

In the Riggs Park Indoor Air, Sub-Slab, Soil and Groundwater Analysis Report, Table 3- states in Q1 "[REDACTED]" I have on memory of this ever happening. Table 8- reveals on 4-3-08 a soil sample was taken at the depth of [REDACTED] feet. No Lab results were provided me by the date of this my response to the DC Remedy.

In February 09 I sent and the District DOE received my FIOA request, my request asked for results from all indoor air, soil, soil vapor, and groundwater test taken in or on my property. This request also asked for copies of all field notes, log books and any other documents generated by S.S. Papadopoulos or its contractors during this sampling event. To date DOE my FOIA has not satisfied my request.

In the District Administrative Record File, why is SSPA Final Report Appendix B, C, R,S, T, considered to be "Confidential" When DC DOE Director Hawkins has come before this community and said this investigation and results are completely transparent and above board. Why is DOE keeping the aforementioned files "confidential" ?


Gertrude Johnson

From: Barbara Davis [candie077077@yahoo.com]

Sent: Tuesday, April 07, 2009 11:14 PM

To: Cooke, Sharon (DDOE)

Cc: fenty@dc.gov; Delores Ford; Frank Harris; Cleo Holmes; Darrel Johnson; ANDREW Robertson JR; eddie_Judy; King, Ronald (DOH); Mary L.; Deborah Lehner; Andrew Robinson; Bettye Tate; Bernard Tinner; Janice Wade; juanita waller; Carol Warren; Barbara Davis

Subject: "A Formal Request"

04/07/2009

Ms. Cooks,

I hope this e-mail find you in good health.

Ms. Cooke the subject of this matter is a **'Formal Request for a 'Vapor Mitigation System'** to be install at my address. Which is stated in the "District of Columbia Remedy Selection".

Even thou **I wasn't allow to participate in the 2008 S. S. Papadopolous Study**, I'm **Formally Requesting, again a 'Vapor Mitigation System'** at my address.

Ms. Cooke, I'm also **requesting that my question (request), and your answer to my request (question) be made apart of the official record for this study.** "I will await your Speedy Decision".

'Thanking You In Advance' & "God Bless"

Ms. Barbara J. Davis

12/08/08

Dear Ms. Cooke,

I am requesting a **"Full Data Pack"** from Spectrum Laboratory of all tests performed by S.S. Papadopoulos at my property: [REDACTED]. Also I'm requesting the **"Tentative Identified Compounds"** I shall look forward to receiving this information **within 7 to 14 business days** from the **date of this e-mail message.**

In addition, I would like to request a **"Vapor Mitigation System"** to be installed on my property, as soon as possible.

'Thanking You in Advance' on these matters.

"God Bless", MS. Barbara J. Davis

candie077077@yahoo.com

Glenda Theodore

[REDACTED]
Washington, DC 20011

April 5, 5009

RE: S- [REDACTED] Comments District Remedy Selection

I notice the Naphtalene in April VMP 1 was [REDACTED] ppbv- [REDACTED] ug/m3 and June [REDACTED] ppbv- [REDACTED] ug/m3 indoor sample o8 reveal increase of almost a 3 times is this be proof that this chemical has entered into my home?

Why did the District and Papadoupas elect not to retest the indoor air in the 3 quarter to validate in increasing and intrusion of this deadly chemical into my home?

For what reason can District defend this type negligent testing behavior as the proper way to evaluate how and if toxic chemicals are coming into my home?

Please explain why the residents were told about the dangers of Naphtalene and its being a human carcinogen?

When I come to meeting why does DOE give the impression as though they are not working in the best interest of the Riggs Park residents?

No matter what I the District should install a vapor mitigation system installed at my property to insure my family safety, does the District agree with me?

I need my comments and the Districts response to my comments to become a part of the official record of the District of Columbia Remedy Selection.

Glenda Theodore

Betty Tate District Remedy Comments April 5, 2009 please publish as part of record

In selecting this Remedy, The District has evaluated the risk for healthy adults.

Question: Why didn't the Dc Remedy mention, adults that may already have health problems, their conditions can be aggravated by exposure to gasoline and PERC vapors coming into their homes?

DDOE has not evaluate the indoor air results in any building in this study and the Actual Cumulative Risk Levels, therefore the Cumulative Risk Level in the Remedy is not known..

Question: Is the DOE decision not to evaluate the Cumulative Risk Levels in Riggs Park a condition of the agreed to DC and Chevron Administrative Consent Order ?

September 11, 2008, Mr. Andrew Fan stated that the upwelling of the contaminated deeper water rising up into shallow water and clean water appears in the Oglethrope Street area-this has something to do with El Nino year off the Coast of Peru, the Contaminated groundwater is still there.

Question: Can this be true?

Question: Is the DOE decision not to challenge EPA decision not to clean up the groundwater a part of the Administrative Consent Order between DOE and Chevron?

Question: Why is the District not establishing toxicity value for the Chemicals in Table 2 that were detected in Riggs Park sub-slabs soil vapor samples?

Question: Does the District feel the District Remedy Selection is flawed because of the lack of a Cumulative Risk of evaluation?

In Jan. 08 a Indoor Air sample was taken at my home, Napthelene was [REDACTED] ppbv-[REDACTED] ug/m3

Question: Why didn't Papadopoulos not come back to my home and do another indoor air test to see if these numbers were increasing or decreasing?

Question: Why is the District asking for the residents to comment on a District Remedy Selection, without the community being able to read the District promised individual report we were promised at the prior to the start of the Papadopoulos contract?

Question: Why, when DOE, came into the picture, did the contract deliverables change to non existent?

Question: How much of the \$ 500,000.00 DOE paid to fund the Papadopoulos contract did Chevron refund to the District as a condition of the District and Chevron Administrative Consent Order?

Cancer is not the only health concerns that are affecting this community. We have residents with Respiratory, Kidney, Liver, and others.

Question: Will the District Remedy Selection give a strong recommendation that a gasoline and PERC related chemical(s) health study/survey be performed in Riggs Park?

Darrell Johnson Comments

DC Remedy Selection

April 5, 2009

Please receive and publish all my questions, attachment and all the District response to my questions in a public format.

Here is a part of my

Tetrachloroethene

VMP 1

VMP 2

Feb 08. [REDACTED] ppbv-[REDACTED] ug/m3

[REDACTED] ppbv-[REDACTED] ug/m3

April 08 [REDACTED] ppbv-[REDACTED] ug/m3

[REDACTED] ppbv-[REDACTED] ug/m3

Sept 08 [REDACTED] ppbv-[REDACTED] ug/m3

[REDACTED] ppbv-[REDACTED] ug/m3

Why did Papadopoulos and the District decide not to resample the indoor air of my home to see how much this chemical is increasing in our indoor air?

How can the District call this study-evaluation complete and accurate without properly evaluating all factors involved with publishing whether or not vapor intrusion is a happening at my home?

What factors in the attached "District and Chevron Administrative Order" on Consent altered the manner in which the District's contractor Papadopoulos performed the duties and responsibilities of the contract the District taxpayer funds paid to receive?

Why didn't the District notify the Riggs Park residents of the DC and Chevron Order of Consent was been negotiated and agreed to?

Why did the District Remedy Selection publish the amounts of chemical contamination that would trigger the installation of a vapor mitigation System?

Since this chemical is on the increase, what is the possible accumulative health affects of this chemical and could this increasing chemical increase the carcinogenic effect of other chemicals and collectively increase the potential for illness at my property and my neighbors as well?

I am Darrell Johnson and I approve this message

Delores Ford

It is documented in either the December 2008 or the January 2009 public meetings where this community repeated pleaded and begged our District government's ' Councilwoman Bowser, Department of Health, Department of Environment, ATSDR, and EPA to install additional monitoring wells between 643 through 736 Oglethorpe Street because in the reports that placed in Lamond/Riggs Library shows that no data is being produced out of Monitoring Well #39 because it is in a clay area. We were told by EPA that monitoring wells can not produce data if they are in monitoring wells. I strongly believe it is this type of behavior from our District and Federal government officials and agency representatives that are responsible for countless members of this community question the motives and actions of those in authority!

Director Hawkins told us in the February 5, 2009 meeting that the District of Columbia could have Chevron install or etc... in this community and they would do it!

1. When are you going to ask Chevron to install additional monitoring wells in this particular area;
2. Why hasn't the District government and DDOE follow up with a health survey that addresses the cancer conditions between this locations since it was reported to you;
3. When the RPAC members conducted their own health survey on Oglethorpe Street, it was found that alarming numbers of cancer has been and still is ramped between that section of homes;
4. Data proves that there is liquid gasoline present on Oglethorpe Street.. Where are additional monitoring wells going to be installed between 651 through 736 on Oglethorpe Street. Because there are not data producing wells in or around these addresses?
5. How clean is the ground water on Oglethorpe Street?

Marion Drummond S- [REDACTED]

[REDACTED]
Washington, DC 20011

April 5, 2009

RE: Comments related to the District Remedy Selection

I asked the District for 2 months and finally received one Papadopulas identification number, I went to the library and researched I found there are two ID #s for my home. Why did the District not disclose I had a second identification number?

How many other homeowners who participated in this study have been two ID numbers without their knowledge?

Since the District did not disclose the 2nd number, this number revealed there was a soil sample taken at my home but did not give me the results of these test taken on my property. How can the District initiate a public comment period without allowing the residents the ability to view then comment on the soil and groundwater results of samples taken from their homes?

Has the District shared the soil, soil vapor, groundwater, and indoor air results with chevron prior to this resident public comment period?

I am very concerned about the depth to the groundwater under my property and the ability of the toxic chemical to come into my home now and in the future. How can the District protect me from these chemicals coming into my home?

Is the District or Chevron going to clean up this contaminated groundwater under my home?

S [REDACTED] Riggs Park Indoor Air, Sub slab vapor, soil and groundwater report makes reference to my basement [REDACTED] and resident refused removal of [REDACTED] from the basement. This statement is not correct, I never made this kind of statement and my basement was not [REDACTED].

Please publish my questions and the District response to my questions as a part of the administrative record for this DC Remedy Selection and the Riggs Park Administrative Record.

Marion Drummond.

From: John Dunston [johndunston923@yahoo.com]

Sent: Wednesday, April 08, 2009 11:11 PM

To: Cooke, Sharon (DDOE)

Cc: cleo holmes; darrel johnson; delores Ford; Carew, Christopher (DDOE); Corman, Bicky (DDOE); Delgadillo, Gabriela (DDOE); North, Victoria (DDOE); Kauffman, Nick (DDOE); Graham, Robin (DDOE); Etwaroo, Larissa (DDOE); b.tate33@yahoo.com; darrel johnson; Carol Warren

Subject: Re: dc remedy coments

Attachments: chain of custody.pdf

ns. cooke, i need someone to explain this chain of custody to me. i was looking through ssipa file h and i found his. about my sample. my id number is s[REDACTED]. the chain of custody looks like the sample was taken from my house on [REDACTED] at [REDACTED] pm. on [REDACTED] at [REDACTED] am the samples left this location and arrived at the final destination, assume the laboratory. i need the district to explain what appears to be two other persons doing something with the canisters on [REDACTED] it shows these persons leaving this location at [REDACTED] pm. this causes me to wonder were these canister tampered with in this time period, what was going on. i would like a detailed description for the actions of everyone who came in contact with my canister s[REDACTED] for the entire time this chain of custody describes.

ask this email questions and answers be made a official apart of the dc remedy selection and the official record for the riggs park chillum investigation.

ns. cooke please confirm your received this email.

ohn dunston

From: "Cooke, Sharon (DDOE)" <sharon.cooke@dc.gov>

To: John Dunston <johndunston923@yahoo.com>

Cc: cleo holmes <cholm7777@yahoo.com>; darrel johnson <d.johnson14@yahoo.com>; delores Ford <delores.ford@yahoo.com>; "Carew, Christopher (DDOE)" <christopher.carew@dc.gov>; "Corman, Bicky (DDOE)" <bicky.corman@dc.gov>; "Delgadillo, Gabriela (DDOE)" <gabriela.delgadillo@dc.gov>; "North, Victoria (DDOE)" <victoria.north@dc.gov>; "Kauffman, Nick (DDOE)" <Nick.Kauffman@dc.gov>; "Graham, Robin (DDOE)" <robin.graham@dc.gov>; "Etwaroo, Larissa (DDOE)" <larissa.etwaroo@dc.gov>

Sent: Monday, April 6, 2009 10:23:17 AM

Subject: RE: dc remedy coments

Mr. Dunston,

I received your comments on the District's Proposed Remedy for Riggs Park .

Regards,

Sharon Cooke
Director
Community Outreach Office
District Department of the Environment



From: John Dunston [mailto:johndunston923@yahoo.com]

Sent: Sunday, April 05, 2009 6:25 PM

To: Cooke, Sharon (DDOE)

Cc: cleo holmes; darrel johnson; delores Ford

john dunston

[REDACTED]
washington, dc 20011

ref. response to dc remedy selection

april 5, 2009

let me first state I want my questions and the district answers to my question to be made apart of the official district administrative record of the riggs park contamination investigation

i have not received a copy of the results of a soil sample taken [REDACTED] at a depth of [REDACTED]. does the district think it is fair for them not to allow me the ability to view and comment on the soil sample as a part of this comment period?

what is acetone and why is it so high in gmpr 1 ([REDACTED] ppbv-[REDACTED] ug/m3 and gmpr 2 ([REDACTED] ppbv-[REDACTED] ug/m3)?

an indoor air test was taken from my property in february 2008. the laboratory results from this sample showed 1,4 dichlorobenzene in my indoor air as [REDACTED] ppbv - [REDACTED] ug/m3. why did the district not do another indoor air sample in april or august to investigate this high february number?

why does DOE feel by not disclosing results of all tests the residents will have a fair opportunity comment on issues related to the indoor air, soil, soil vapor and groundwater samples taken from their properties?

in the feb. public meeting doe director george hawkins stated the district would be transparent with the documents for the riggs park community. what documents are in appendix a, b,r,s, t, the districts administrative record file for the riggs park remedy selection that cause these files to be treated as confidential.

through agreement with chevron, did the district share these confidential files with chevron when these files came available from papdaopulas?

in the January 08 administrative order of consent between chevron and doe the chevron agreed to pay \$10,000.00 of the cost for the district expert toxicologist. did the district reveal the name of its expert toxicologist when negotiating this consent order with chevron?

how much money did chevron pay the doe prior to and while the papadoupas study was being done?

as part of the aoc did chevron have access to resident results before the resident did?

councilwoman bowser's office held 10 to 12 monthly ward 4 public meetings, with representatives of dOE in attendance. why did doe choose not disclose the terms of the administrative order of consent at the request of chevron?

when exactly did doe inform the mayor office and councilwoman bower that doe had agreed to enter into an administrative order of consent with chevron?

since chevron paid for the services of victoria north, did the district agree to limit the monitoring of chevrons site activities and/or not continue monitoring chevron site activities on behalf of the residents of riggs park?

when the residents asked questions by email and public meeting did the doe agree limit answers to the residents questions as a result of an agreement with chevron?

as a result of the aoc between chevron and the district did chevron have access to the districts experts toxicologist prior to the release?

what percentage of the district remedy selection was negotiated and modified with chevron prior to its release to residents of riggs park?

why when the district knew the mistrust the residents have of chevron, why did doe enter into secret activities with chevron without the knowledge of and against the will of the district very residents chevrons caused harm?

i am truly concerned and upset that the very department, dc department of the environment, with the mission to protect the residents of the district from environmental harm, entered into an agreement against the very residents this agency was created to protect. this action by doe has cause me to wonder why the residents of the district are not being treated in a honest and fair manner. i am asking the mayor of the district of columbia to have a public hearing to investigate the activities the district department of the environment. this hearing must be open and transparent as to allow the residents of riggs park and the district of columbia full disclosure.

Again I state I want all my questions and doe answers to my questions published and made apart to the official record for the riggs park contamination investigation.

john dunston

Chillum Resampling Locations

1. HSCD has reviewed all of the Indoor Air data for the 151 homes sampled, and identified the following 7 homes as locations where the Contaminant of Concern (COC) in basement readings exceed EPA's 10-4 cancer Risk Screening Levels (RSLs) or result in a non-cancer hazard index (HI) > 1 (using standard residential exposure assumptions). HSCD further reviewed the historical sampling results, and provides the following house specific recommendations:

██████████ - COC is Naphthalene, which is not related to either the suspect gas station or dry cleaner releases. DDOE performed the one sampling event in 2008. DDOE should advise the residents of the risk value exceedance, and consider further identification of an indoor source. Relative to investigation of the Chillum Site gasoline or dry cleaner releases, no additional sampling is recommended.

██████████ - COC is 1,4 Dichlorobenzene; it is unclear whether this is related to the suspect gas station leak but it is not known to be a dry cleaning chemical. Only one indoor air and subslab sampling event was performed by DDOE. Subslab concentrations were significantly less than the indoor air results. Therefore, it is recommended that an additional round of contemporaneous sampling be performed to more fully characterize subslab and indoor air at this residence.

██████████ - COCs are Carbon Tetrachloride and Chloroform, which may be related to the suspect dry cleaner release. These COCs were detected by EPA above the 10-4 cancer risk level in the July 2003 sampling event. The data from the April 2005 EPA and the DDOE 2008 sampling events are within acceptable risk levels. Subslab levels were either comparable to or less than the Indoor Air levels. Therefore, it is recommended that an additional round of contemporaneous indoor air and subslab sampling be performed to confirm that no further work is required.

██████████ - COCs are 1,2,4 Trimethylbenzene and 1,3,5 Trimethylbenzene; it is unclear whether the results are related to the suspect gas station leak but they are not known to be dry cleaning chemicals. Only one indoor air and subslab sampling event was performed (by DDOE). The COCs were detected in only one of the 6 Subslab samples, and this one sample concentration was significantly less than the indoor air. Therefore, it is recommended that an additional round of contemporaneous indoor air and subslab sampling be performed to more fully characterize this residence.

██████████ - COC is Chloroform, which may be related to the suspect dry cleaner release. Only one indoor air and subslab sampling event was performed by DDOE. The three subslab concentrations for Chloroform were significantly less than the indoor air. Therefore, it is recommended that an additional round of contemporaneous indoor air and subslab sampling be performed to more fully characterize this residence.

██████████ – Vapor Mitigation System has been installed. Therefore, no further evaluation of historical data was conducted.

██████████ – COC is 1,2,4 Trimethylbenzene; it is unclear whether this is related to the suspect gas station leak but it is not known to be a dry cleaning chemical. This COC was detected above the RSL in an April 2004 EPA sampling event. The data from the April 2003, July 2003, June 2005, and April 2006 EPA sampling events and the DDOE 2008 sampling event were non-detect for this COC. Subslab levels for this compound also were non-detect. This residence will be discussed further under the Subslab data review, and it is recommended that an additional round of contemporaneous indoor air and subslab sampling be performed to confirm that no further work is required.

2. HSCD has reviewed all of the subslab data for the 151 homes sampled, and identified the following 3 homes as locations where the Contaminant of Concern (COC) exceeds EPA's 10-3 cancer Risk Screening Levels (RSLs) or results in a non-cancer hazard index (HI) > 10. By applying this screening level, we are using the conservative Attenuation Factor of 0.1 for vapors migrating from subslab to indoor air. HSCD further reviewed the historical sampling results, and provides the following house specific recommendations:

██████████ - COC is Naphthalene detected by DDOE, which is not related to either the suspect gas station or dry cleaner releases. It should be noted that Naphthalene was not detected in any of the 4 Indoor Air samples collected by EPA in July 2003, April 2004, February 2005 or DDOE in 2008, nor in 5 of the 6 Subslab samples collected in 2008 by DDOE. DDOE should advise the residents that a public health threat exists. No additional sampling relative to the Chillum Site groundwater releases is recommended.

██████████ – COC is Chloroform, detected by DDOE in 2008, which may be related to the suspect dry cleaner release. Only one indoor air sampling event was performed by DDOE, which was non-detect. It should be noted that Chloroform levels exceeded the RSL in five out of the 6 DDOE subslab samples in 2008. Therefore, it is recommended that an additional round of contemporaneous indoor air and subslab sampling be performed to more fully characterize this residence.

██████████ – COC is Tetrachloroethene; which is likely related to the suspect dry cleaner release. This COC had significant levels detected in all of the Subslab samples collected in EPA's July 2003 and DDOE 2008 sampling events. It should be noted that the COC was not detected in indoor air in EPA's April 2003, July 2003, April 2004, June 2005, April 2006 sampling events and the DDOE 2008 sampling events. It is recommended that an additional round of contemporaneous indoor air and subslab sampling be performed to confirm that no further work is required.



**Chevron Environmental
Management Company**
Marketing Business Unit
2300 Windy Ridge Parkway
Suite 575 South
Atlanta, GA 30339
Tel 770-984-3104

April 20, 2009

District of Columbia Department of the Environment
Attn: Victoria North
51 N Street NE, 6th Floor
Washington, DC 20002

RE: Comments on Remedy Selection, Risk Assessment and S.S. Papadopoulos Report
Former Chevron Facility
5801 Riggs Road
Chillum, MD

Dear Ms. North:

Enclosed are Chevron's interim comments related to the following documents:

Remedy Selection for Riggs Park Community, Washington, D.C.

*Methods: Riggs Park Comprehensive Human Health Risk Assessment Long Version, and Summary Tables
Supplied by Expert Toxicologist 2/13/09*

Riggs Park Indoor Air, Sub-slab Vapor, and Groundwater Sampling and Analysis Report

If you have any questions, please call me at 770-984-3104.

Sincerely

A handwritten signature in cursive script that reads "Judson Polikoff".
Judson Polikoff
Area Manager

cc: Bicky Corman
Andrew Fan
Herb Meade



GANNETT FLEMING, INC.

Seton Business Park
4701 Mount Hope Drive
Suite A
Baltimore, MD 21215

Office: (410) 585-1460
Fax: (410) 585-1470
www.gannettfleming.com

April 17, 2009

Mr. Judson Polikoff
Area Manager and Assistant Secretary
Chevron Environmental Management Company
2300 Windy Ridge Parkway, Suite 575
Atlanta, Georgia 30339

**RE: Review of Remedy Selection for Riggs Park Community, Washington, D.C.
Former Chevron Facility 122208, Chillum, Maryland**

Dear Mr. Polikoff:

As requested, Gannett Fleming, Inc. (GF) has reviewed the *Remedy Selection for Riggs Park Community, Washington, D.C.*, prepared for the residential area surrounding Former Chevron Facility 122208, Chillum, Maryland, dated February 20, 2009. The report was prepared by the Government of the District of Columbia Department of the Environment (DDOE) and Department of Health (DOH).

The following references were used in the review of the report:

Agency for Toxic Substances and Disease Registry (ATSDR), 2008. Health Consultation, Indoor and Outdoor Air Data Evaluation for Chillum Perc Site. Dated April 2008.

Gannett Fleming, 2003. Description of Current Conditions Report. Former Chevron Facility 122208, Chillum, Maryland. Dated July 2003.

Gannett Fleming, 2006. Site Investigation Report. Former Chevron Facility 122208. Dated July 2006.

Gannett Fleming, 2007a. Interim Measures Report for Indoor Air Sampling at 5846 Eastern Avenue. Former Chevron Facility 122208, Chillum, Maryland. Dated July 2007.

Gannett Fleming, 2007b. Baseline Risk Assessment. Former Chevron Facility 122208, Chillum, Maryland. Dated January 2007.

Interstate Technology & Regulatory Council (ITRC), 2007. Vapor Intrusion Pathway: A Practical Guide. Dated January 2007.

McHugh, T., P. DeBlanc, and R. Pokluda, 2006. Indoor Air as a Source of VOC Contamination in Shallow Soils Below Buildings. Soil and Sediment Contamination, Vol. 15, pages 103-122.

S.S. Papadopoulos & Associates, Inc., 2009. Riggs Park Indoor Air, Sub-slab Soil Vapor, Soil, and Groundwater Sampling and Analysis Report. Dated February 2009.

U.S. Environmental Protection Agency (EPA), 1989. Risk Assessment Guidance for Superfund, Volume 1, Part A.

EPA, 2002. Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils. EPA 530-D-02-004.

EPA, 2007. Letter to Ms. Denise Dixon of Chevron, re: Comments on Corrective Measures Study. Dated June 2007.

EPA, 2008. Final Decision and Response to Comments, Chevron Gasoline Release at Chillum, Maryland. Dated April 2008.

GF reviewed the report for technical content, data gaps, validity, accuracy, completeness, and compliance with regulations and guidance.

GENERAL COMMENTS

1. The District of Columbia's (the District's) remedy for the Riggs Park community was selected after reviewing data collected by S.S. Papadopoulos & Associates (SSP&A) (2009), additional documents contained in the administrative record, and conducting an extensive human health risk assessment. The selected remedy described in this document is the "installation and operation of vapor mitigation systems in up to 45 residences with elevated sub-slab soil vapor levels attributable to contaminated groundwater." However, groundwater was not evaluated as part of the remedy selection. Rather, the District states the sub-slab soil vapor "results are indicative of contaminants potentially emanating from groundwater and represent a source of potential indoor vapor intrusion." However, a review of the September 2008 groundwater analytical results for shallow wells screened across the water table indicated only 17 compounds were detected above laboratory reporting limits and only 13 of these compounds were detected by DDOE in sub-slab soil vapor (Attachment 1). Thus, of the 36 compounds identified in sub-slab soil vapor and assumed by the District to be potentially emanating from groundwater, only 13 were actually detected in shallow groundwater in September 2008. As a result, the DDOE HHRA likely overestimated the risk to residents by including 36 compounds in the assessment instead of the 13 present in shallow groundwater.

The likely source of the compounds detected in sub-slab soil vapor that are not present in groundwater is indoor air (McHugh, et al., 2006). As noted in the SSP&A data set for indoor air, ambient air, sub-slab soil vapor, and outdoor soil vapor, this phenomenon is observed in Riggs Park (SSP&A, 2009). To summarize the SSP&A data, Freon 11 and 12 are observed in ambient air, indoor air, and sub-slab soil vapor, but not in the outdoor vapor monitoring ports. Freon compounds are commonly detected in ambient and indoor air, but are not likely attributable to subsurface contamination (SSP&A, 2009). Therefore, the Freon compounds are present in the sub-slab soil vapor as a result of infiltration of ambient and/or indoor air through the basement slab. Benzene and other hydrocarbons are also present in ambient and indoor air and it is reasonable to assume that some portion of the concentration of hydrocarbons in sub-slab soil vapor is attributable to ambient and indoor air infiltration into the sub-slab environment as well.

Previous investigations conducted by Chevron have demonstrated that contaminants present in indoor air have been detected in sub-slab soil vapor samples (GF, 2007a).

2. The District conducted a "home-by-home" risk assessment (the DDOE HHRA) whereby the individual risk for each residence within the study was calculated. More than 1,700 separate risk assessments were conducted. Chevron has several concerns regarding this approach. First, it greatly compartmentalizes the site into small microcosms and neglects larger trends in sampling data that are observed site-wide. Each home may have a very small data set, perhaps one set of indoor, ambient, and sub-slab data taken at one or a few points in time. Soil vapor concentrations can vary over a wide range both spatially and temporally (SSP&A, 2009). In contrast, the Baseline Risk Assessment for the site (GF, 2007b) took into account thousands of samples from multiple media collected over nearly a decade. Second, this approach introduces a large amount of uncertainty into the risk assessment for each home. The list of factors that influence indoor air concentrations is long and includes personal habits such as smoking, dry cleaning, use of cleaning products, building materials, among many others (SSP&A, 2009). Each of these factors contributes additional uncertainty to a very small data set that already has considerable inherent uncertainty. It is Chevron's position that the home-by-home risk assessment does not provide much value for determining risk to the residents from vapor intrusion.

SPECIFIC COMMENTS

1. **Section I, page 5, bullets 1 and 4.** The first bullet states "No residences have gasoline-related contaminants such as benzene in the SSP&A study in the sub-slab soil vapor at concentrations that exceed the 1×10^{-5} cancer risk level after the application of an attenuation factor of 10%." The last bullet in this section, as well as text in Section III, states "that out of 106 homes, additional residences require vapor mitigation systems (VMS) where gasoline-related contaminants are still present in sub-slab soil vapor." These two statements are contradictory. It is unclear why vapor mitigation systems would be required for residences where the concentrations of gasoline-related compounds in soil vapor are considered to be acceptable.
2. **Section I, page 5, bullet 3.** According to the third bullet in this section, the homes requiring VMS are those where site specific chemicals of concern (perchloroethene [PCE] and its degradation products, 1,4-dichlorobenzene, chloroform, naphthalene, carbon tetrachloride, and methylene chloride) "have the potential to pose a cumulative health risk from sub-slab soil vapor to exceed the 1×10^{-5} cancer risk level after the application of an attenuation factor of 10%." It should be made clear that these compounds are not related to the petroleum release at the former Chevron Facility (SSP&A, 2009).
3. **Section I, page 6, bullet 4.** The District's remedy includes a health survey of Riggs Park residents who reside in the plume footprint caused by the release of hydrocarbons at the former Chevron Facility. It should be noted that the Agency for Toxic Substances and Disease Registry (ATSDR) has issued three health consultations for the site to evaluate the public health implications through the vapor intrusion pathway. ATSDR has concluded that all indoor and outdoor volatile organic compound (VOC) concentrations detected at the site are at levels not expected to cause adverse cancer or non-cancer

health effects and has categorized the site as No Apparent Public Health Hazard for exposures to reported VOC levels (ATSDR, 2008). The goals and purpose of additional health surveys administered by DOH are unclear.

4. **Section II.A, page 7, paragraph 2.** This section states that in October 1989, the release of gasoline into the subsurface was confirmed after Chevron conducted a tightness test on its underground storage tanks. Although this statement is true, it should be noted that vehicle accident damage to a fuel dispenser caused the product line to fail the tightness test (GF, 2003).
5. **Section II.A, page 7, paragraphs 3 and 4.** The first sentence in the fourth paragraph should be replaced with "Final Decision and Response to Comments", which was issued in April 2008 and outlined the corrective measures to be implemented (EPA, 2008).
6. **Section III, page 9, paragraph 3.** This section describes the regulatory framework allowing the District to require and secure corrective actions at the site. Paragraph 3 describes corrective actions under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Corrective actions undertaken under CERCLA use the risk management tool to select appropriate corrective actions. A human health risk assessment is used by risk managers to determine if corrective actions are warranted for a site. Without the full text and tables of the DDOE HHRA, it is not feasible for risk managers to evaluate the need for, or appropriateness of, corrective action. All text and tables used in the DDOE HHRA are required to adequately determine the appropriateness of the selected remedy. The complete DDOE HHRA was not available for review, therefore the District's conclusions concerning the appropriateness of the selected remedy can not be fully evaluated, and the District's conclusions are not supported by other available information, as described in other comments and documents referenced by the comments.
7. **Section III, page 10, paragraph 6.** This paragraph states that "The Don Clay Memo provides that US EPA remedial action is generally not warranted where cancer risk is found to be below 1×10^{-4} ." The word "below" (less than) should be replaced with the word "above" (greater than).
8. **Section IV, page 10, paragraph 3.** An attenuation factor of 0.1 (10%) was selected, based on Draft EPA Vapor Intrusion Guidance, to represent the amount of sub-slab soil vapors that may be entering the home or that might enter the home in the future (EPA, 2002). Attenuation factors for the migration of sub-slab soil vapor to indoor air are generally based on empirical data and range from 0.01 to 0.1 (ITRC, 2007). The recommended criterion established by EPA in the Draft Vapor Intrusion Guidance is a conservative estimate that assumes the chemicals do not degrade as they migrate upward through the vadose zone; however petroleum hydrocarbon vapors are known to biodegrade in the presence of oxygen (EPA, 2002). Site investigation data collected at the site from 2002 to 2004 suggested that biodegradation of hydrocarbons in soil vapor was occurring in the vadose zone (GF, 2006). In addition, Chevron has calculated a site specific attenuation factor for one residence of 0.0026 based on sub-slab soil vapor and indoor air sampling results conducted in 2007 (GF, 2007a). Since its publication of the Draft Vapor Intrusion Guidance in 2002, EPA has determined that its recommended sub-slab to indoor air attenuation factor of 0.1 may be overly conservative (ITRC, 2007). It is

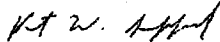
Chevron's position that using an attenuation factor of 0.1 is a very conservative estimate which leads to an overestimation of risk from vapor intrusion of petroleum hydrocarbons.

9. **Section IV, page 10, paragraph 4.** This paragraph makes the statement that Hazard Indices were calculated using toxicity values for both healthy adults and children. Toxicity values are selected on a chemical-specific basis and do not vary based on the age of the receptor. "Exposure parameters" are adjusted to reflect the specific age of the receptor. It appears that the District meant exposure parameters rather than toxicity values.
10. **Section V, page 11, paragraph 4.** This paragraph details the methods for calculating risk based on sub-slab soil vapor samples. According to the Draft EPA Vapor Intrusion Guidance, the sampling of sub-slab air provides a direct measure of the potential for exposures from vapor intrusion (EPA, 2002). It is noted that "for homes with multiple sub-slab soil vapor sample results, the basis of the cancer risk was the sample posing the maximum calculated cancer risk." Text in the SSP&A report indicates that several of the sub-slab soil vapor samples from homes with multiple samples were obtained from several feet below the bottom of the basement slab. The depth ranges of the sub-slab soil vapor samples should be specified, because EPA considers sub-slab air to be soil vapor samples obtained from directly below the foundation or from depths less than 5 feet below the foundation level (EPA, 2002). Deeper soil vapor samples are a more direct measurement of the source vapor concentration and will likely result in higher concentrations than shallow soil vapor samples. The EPA recommended attenuation factor for deep (greater than 5 feet below the foundation level) soil vapor samples to indoor air is 0.01 (EPA, 2002).
11. **Section V, page 12, paragraph 5.** This paragraph states that indoor air samples were not evaluated as part of the DDOE HHRA because of the numerous "background" sources of indoor air (discussed in General Comment #1). It should be noted, however, that all of the indoor air samples collected during the SSP&A investigation were reported to be below EPA's Indoor Air Standards for the site (EPA, 2007).
12. **Section V, page 12, paragraph 6.** The District has evaluated the cumulative risk posed to healthy adults by 66 compounds reported in the samples collected by SSP&A. Of those 66 compounds, 36 compounds detected in sub-slab soil vapor samples (SSP&A, 2009) have been identified as compounds of interest, and were included in the DDOE HHRA. As stated in General Comment #1, of the 36 compounds of interest shown on Table 1 on page 14, only 13 of those compounds have been detected in shallow groundwater (Attachment 1). The compounds evaluated in the DDOE HHRA should only include those compounds that are attributable to groundwater.
13. **Section V, page 12, Exhibit 1.** This table presents exposure assumptions used to calculate the chronic daily dose for the adult receptor. No exposure parameters have been provided for the child receptor. Exhibit 1 should be modified to include exposure parameters for the child receptor. Also, the Risk Assessment Guidance for Superfund (RAGS), which provided the basis for health risk calculations for this risk assessment, requires that references be provided for all exposure parameters (EPA, 1989). Per RAGS, Exhibit 1 should be modified to include the assumptions for the child receptor.

Mr. Judson Polikoff
Chevron EMC
April 17, 2009
Page 6 of 6

If you have any questions or require additional information, please contact the undersigned at (410) 585-1460.

Sincerely,
GANNETT FLEMING, INC.



Robert Scrafford, P.E.
Project Manager

Attachment 1 – Shallow Groundwater Analytical Detections- September 2008

Location	Sample Date	1,2,4- Trinitrobenzene (µg/L)	1,3,5- Trinitrobenzene (µg/L)	Acetone ¹ (µg/L)	RL (µg/L)	Benzene (µg/L)	RL (µg/L)	Chloro form (µg/L)	RL (µg/L)	cis-1,2- Dichloro ethene (µg/L)	RL (µg/L)	Ethyl benzene (µg/L)	RL (µg/L)	Isopropyl benzene ² (µg/L)	RL (µg/L)
GP-11A(20-25)	9/24/08	ND	1	5,000	25	ND	1	ND	1	ND	1	ND	1	ND	1
GP-2E(45-50)	9/25/08	ND	2	24	10	ND	2	ND	2	ND	2	ND	2	ND	2
GP-2F(45-50)	9/25/08	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
GP-7A(20-25)	9/24/08	ND	1	610	5	ND	1	ND	1	ND	1	ND	1	ND	1
GP-9A(20-25)	9/24/08	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-16 ²	9/25/08	1,700	100	ND	500	4,700	100	ND	100	ND	100	1,400	100	ND	100
MW-17 ²	10/1/08	1,100	50	320	50	5,700	50	ND	50	ND	50	1,100	50	ND	50
MW-18	9/25/08	3,400	20	1,400	20	6.1	20	ND	20	ND	20	270	20	27	20
MW-19	9/25/08	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-22 ²	9/25/08	61	5	280	25	1,100	5	ND	5	ND	5	95	5	ND	5
MW-23 ²	9/25/08	ND	1	19	5	6.5	1	1.6	1	ND	1	ND	1	ND	1
MW-24A	9/24/08	3,100	20	650	100	ND	20	ND	20	ND	20	640	20	39	20
MW-25A	9/24/08	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-26A	9/23/08	ND	1	83	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-27A	9/23/08	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-28A	9/22/08	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-28A	9/22/08	ND	1	ND	5	ND	1	1	1	ND	1	ND	1	ND	1
MW-30	9/24/08	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-33S	9/23/08	ND	1	63	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-38	9/24/08	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-39R	9/24/08	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-40	9/24/08	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-41A	9/24/08	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-42	9/23/08	ND	1	ND	5	ND	1	1.1	1	ND	1	ND	1	ND	1
MW-43A	9/23/08	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-44A	9/23/08	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-53	9/22/08	ND	1	ND	5	23	1	ND	1	11	1	ND	1	ND	1
MW-54	9/22/08	ND	1	180	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-55	9/23/08	ND	1	23	5	ND	1	ND	1	ND	1	ND	1	ND	1
Number of Detections		5/29	5/29	10/29	5000	6/29	5/29	3/29	1.6	1/29	11	5/29	1,400	2/29	39
Maximum Detection (µg/L)		3,400	1,400	5000		5,700									

Abbreviations:

ND- Not Detected
RL- Reporting Limit
µg/L- Micrograms per Liter
TPH-GRO- Total Petroleum Hydrocarbons - Gasoline Range Organics

Notes:

- Acetone is a common laboratory contaminant.
- Wells MW-16, MW-17, MW-22, and MW-23 are located within the active remediation area and not in the residential neighborhood.
- These compounds were not detected in sub-slab soil vapor samples collected by SSP&A.

Location	Sample Date	m,p- Xylene (µg/L)	RL (µg/L)	MTBE (µg/L)	RL (µg/L)	n-Propyl benzene ^a (µg/L)	RL (µg/L)	Naph- thalene (µg/L)	RL (µg/L)	o-Xylene (µg/L)	RL (µg/L)	Tetra- chloro ethane (µg/L)	RL (µg/L)	Toluene (µg/L)	RL (µg/L)	TPH- GRO ^b (µg/L)	RL (µg/L)	Tri- chloro ethane ^a (µg/L)	RL (µg/L)
GP-11A(20-25)	9/24/08	ND	4	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
GP-2E(45-50)	9/25/08	ND	4	370	2	ND	2	ND	2	ND	2	10	2	ND	2	320	100	ND	2
GP-2F(45-50)	9/25/08	ND	2	270	1	ND	1	ND	1	ND	1	16	1	ND	1	390	100	ND	1
GP-7A(20-25)	9/24/08	ND	2	1	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
GP-9A(20-25)	9/24/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-16 ^c	9/25/08	6,500	200	560	100	160	100	810	100	3,300	100	ND	100	13,000	100	38,000	2,000	ND	100
MW-17 ^c	10/1/08	4,200	100	6,500	50	94	50	470	50	2,100	50	ND	50	10,000	50	43,000	2,000	ND	50
MW-18	9/25/08	4,400	40	ND	20	47	20	150	20	2,500	20	ND	20	870	20	27,000	10,000	ND	20
MW-19	9/25/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-22 ^c	9/25/08	340	10	1,100	5	ND	5	48	5	290	5	ND	5	730	5	4,400	100	ND	5
MW-23 ^c	9/25/08	ND	2	16	1	ND	1	ND	1	ND	1	1.3	1	ND	1	ND	100	ND	1
MW-24A	9/24/08	4,600	40	ND	20	110	20	770	20	340	20	ND	20	160	20	26,000	1,000	ND	20
MW-25A	9/24/08	ND	2	4.6	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-26A	9/23/08	ND	2	2	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-27A	9/23/08	ND	2	23	1	ND	1	ND	1	ND	1	5.9	1	ND	1	ND	100	ND	1
MW-28A	9/22/08	ND	2	1.8	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-29A	9/22/08	ND	2	9.4	1	ND	1	ND	1	ND	1	1.3	1	ND	1	ND	100	ND	1
MW-30	9/24/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-33S	9/23/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-38	9/24/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-39R	9/24/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-40	9/24/08	ND	2	1.3	1	ND	1	ND	1	ND	1	1.4	1	ND	1	ND	100	ND	1
MW-41A	9/24/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-42	9/23/08	ND	2	ND	1	ND	1	ND	1	ND	1	1.1	1	ND	1	ND	100	ND	1
MW-43A	9/23/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-44A	9/23/08	ND	2	42	1	ND	1	ND	1	ND	1	6.2	1	ND	1	ND	100	ND	1
MW-53	9/22/08	ND	2	160	1	ND	1	ND	1	ND	1	ND	1	ND	1	330	100	3	1
MW-54	9/22/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-55	9/23/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
Number of Detections		5/29		14/29		4/29		5/29		5/29		8/29		5/29		8/29		1/29	
Maximum Detection (µg/L)		6,500		6,500		160		810		3,300		16		13,000		43,000		1/29	
																		3	

April 3, 2009

Mr. Judson Polikoff
Area Manager and Assistant Secretary
Chevron Environmental Management Company
2300 Windy Ridge Parkway, Suite 575
Atlanta, Georgia 30339

**RE: Review of Methods: Riggs Park Comprehensive Human Health Risk
Assessment Long Version, and Summary Tables Supplied by Expert
Toxicologist 2/13/09
Former Chevron Facility 122208, Chillum, Maryland**

Dear Mr. Polikoff:

As requested, RAM Group of Gannett Fleming, Inc. (RAM Group) has reviewed the *Methods: Riggs Park Comprehensive Human Health Risk Assessment Long Version, and Summary Tables Supplied by Expert Toxicologist 2/13/09*, prepared for the residential area surrounding Former Chevron Facility 122208, Chillum, Maryland.

The Human Health Risk Assessment (HHRA) report was found to be missing several key sections necessary for proper review of the estimate of risk. In addition, it does not follow typical USEPA guidance or the practice of risk assessment. Therefore, any remedy proposed as a result of these data and conclusions cannot be properly substantiated. The missing data and sections should be provided so that the HHRA can be adequately reviewed.

GENERAL COMMENTS

1. In page 1, paragraph 1, the report states "The goal of the HHRA was to determine whether any unacceptable adverse health effects associated with vapor intrusion originating from ground water contamination are present in any of the 106 homes, based on current and future exposures." The report makes no attempt to relate the sub-slab vapor (SSV) concentrations to the groundwater concentrations. Rather, the report states the SSV "results are indicative of contaminants potentially emanating from groundwater and represent a source of potential indoor vapor intrusion." No evidence is presented that the 36 chemicals detected in the various SSV samples are due to volatilization of these COCs from the groundwater. Our review of the September 2008 groundwater analytical results for shallow wells screened across the water table indicated that only 17 compounds were detected above laboratory reporting limits and only 13 of these compounds were detected in SSV. Thus, of the 36 compounds identified in SSV and assumed by the report to be potentially emanating from groundwater, only 13 were actually detected in shallow groundwater in September 2008. As a result, the report likely overestimated the risk to residents by including 36 compounds in the HHRA instead of the 13 present in shallow groundwater.

2. The source of chemicals measured in the SSV samples may be indoor air that has advected downward through the slab and into the vadose zone. This phenomenon has been reported in peer reviewed literature. McHugh et al. (2006) indicates that the likely source of the compounds detected in sub-slab soil vapor that are not present in groundwater is indoor air. Previous investigations conducted by Chevron have demonstrated that airborne contaminants can be transported both downward and upward through the basement slab (GF, 2007). For ease of reference, Figure 1 from this report is attached which shows that during an entire week in June 2007, the pressure gradient in one residence at the site was downward through the slab. When this occurs, the airborne contaminants in indoor air are advected downward through the slab and into shallow soil vapor. Therefore, it is reasonable to assume that some portion of the concentration of hydrocarbons (and other airborne contaminants) in sub-slab soil vapor is attributable to ambient and indoor air infiltration into the sub-slab environment. This should be taken into account in the HHRA.

3. Page 4, paragraph 3 indicates that "The results of this HHRA were based on 357 vapor monitoring port SSV samples collected from 106 Riggs Park homes. In total, 1,785 separate cumulative health risk analyses were performed on each of the 357 SSV samples." This is not consistent with the practice of risk assessment as described in the various USEPA guidance documents referred to in the report (although the report did not include a reference list).

For a detailed site-specific HHRA, it may be reasonable to perform exposure and risk calculations for each home to account for the variability in the inputs for each home. However, no home-specific information has been used in the calculations.

4. The report does not present the data for the 357 sub-slab vapor (SSV) samples. A comprehensive HHRA must present all the data, evaluate the data, and comment on the variability in the data. The report does not include any discussion about the quality of the data or whether sufficient representative data has been collected to support a realistic estimate of risk.

5. RAGS Part A (USEPA, 1989), Sections 5.8 and 5.9 describe the process for the selection of chemicals of concern (COCs). It suggests that the following criteria be used to determine the COCs:

- Positively detected in a medium;
- Detected at levels above the concentration in blank samples;
- Detected at levels above naturally occurring levels;
- Only tentatively identified but associated with the site or confirmed by special analytical services;
- Transformation products;
- Not detected chemicals but present at the site if an evaluation of the risks at the detection limit is desired; and
- Further criteria:
 - Chemicals by class;
 - Frequency of detection;
 - Essential nutrients; and

o Concentration-toxicity screen.

All of the chemicals analyzed for or detected in a sampling program are not considered COCs for the purposes of a HHRA. For example, the frequency of detection has not been discussed in the report and as presented in Specific Comment 6, not detected chemicals were eliminated without proper review. Therefore, this HHRA is deficient in that it does not follow the methodology described in RAGS. Thus, the statement on page 2, paragraph 2 "HHRA was conducted strictly according to RAGS" is misleading.

6. RAGS Part A (USEPA, 1989) requires a section devoted to uncertainly analysis to discuss the impact of various assumptions and variability in the data used. The report does not include such a section. Therefore, again it does not follow USEPA guidance. A discussion of the uncertainty, especially the large amount of uncertainty inherent in the home-by-home risk assessment methodology described, should be clearly discussed in detail in the HHRA.
7. Review of the calculated risks indicates that the majority of the calculated risk is from chloroform. This compound is a common disinfectant byproduct present in drinking water. In addition, a review of the September 2008 groundwater sampling results for shallow (water table) monitoring wells indicates that chloroform was present in only 3 of 29 wells at a maximum concentration of 1.6 µg/L. Based on Henry's Law, this concentration is not elevated enough to cause diffusion into soil vapor at the concentrations observed in shallow soil vapor. The chloroform concentrations in soil vapor likely were advected through the basement slab as described in general comment 2 above. Thus, for residences where chloroform was the major risk driver, the risk is likely overestimated.
8. It is interesting to note that the measured sub-slab benzene concentrations presented in the various tables in Exhibit 7 are all below or within the range of benzene indoor air background concentrations and for most of the samples cause a very small percentage of the risk. This HHRA indicates that petroleum hydrocarbons are not a major risk driver at the site.

SPECIFIC COMMENTS

1. Section 1.0, page 1, paragraph 2. The cumulative noncarcinogenic health hazard index (HI) was calculated based on four different toxicity values from four different sources. The rationale for using various toxicity values is not provided and the values used could not be verified. The toxicity values and their source should be provided in the HHRA.
2. Section 1.0, page 2, line 6. The cumulative cancer risk is referred to as "Incremental Lifetime Cancer Risk (ILCR)", but it is referred as "ELCR" several times. This difference should be clarified and consistent terminology used throughout the HHRA to prevent confusion.
3. Section 1.1, page 3, paragraph 1. This section refers to the draft vapor intrusion (VI) guidance (EPA, 2002). This is a draft guidance that has not been

updated by USEPA to date due to considerable controversy about the contents of the document, and overly conservative assumptions, such as conservative attenuation factors.

In addition, this draft guidance is not applicable to underground storage tank (UST) sites. Page 2 of the draft EPA VI guidance states that:

"The draft guidance is suggested for use at RCRA Corrective Action, CERCLA (National Priorities List and Superfund Alternative Sites), and Brownfields sites, but is not recommended for use at Subtitle I Underground Storage Tank (UST) sites at this time. The draft guidance recommends certain conservative assumptions that may not be appropriate at a majority of the current 145,000 petroleum releases from USTs."

As such, the draft guidance is unlikely to provide an appropriate mechanism for screening the vapor pathway at UST sites.

4. **Section 1.1, page 3, paragraph 2.** The text states that "According to EPA VI guidance (EPA 2002), the recommended attenuation factor for sub-slab soil gas samples is 0.1." The recommended criterion established by EPA in the Draft Vapor Intrusion Guidance is a conservative estimate that assumes the chemicals do not degrade as they migrate upward through the vadose zone; however petroleum hydrocarbon vapors are known to biodegrade in the presence of oxygen (EPA, 2002). Site investigation data collected at the site from 2002 to 2004 suggested that biodegradation of hydrocarbons in soil vapor was occurring in the vadose zone (GF, 2006). In addition, Chevron has calculated a site specific attenuation factor for one residence of 0.0026 based on sub-slab soil vapor and indoor air sampling results conducted in 2007 (GF, 2007). Since its publication of the Draft Vapor Intrusion Guidance in 2002, EPA has determined that its recommended sub-slab to indoor air attenuation factor of 0.1 may be overly conservative (ITRC, 2007). It is Chevron's position, as well as that of most experts in this field, that using an attenuation factor of 0.1 is a very conservative estimate which leads to an overestimation of risk from vapor intrusion of petroleum hydrocarbons.
5. **Section 1.1, page 4, paragraph 1.** The statement "This assumption has become so integral to the U.S. EPA risk management frame work that a site is automatically remediated when chemicals contaminate soil, water, or air above acceptable risk levels" is not accurate. There are many sites where the USEPA, state regulators, and the responsible party have agreed to implement institutional controls or used mechanisms other than remediation to reduce the risk to an acceptable level. This statement should be revised or removed from the text.
6. **Section 1.1, page 4, paragraph 4.** Text in this section states that chemicals not detected in any home were not considered to be chemicals of concern. It is not reasonable to eliminate chemicals that were not detected without a proper review of detection limits.

Mr. Judson Polikoff
Chevron EMC
April 3, 2009
Page 5 of 5

7. Section 1.2, page 6, exhibit 2. Exhibit 2 presents the dose equation for both carcinogenic and noncarcinogenic effects. However, the chronic daily dose (CDD) equation presented in Exhibit 2 is applicable for noncarcinogenic exposure only. The parameter "BW" included in the exhibit should be deleted. The unit for averaging time should be hours instead of days, and values should be 262,800 and 613,200 for noncarcinogenic and carcinogenic, respectively.

As per the recent EPA's document (USEPA, 2009), CDD is referred as exposure concentrations (EC). The EC for carcinogenic effects should be as below:

$$EC = \frac{C \times ET \times EF \times ED}{AT}$$

It was confirmed that cancer risks presented in Exhibit 7 were calculated based on the equation above using an averaging time of 613,200 hours, not the equation presented in Exhibit 2 of the report. The revised equations and the resulting calculations should be provided.

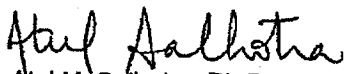
In addition, the calculation of the noncarcinogenic hazard quotient could not be verified. Supporting information for this calculation should be provided in the HHRA.

8. Section 1.3, page 9. The unit for CDD is presented as mg/kg-day, however, it should be mg/m³ for inhalation.
9. Section 1.3, page 10, paragraph 1. This section states that the Hazard Index (HI) is calculated for the sample. Please note that the HI is calculated for a receptor not a sample.

The references used in the review of the report are attached.

If you have any questions, please do not hesitate to contact me. We will welcome the opportunity to discuss our comments in more detail with DC official as well as the authors of the HHRA report as appropriate.

Sincerely,


Atul M. Sathotra, Ph.D.
Vice President

- Attachments: 1. References
2. Shallow Groundwater Analytical Detections - September 2008
3. Figure: Mean Soil-Building Pressure Differential

ATTACHMENT 1: REFERENCES

Gannett Fleming, 2006. Site Investigation Report. Former Chevron Facility 122208, Chillum, Maryland. Dated July 2006.

Gannett Fleming, 2007. Interim Measures Report for Indoor Air Sampling at 5846 Eastern Avenue. Former Chevron Facility 122208, Chillum, Maryland. Dated July 2007.

Interstate Technology & Regulatory Council (ITRC), 2007. Vapor Intrusion Pathway: A Practical Guide. Dated January 2007.

USEPA, 1989. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A).

USEPA, 2002. OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance).

USEPA, 2009. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance For Inhalation Risk Assessment).

McHugh, T., P. DeBlanc, and R. Pokluda, 2006. Indoor Air as a Source of VOC Contamination in Shallow Soils Below Buildings. Soil and Sediment Contamination, Vol. 15, pages 103-122.

Location	Sample Date	1,2,4- Trimethyl benzene (µg/L)	RL (µg/L)	1,3,5- Trimethyl benzene (µg/L)	RL (µg/L)	Acetone ¹ (µg/L)	RL (µg/L)	Benzene (µg/L)	RL (µg/L)	Chloro form (µg/L)	RL (µg/L)	cis-1,2- Dichloro ethene (µg/L)	RL (µg/L)	Ethyl benzene (µg/L)	RL (µg/L)	Isopropyl benzene ³ (µg/L)	RL (µg/L)
GP-11A(20-25)	9/24/08	ND	1	ND	1	5,000	25	ND	1	ND	1	ND	1	ND	1	ND	1
GP-2E(45-50)	9/25/08	ND	2	ND	2	24	10	ND	2	ND	2	ND	2	ND	2	ND	2
GP-2F(45-50)	9/25/08	ND	1	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
GP-7A(20-25)	9/24/08	ND	1	ND	1	610	5	ND	1	ND	1	ND	1	ND	1	ND	1
GP-9A(20-25)	9/24/08	ND	1	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-16 ²	9/25/08	1,700	100	460	100	ND	500	4,700	100	ND	100	ND	100	1,400	100	ND	100
MW-17 ²	10/1/08	1,100	50	320	50	ND	250	5,700	50	ND	50	ND	50	1,100	50	ND	50
MW-18	9/25/08	3,400	20	1,400	20	ND	100	6.1	20	ND	20	ND	20	270	20	27	20
MW-19	9/25/08	ND	1	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-22 ²	9/25/08	61	5	16	5	280	25	1,100	5	ND	5	ND	5	95	5	ND	5
MW-23 ²	9/25/08	ND	1	ND	1	19	5	6.5	1	1.6	1	ND	1	ND	1	ND	1
MW-24A	9/24/08	3,100	20	920	20	650	100	ND	20	ND	20	ND	20	640	20	39	20
MW-25A	9/24/08	ND	1	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-26A	9/23/08	ND	1	ND	1	83	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-27A	9/23/08	ND	1	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-28A	9/22/08	ND	1	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-29A	9/22/08	ND	1	ND	1	ND	5	ND	1	1	1	ND	1	ND	1	ND	1
MW-30	9/24/08	ND	1	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-33S	9/23/08	ND	1	ND	1	63	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-38	9/24/08	ND	1	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-39R	9/24/08	ND	1	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-40	9/24/08	ND	1	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-41A	9/24/08	ND	1	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-42	9/23/08	ND	1	ND	1	ND	5	ND	1	1.1	1	ND	1	ND	1	ND	1
MW-43A	9/23/08	ND	1	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-44A	9/23/08	ND	1	ND	1	ND	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-53	9/22/08	ND	1	ND	1	ND	5	23	1	ND	1	11	1	ND	1	ND	1
MW-54	9/22/08	ND	1	ND	1	180	5	ND	1	ND	1	ND	1	ND	1	ND	1
MW-55	9/23/08	ND	1	ND	1	23	5	ND	1	ND	1	ND	1	ND	1	ND	1
Number of Detections		5/29		5/29		10/29		6/29		3/29		1/29		5/29		2/29	
Maximum Detection (µg/L)		3,400		1,400		5000		5,700		1.6		11		1,400		39	

Abbreviations:

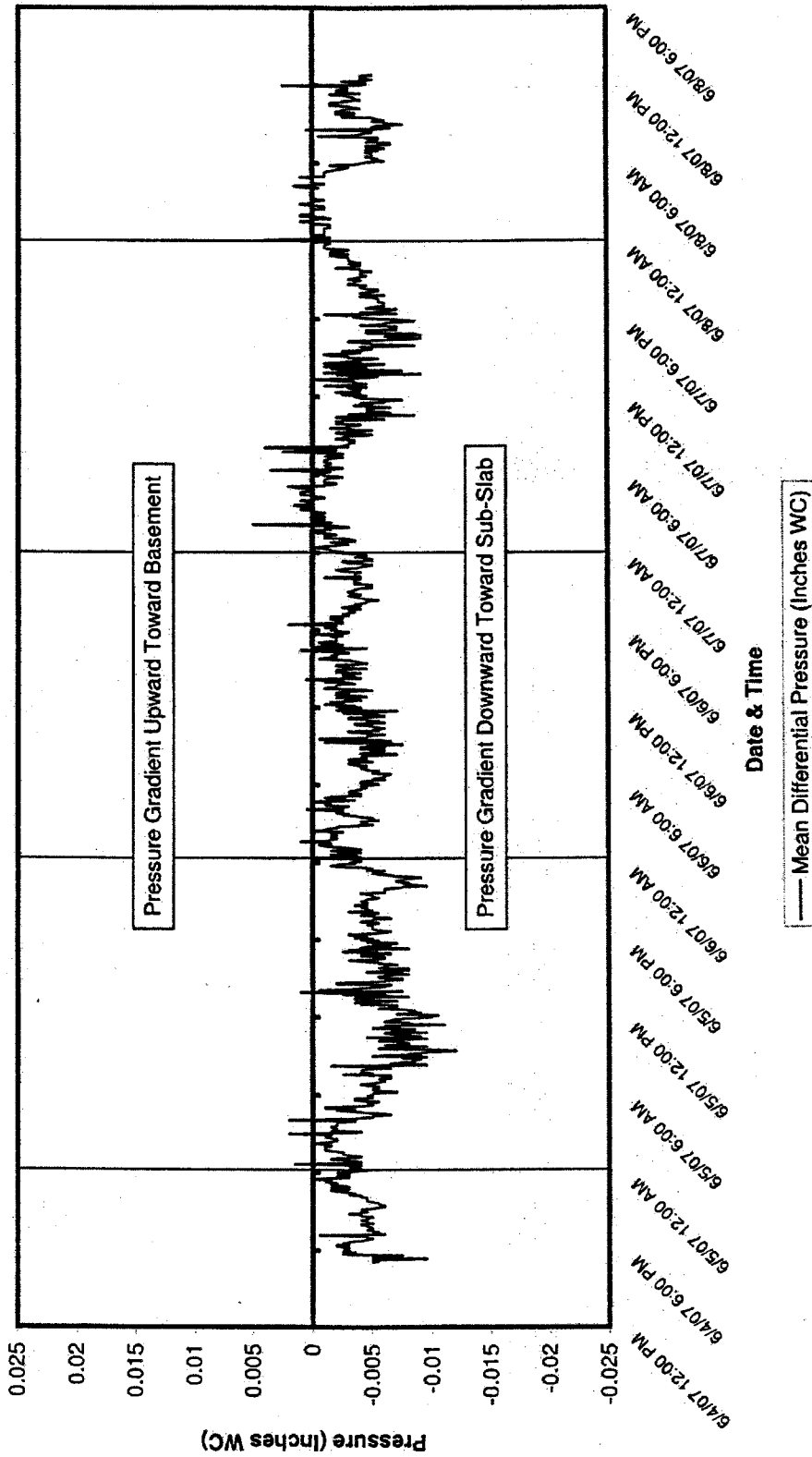
ND - Not Detected
RL - Reporting Limit
µg/L - Micrograms per Liter
TPH-GRO - Total Petroleum Hydrocarbons - Gasoline Range Organics

Notes:

- Acetone is a common laboratory contaminant.
- Wells MW-16, MW-17, MW-22, and MW-23 are located within the active remediation area and not in the residential neighborhood.
- These compounds were not detected in sub-slab soil vapor samples collected by SSP&A.

Location	Sample Date	m,p-Xylene (ug/L)	RL (ug/L)	MTBE (ug/L)	RL (ug/L)	n-Propyl benzene ² (ug/L)	RL (ug/L)	Naphthalene (ug/L)	RL (ug/L)	o-Xylene (ug/L)	RL (ug/L)	Tetra chloro ethene (ug/L)	RL (ug/L)	Toluene (ug/L)	RL (ug/L)	TPH - GRO ³ (ug/L)	RL (ug/L)	Tri chloro ethene ³ (ug/L)	RL (ug/L)
GP-11A(20-25)	9/24/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1
GP-2E(45-50)	9/25/08	ND	4	370	2	ND	2	ND	2	ND	2	10	2	ND	2	320	100	ND	2
GP-2F(45-50)	9/25/08	ND	2	270	1	ND	1	ND	1	ND	1	16	1	ND	1	390	100	ND	1
GP-7A(20-25)	9/24/08	ND	2	1	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
GP-9A(20-25)	9/24/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-16 ²	9/25/08	6,500	200	560	100	160	100	810	100	3,300	100	ND	100	13,000	100	38,000	2,000	ND	100
MW-17 ²	10/1/08	4,200	100	6,500	50	94	50	470	50	2,100	50	ND	50	10,000	50	43,000	2,000	ND	50
MW-18	9/25/08	4,400	40	ND	20	47	20	150	20	2,500	20	ND	20	670	20	27,000	10,000	ND	20
MW-19	9/25/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-22 ²	9/25/08	340	10	1,100	5	ND	5	48	5	290	5	ND	5	730	5	4,400	100	ND	5
MW-23 ²	9/25/08	ND	2	16	1	ND	1	ND	1	ND	1	1.3	1	ND	1	ND	100	ND	1
MW-24A	9/24/08	4,600	40	ND	20	110	20	770	20	340	20	ND	20	160	20	26,000	1,000	ND	20
MW-25A	9/24/08	ND	2	4.6	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-26A	9/23/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-27A	9/23/08	ND	2	23	1	ND	1	ND	1	ND	1	5.9	1	ND	1	ND	100	ND	1
MW-28A	9/22/08	ND	2	1.8	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-29A	9/22/08	ND	2	9.4	1	ND	1	ND	1	ND	1	1.3	1	ND	1	ND	100	ND	1
MW-30	9/24/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-33S	9/23/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-38	9/24/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-39R	9/24/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-40	9/24/08	ND	2	1.3	1	ND	1	ND	1	ND	1	1.4	1	ND	1	ND	100	ND	1
MW-41A	9/24/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-42	9/23/08	ND	2	ND	1	ND	1	ND	1	ND	1	1.1	1	ND	1	ND	100	ND	1
MW-43A	9/23/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-44A	9/23/08	ND	2	42	1	ND	1	ND	1	ND	1	6.2	1	ND	1	ND	100	ND	1
MW-53	9/22/08	ND	2	160	1	ND	1	ND	1	ND	1	ND	1	ND	1	330	100	3	1
MW-54	9/22/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
MW-55	9/23/08	ND	2	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	100	ND	1
Number of Detections		5/29		14/29		4/29		5/29		5/28		8/29		5/29		8/29		1/29	
Maximum Detection (ug/L)		6,500		6,500		160		810		3,300		16		13,000		43,000		3	

Attachment 3
Mean Soil-Building Pressure Differential
From: Interim Measures Report for Indoor Air Sampling at 5846 Eastern Avenue
Former Chevron Facility 122208, Chillum, Maryland





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April 17, 2009

Mr. Judson Polikoff
Area Manager and Assistant Secretary
Chevron Environmental Management Company
2300 Windy Ridge Parkway, Suite 575
Atlanta, Georgia 30339

**RE: Review of Riggs Park Indoor Air, Sub-Slab Vapor, and Groundwater Sampling and Analysis Report
Former Chevron Facility 122208, Chillum, Maryland**

Dear Mr. Polikoff:

As requested, Gannett Fleming, Inc. (GF) has reviewed the *Riggs Park Indoor Air, Sub-slab Vapor, and Groundwater Sampling and Analysis Report*, prepared for the residential area surrounding Former Chevron Facility 122208, Chillum, Maryland, dated February 2009. The report was prepared by S.S. Papadopoulos and Associates, Inc. for the District of Columbia Department of Health and Department of Environment (DDOE).

The following references were used in the review of the report:

Gannett Fleming, 2007. Interim Measures Report for Indoor Air Sampling at 5846 Eastern Avenue. Former Chevron Facility 122208, Chillum, Maryland. Dated July 2007.

McHugh, T., P. DeBlanc, and R. Pokluda, 2006. Indoor Air as a Source of VOC Contamination in Shallow Soils Below Buildings. *Soil and Sediment Contamination*, Vol. 15, pages 103-122.

McHugh, T., D. Hammond, T. Nickels, and B. Hartman, 2008. Use of Radon Measurements for Evaluation of VOC Vapor Intrusion. *Environmental Forensics*, Vol. 9, March 2008.

U.S. Environmental Protection Agency (EPA), 2002. Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils. EPA 530-D-02-004.

EPA, 2008. Final Decision and Response to Comments, Chevron Gasoline Release at Chillum, Maryland. Dated April 2008.

GF reviewed the report for technical content, data gaps, validity, accuracy, completeness, and compliance with regulations and guidance. Several of the appendices were labeled as confidential and not provided in the public version of the report, thus they could not be reviewed.

GENERAL COMMENTS

1. Several figures and appendices of this report were considered confidential and were not provided in the public version of this report. This included maps showing the distribution of contaminants in various media and appendices documenting home surveys of chemicals removed from residences prior to sampling. These are critical pieces of information that are required to fully evaluate the conclusions of this report.
2. An immense amount of data were collected as a part of this study. Tables for many of the media sampled were prepared to summarize the data using percentages and other summary statistics. However, broad conclusions regarding the validity of the site conceptual model were made based on specific sample data. No data tables with individual sample results were provided for any of the media sampled. Figures with few or vague reference points were prepared to summarize some of the data (e.g., Figure 23). Some of the conclusions and assertions made in this report cannot be substantiated without the specific sample data.

SPECIFIC COMMENTS

1. Section 2, page 4, paragraph 5. This section states that perchloroethene (PCE), a halogenated compound, was detected in groundwater during the summer of 2002. The first detection of halogenated compounds at the site by Chevron was during the September 2001 investigation along the south side of Eastern Avenue summarized in the following document:

Gannett Fleming, 2001. Geoprobe and Membrane Interface Probe (MIP) Investigation Results. Former Chevron Facility 122208, Chillum, Maryland. Dated October 2001.

The text should be revised.

2. Section 5, page 16, paragraph 4. This paragraph describes the pre-indoor air sampling survey. Careful detection and removal of potential indoor air sources of chemicals is critical to obtaining quality samples. This section does not provide enough detail to determine whether quality samples were collected during the sampling event. Clarification of the following items should be provided in the text:
 - It is unlikely that the ppbRAE photoionization detector (PID) was calibrated prior to surveying activities at each residence. Calibration sheets from Appendices D, E, and F indicated the PID calibration was checked daily and calibrated when required, which was once every 3 days on average. These instruments tend to drift with use, particularly after detecting a high concentration source, such as moth balls or perfume.
 - It is unclear if the sampling protocol prohibited the fueling of vehicles by the sampling team prior to collecting samples. This prevents cross contamination of samples.
 - Based on the observations noted in Table 3 and Appendix D, various chemicals were inadvertently not removed during the survey for several residences (e.g.,

refer to line 185 of the table that states "additional can of paint found during sample setup, removed"). It is unclear whether the residence was allowed to ventilate for 24 hours after these items were removed as is stated in the text.

- Table 3 also indicates that items potentially containing petroleum products such as gas cans and lawn mowers, were removed from several residences. It is unclear whether the residence was allowed to adequately ventilate prior to sampling.
 - Several observations from Table 3 and Appendices D and E state that the basement air had an odor during sampling. For example, on line 184 of the table, the observation for indoor air sample Q1-S289-INA is "smell of mothballs in home". This suggests that either all sources of indoor air contaminants were not removed or the residence may not have had adequate time to ventilate.
 - The text states there were several homes with attached garages that were sampled. It is unclear whether residents were requested not to park or run vehicles within the garage before or during sampling.
 - Observations from Table 11 indicate that numerous residents that smoke were encountered during the study. It is unclear whether they were discouraged from smoking indoors during the ventilation and sampling period. It is also unclear whether an exit interview was conducted to determine whether smoking occurred indoors during the sampling period.
3. **Section 5, page 18, paragraph 2.** This section provides information on the outdoor vapor monitoring ports. The text states that some of the ports were replaced and were installed at depths of 1 to 2 feet. Analytical results from outdoor ports installed to a final depth of less than 5 feet are considered unreliable (EPA, 2002; Appendix E) due to the high potential for short-circuiting of ambient (outdoor) air into the sample. EPA recommended that these samples be excluded from evaluation in their 2002 Draft Vapor Intrusion Guidance. There are some areas of the site, however, where groundwater is found at depths shallower than 5 feet. In this case, shallow soil vapor sample collection with quantitative leak detection is the only available option. If this situation was encountered, it should be clarified in the text. To aid in clarification, the text should include a construction table for all vapor monitoring ports along with corresponding depth to groundwater or perched water (if known). A map of the ports should also be released to better evaluate spatial trends.
4. **Section 5, page 20, paragraph 1.** This section provides information on sampling of the sub-slab and outdoor vapor monitoring ports.
- The text does not mention if leak detection was conducted during the sampling. Based on the field notes in Appendices D, E, and F, leak detection was not conducted for any of the soil vapor samples collected. If leak detection was not conducted, then the soil vapor samples could have been diluted by ambient air intrusion into the sample collection apparatus or through the port itself. This is of particular concern for shallow outdoor and sub-slab vapor monitoring ports. This should be clarified in the text.

- The text does not mention if the vapor monitoring ports were purged and what the general purge volume target was (e.g., 3 well volumes, etc.). Appendices D, E, and F indicated purging was completed prior to sampling. This information is critical to evaluate sample quality and should be added to the text. In addition, there were many samples in Appendices D, E, and F (as summarized in Table 3) that appeared to have excessive purge volumes. For example, line 162 of Table 3 indicates that for sub-slab vapor monitoring port sample Q1-S293-VMP2 purging of two liters of soil vapor was attempted. According to Appendices D, E, and F, all the sub-slab soil vapor ports were purged of at least one liter of vapor prior to sampling. This volume seems excessive given the typical sub-slab vapor monitoring port contains less than 10 milliliters of air. This issue and its affect on sample quality for sub-slab ports as well as outdoor vapor wells should be discussed in the text.
 - The text does not mention what size canister was used. Typically, one-liter canisters are used for soil vapor sampling to minimize the volume of vapor removed from the subsurface. This information should be provided in the text.
 - The industry standard for collecting soil vapor samples from implants, probes and ports is generally to use grab sampling techniques while maintaining a low (e.g., less than 200 milliliters per minute) soil vapor flow rate. The 24 or 20 hour composite samples collected for this study are not considered grab samples. Although the soil vapor flow rate was sufficiently low, the text should provide justification why the samples were collected in this manner.
 - The text states that a PID was used to screen each of the ports on the initial visit. Although good for the general screening for presence or absence of volatile organic compounds (VOCs), a PID does not provide data that is of sufficient accuracy or reliability to make definitive conclusions, particularly if the PID was not calibrated regularly. The data quality objectives and use of these data should be provided in the text. Furthermore, the PID readings were collected prior to collecting the summa canister sample, effectively purging the vapor port. It is unclear whether the port was purged a second time with the sampling apparatus attached to the port. If this was the case, a discussion of the effect on sample quality should be added to the text.
5. **Section 7, page 31, paragraph 1.** This paragraph raises concerns over false negative results from outdoor vapor monitoring ports and infers that sub-slab samples are of higher quality for use in determining vapor intrusion problems. Although this statement is true to some extent, it should also be noted that the indoor air inside the residence can also serve as a source of contaminants to sub-slab soil vapor (McHugh, et al., 2006). This phenomenon is observed in the lists of detected compounds for indoor air, ambient air, sub-slab soil vapor, and outdoor soil vapor on pages 22 through 24. Both Freon 11 and 12 are detected in ambient air, indoor air, and sub-slab air, but not in the outdoor vapor monitoring ports. Text on page 31 indicates that the Freon compounds are commonly detected in ambient and indoor air, but not likely attributable to subsurface contamination. Therefore, the Freon compounds are present in the sub-slab soil vapor as a result of infiltration of ambient and/or indoor air through the basement

slab. Benzene and other hydrocarbons are also present in ambient and indoor air and it is reasonable to assume that some portion of the concentration of hydrocarbons in sub-slab soil vapor is attributable to ambient and indoor air infiltration into the sub-slab environment as well. The inference that sub-slab soil vapor samples are of higher quality when compared to results from outdoor vapor monitoring ports should be qualified.

6. **Section 6, page 25, paragraph 0.** This section indicates that liquid-phase hydrocarbons (LPH) or gasoline from the release at the service station migrated into the alley south of Eastern Avenue in the vicinity of monitoring well MW-24A. This assertion was based on soil concentrations from the groundwater interface provided on page 24. Xylenes were detected at approximately 6 parts per million (ppm) and naphthalene at 3 ppm. A reference with representative concentrations of these compounds in soil indicative of LPH should be provided in the text.

In addition, these soil results are but one line of evidence. Other lines of evidence include groundwater concentrations, total petroleum hydrocarbons (TPH) analysis, product fingerprinting (if the LPH is mobile), observation in soil cores, occurrence in monitoring wells, and others. LPH has never been detected in well MW-24A since it was installed in 2004. The assertion that LPH migrated to the vicinity of monitoring well MW-24A is not founded based on the information provided in the text.

7. **Section 7, page 34, paragraph 3.** This paragraph compares the results obtained during this study to others, including previous indoor air sampling conducted by Building Sciences and Engineering Associates (BSEA) on behalf of DDOE. Specifically, the maximum concentration of benzene in indoor air from the BSEA study was used for comparison purposes. It should be noted that Chevron sampled this residence after BSEA and found numerous indoor air contaminant sources in an attached shed, including an open gasoline can. After removal and ventilation, the residence had a benzene concentration in indoor air of $2.9 \mu\text{g}/\text{m}^3$, which was much lower than the BSEA study maximum of $26.8 \mu\text{g}/\text{m}^3$ used for comparison in the text. The BSEA results should be qualified in the text or omitted.
8. **Section 7, page 35, paragraph 2.** A thorough discussion of potential sources of contaminants for indoor air is provided in this paragraph. Table 3 indicates that moth balls were found in a fair number of residences during the building survey. Naphthalene is one of the primary ingredients in moth balls, however, this is not mentioned in this paragraph. Text on page 29 indicates that naphthalene was detected in 21 percent of indoor air samples but only 2 percent of sub-slab samples. The presence of moth balls in residences likely explains the prevalence of naphthalene in indoor air. The text should include a brief discussion of this issue.
9. **Section 7, page 36, paragraph 1.** This paragraph provides the conclusion that the currently accepted conceptual site model that the sewer line along Nicholson Street is the groundwater discharge point may be flawed. This assertion cannot be supported with the data provided in the public version of the report. Neither individual sample results nor figures showing sample points were provided. Chevron will review the data collected for this study in conjunction with its extensive data set for this area to determine the validity of this claim when the data are released to Chevron.

10. **Section 9, page 38, paragraph 1.** This section provides a formula for the observed ratio of contaminant concentrations between the subsurface and indoor air and indicates that it is one measure for the potential occurrence of vapor intrusion. There are several issues with this equation and its usage with respect to vapor intrusion:

- Most of the compounds of interest in the study are not conservative tracers. That is, they have documented indoor or ambient air sources that are not related to vapor intrusion.
- The equation was not corrected for indoor air. EPA (2002) indicates that the average building exchanges a full volume of air over 6 times per day. Therefore, ambient air has a large effect on the concentrations of contaminants in indoor air. By subtracting the ambient air concentration out of the denominator as suggested in McHugh, et al. (2008) this effect is reduced.
- As noted in comment 5, indoor air contaminants can migrate downward through the basement slab and into the subsurface. The concentrations of some contaminants detected in sub-slab air in this study are attributable to indoor air infiltration into the subsurface.

Based on the points above, the inverted attenuation factor equation presented in the text is not a good indicator of the potential for vapor intrusion. Any conclusions based on this equation should be qualified accordingly. To determine an accurate attenuation factor, a conservative tracer must be used such as radon (McHugh, et al, 2008, Gannett Fleming, 2007).

11. **Section 10, page 42, paragraph 2.** This paragraph presents the recommendations of the study. A "home-by-home" risk assessment was recommended whereby individual risk for each individual residence within the study would be calculated. This is not a small undertaking and should be evaluated carefully. Chevron has several concerns regarding this approach. First, this approach greatly compartmentalizes the site into small microcosms and neglects larger trends in sampling data that are observed site-wide. Each home may have a very small data set, perhaps one set of indoor, ambient, and sub-slab data taken at one or a few points in time. As stated in the report, soil vapor concentrations can vary over a wide range spatially and temporally. Contrast this to the Baseline Risk Assessment prepared for the site, which took into account thousands of samples from multiple media collected over nearly a decade. Secondly, this approach introduces a large amount of uncertainty into the risk assessment for each home. As stated in the report, the list of factors that influence indoor air concentrations is long and includes personal habits such as smoking, use of dry cleaning, use of cleaning products, building materials, the building exchange rate, ambient air concentrations, and attached garages, among many others. All of these factors contribute additional uncertainty to a very small data set with considerable inherent uncertainty. It is Chevron's opinion that a home-by-home risk assessment would not provide much value for determining risk to residents from vapor intrusion.
12. **Appendices D, E, and F.** These appendices provide field documentation sheets for each of the samples collected during the investigation. According to the field sheets,

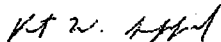
Mr. Judson Polikoff
Chevron EMC
April 17, 2009
Page 7 of 7

there was no vacuum at the conclusion of the 24-hour sampling period for 27 out of 128 indoor air samples (21 percent) and 10 out of 39 ambient air samples (26 percent). The true sampling period cannot be known for these samples, but it was less than 24 hours. Therefore, these samples may not be truly representative of indoor and ambient air concentrations. This issue should be discussed in the text.

13. **Appendix O. Memorandum from H. Cohen of SSPA to Dr. V. Sreenivas (DCDOH) dated July 22, 2008.** This memorandum provides a summary of activities related to the outdoor vapor port sampling. The memo states that "some of the PVC casings and Teflon sample tubing contained unacceptable levels of tetrahydrofuran, acetone, and 2-butanone (methyl ethyl ketone)." These chemicals are the main ingredients in PVC primer and glue. As a result, all existing outdoor vapor ports were abandoned and reinstalled. This is a significant event that was not discussed in the text. A thorough discussion of the well abandonment should be provided in the text along with how the construction of the vapor wells may have affected sample quality. For instance, if the concentrations of these compounds decreased after replacing the wells, then it is clear that leaks were present in the well during sampling.

If you have any questions or require additional information, please contact the undersigned at (410) 585-1460.

Sincerely,
GANNETT FLEMING, INC.



Robert Scrafford, P.E.
Project Manager

April 20, 2009

Mr. Judson Polikoff
Area Manager and Assistant Secretary
Chevron Environmental Management Company
2300 Windy Ridge Parkway, Suite 575
Atlanta, Georgia 30339

**RE: Review of Riggs Park Comprehensive Human Health Risk Assessment
Toxicologist Work Product Data Tables
Former Chevron Facility 122208, Chillum, Maryland**

Dear Mr. Polikoff:

As requested, RAM Group of Gannett Fleming, Inc. (RAM Group) has reviewed the *Riggs Park Comprehensive Human Health Risk Assessment Toxicologist Work Product Data Tables*, prepared for the residential area surrounding Former Chevron Facility 122208, Chillum, Maryland.

This review was conducted on an expedited basis and should not be considered a comprehensive review of the data provided. However, unless additional documentation and information is provided, a comprehensive review would not add value. Representative calculations and input values to the risk assessment were spot checked for consistency with applicable U.S. Environmental Protection Agency (EPA) risk assessment guidance. The comments provided are general in nature and represent general issues and discrepancies in the data files provided.

SUMMARY OF DATA REVIEWED

The data were provided on CD with no associated key to the files or supporting information. The following narrative describes our presumption of the data and calculations based on the S.S. Papadopoulos and Associates Report and inferences made from the calculations provided in the files. As shown in the attached figure, the data consist of five folders labeled:

1. Data-Each Home Q1
2. Data-Each Home Q2
3. Data-Each Home Q3
4. VMP
5. Combined Data Sets

Folders 1 to 3 presumably contain analytical data for three quarters. Folder 4 contains raw data, calculated risks, and hazard indices for each sample. Folder 5 contains compiled raw data for each sampling location or home and comparison of calculated risks and hazard indices using U.S. Environmental Protection Agency (EPA) Region 3 toxicity values. The data and associated calculated risk values are not clear because most of the files are missing column headings and other necessary information (e.g., references). The contents of each folder are discussed in detail below.

Folder 1: Data-Each Home Q1

Folder 1 contains data from sampling conducted during quarter 1; 104 excel workbooks named "number".xls where the number varies from 8 to 426. All of the numbers in this range are not used and presumably represent different measurement locations or homes. In addition, the folder contains 5 workbooks named 4-663 Oglethorpe.xls, 7-5902 8th.xls, 8-5908 8th.xls, 107-643 Kensington.xls, and 120-5618 Eastern.xls. Each workbook contains one excel sheet with the following column headings:

Sample Name, Week, Analyte, ppb, Detect Flag, $\mu\text{g}/\text{m}^3$.

The sample names in each workbook start with "S" followed by sampling location number and presumably the type of sample (AOA, INA, VMP, GMPR, VMP&, GMPR&, and PVMP, where the symbol "&" is 1, 2 or 3). All excel workbooks do not contain all sample types mentioned above. For the sample types included, concentrations in parts per billion (ppb) and micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) are presented for over 60 chemicals.

Folder 2: Data-Each Home Q2

Folder 2 contains data from sampling conducted during quarter 2; 107 excel workbooks also named "number".xls where the number varies from 4 to 426. All of the numbers in this range are not used and presumably represent different measurement locations or homes. Each workbook has one excel sheet with the following column headings (although not indicated in each worksheet):

Sample Name, Analyte, ppb, Detect Flag, $\mu\text{g}/\text{m}^3$ although not labeled as such.

The sample names in each workbook start with "S" followed by sampling location number and presumably type of sample (AOA, INA, and VMP). All excel workbooks do not contain all sample types mentioned above. For the sample types included concentrations in ppb and $\mu\text{g}/\text{m}^3$ are presented for over 60 chemicals.

Folder 3: Data-Each Home Q3

Folder 3 contains data from sampling conducted during quarter 3; 109 excel workbooks also named "number".xls where the number varies from 4 to 426. All of the numbers in this range are not used and presumably represent different measurement locations or homes. Each workbook has one excel sheet with the following column headings (although not indicated in each worksheet):

Sample Name, Analyte, ppb, Detect Flag, $\mu\text{g}/\text{m}^3$ although not labeled as such.

The sample names in each workbook start with "S" followed by sampling location number and presumably type of sample (AOA, INA, VMP, GMPR, VMP&, GMPR&, and PVMP, where the symbol "&" is 1, 2 or 3). All excel workbooks do not contain all sample types mentioned above. For the sample types included concentrations in ppb and $\mu\text{g}/\text{m}^3$ are presented for over 60 chemicals.

Folder 4: VMP

This folder contains 112 excel workbooks named *No. of Homes.xls* and *Risk Summary.xls* in addition to "S#".xls where the "#" varies from 4 to 426. All of the numbers in this range are not used and presumably represent different measurement locations or homes. Each of these is described below.

No. of Homes.xls: This file includes presumably 103 homes and for each home the VMP (sub-slab soil vapor) samples are identified. For example home No. 5 is associated with Q3-S21-VMP2, Q3-S21-VMP1, Q2-S21-VMP2, Q2-S21-VMP1, Q1-S21-VMP2, and Q1-S21-VMP1; whereas home No. 37 is associated with only one sample number Q1-S144-VMP.

Risk Summary.xls: This file contains five sheets. First sheet named "Number Homes" contain the following column headings:

Sample No., Week, HI, "Unlabeled", Risk, Risk;

The first two columns have number of homes and sample number information in the same fashion as *No. of Homes.xls*. The Hazard Index (HI) is assumed to be a cumulative hazard coefficient (HQ) for non carcinogenic chemicals and risk is cumulative for carcinogenic chemicals. The HI and risk are calculated for each sample. An unlabeled column presents the ratio of carcinogenic risk to the 1×10^{-6} risk level (acceptable risk). A second sheet named "Original" presumably contains the same information as the first sheet. The rest of the three sheets Sheet 5, Sheet 4, and Risk > 1×10^{-5} do not have any column headings.

S#.xls: These excel workbooks contain three work sheets named VMP, INA, and Tox V. No column headings are presented in these sheets.

Folder 5: Combined Data Sets

This folder contains 128 excel workbooks named "number".xls (except for nine files named Book2.xls, Combined Data.xls, Dosimetric Child PERC.xls, HI for Carcinogens.xls, List of COCs.xls, New Tox Values.xls, RISK SUMMARY.xls, VMP SUMMARY.xls, and VMP-New Region 3 Values.xls) where the number varies from 4 to 426. All the numbers in this range are not used and presumably represent different measurement locations or homes. Each of these is described below.

Book2.xls: This file contains HI and risk for different samples collected in the three quarters.

Combined Data.xls: This file presents the concentration data for chemicals analyzed for different samples. This file presumably contains all of the raw data except nondetects and non toxic chemicals, which are excluded.

Dosimetric Child PERC.xls: This file contains one sheet with average ventilation rate information.

HI for Carcinogens.xls: This file contains reference concentration (RfCi) values for carcinogenic chemicals. These sheets also contain other columns with sample numbers and analytes but the values provided here are not labeled.

List of COCs.xls: This file contains EPA Region 3 toxicity values.

New Tox Values.xls: This file does not have any column headings, but presumably contains toxicity values.

Risk Summary.xls: This file contains eight sheets presumably presenting calculated HI and risk values for each sample using EPA Region 3 and Integrated Risk Information System (IRIS) toxicity values.

VMP Summary.xls: This file contains one sheet, but there are no column headings.

VMP-New Region 3 Values.xls: This file contains three sheets presumably presenting EPA Region 3 toxicity values in the first sheet. There are no column headings in the second and third sheets.

Number.xls: These files have a variable number of sheets in each file, each containing raw data for different sampling types.

SPECIFIC COMMENTS

1. **Files:** *Combined Data Sets/8.xls/data*, *Data Each Home Q1/8.xls/sheet1*, and *Data Each Home Q2/8-2.xls/sheet1*

Comment: Data listed as Q1 for samples S8-AOA and S8-INA in *Combined Data Sets/8.xls/data* do not match with that for the same samples in *Data Each Home Q1/8.xls/sheet1*. Instead, they match with *Data Each Home Q2/8-2.xls/sheet1*. This discrepancy should be corrected.

2. **Files:** *Combined Data Sets/8.xls/data* and *Data Each Home Q1/8.xls/sheet1*

Comment: Data for the chemicals 1,3-dichlorobenzene, 2-butanone (MEK), 2-hexanone (MBK), benzene, and toluene in sample Q1 S8-VMP in *Combined Data Sets/8.xls/data* do not match with that for the same sample in *Data Each Home Q1/8.xls/sheet1*. This discrepancy should be corrected.

3. **Files:** *Combined Data Sets/8.xls/data* and *Data Each Home Q1/8.xls/sheet1*

Comment: Data for the chemicals 2-butanone (MEK), 2-hexanone (MBK), acetone, and benzene for sample Q2 S8-VMP in *Combined Data Sets/8.xls/data* do not match with that in *Data Each Home Q1/8.xls/sheet1*. This discrepancy should be corrected.

4. **Files:** *Combined Data Sets/402.xls/Raw* and *Data-Each Home Q2/402.xls*

Comment: Q2 sample data from individual tables from Folder 1, Folder 2, and Folder 3 do not match with the data in Folder 5. Conversions from ppb to $\mu\text{g}/\text{m}^3$ are not verifiable with the following formula:

$$\mu\text{g}/\text{m}^3 = (\text{ppb} * P * \text{MW}) / (R * T)$$

where: ppb: Value from raw data table in parts per billion
P: Atmospheric pressure; 760 mmHg
MW: Molecular weight of chemical obtained from EPA Regional Tables (12Sep2008);
R: Ideal gas constant; 62.4 L·mmHg/(mol·°K)
T: Temperature; 298 °K

The above formula can be used to match the conversion from ppb to $\mu\text{g}/\text{m}^3$ for data in the Q1 and Q3 folders. Therefore, it is evident that there is a discrepancy in conversions that should be corrected.

5. **Files:** *Combined Data Sets/402.xls/VMP and /RAW*

Comment: As per the Riggs Park Comprehensive Human Health Risk Assessment document Exhibit 2, chronic daily dose (CDD) is calculated using the following equation:

$$\text{CDD} = (C * E * F * ED) / (A * CF)$$

This equation is not correct. Refer to specific comment 7 in the Riggs Park Comprehensive Human Health Risk Assessment Document review for the correct equation.

The hazard index calculations were made using the actual concentration with an attenuation factor of 10 instead of using the CDD. For example, in worksheet VMP cell "E2", which is the concentration used in HQ calculation (with an attenuation factor of 10) for acetone in Q3-s402-VMP matches with the corresponding value in worksheet RAW. The CDD should be used in this calculation.

6. **Files:** *Combined Data Sets/107-643 Kensington.xls/Raw, Data-Each Home Q1/107-643 Kensington.xls/sheet1, and Data-Each Home Q2/107.xls/sheet1*

Comment: There is no data for sample Q2 S107-GMPR in Data-Each Home Q2/107.xls/sheet1, however, the data are presented in Combined Data Sets/107-643 Kensington.xls/Raw. In addition, conversion to $\mu\text{g}/\text{m}^3$ is not consistent. These discrepancies should be corrected.

In addition, sample Q2 S107-INA data presented in Data-Each Home Q2/107.xls/sheet1 is not included in Combined Data Sets/107-643 Kensington.xls/Raw. This discrepancy should be corrected.

7. **Files:** *Combined Data Sets/VMP-New Region3 Values.xls/Region3 Tox*

Comment: There are no column headings for this file and there are no units to identify the reference and check the toxicity values. This information should be provided.

8. **Files:** *Combined Data Sets/30.xls/Raw and Data-Each Home Q2/30.xls/sheet1*

Comment: Concentration values provided in Exhibit 7 of the Riggs Park Comprehensive Human Health Risk Assessment Document for sample Q2-S30-VMP do not match with the corresponding values in Data-Each Home Q2/30.xls/sheet1 and Combined Data Sets/30.xls/Raw. However, they match with the concentrations in Combined Data Sets/30.xls/Raw, if the conversions from ppb to $\mu\text{g}/\text{m}^3$ were made according to the formula in comment 4 above. This discrepancy should be corrected.

9. **Files:** *Combined Data Sets/13.xls/Raw and Data-Each Home Q1/13.xls/sheet1*

Comment: Concentration values provided in Exhibit 7 of the Riggs Park Comprehensive Human Health Risk Assessment Document for sample Q1-S13-VMP do not match with the corresponding values in Data-Each Home Q1/13.xls/sheet1. However, they match with Combined Data Sets/13.xls/Raw. It is not clear if the correct concentrations were used in risk calculations.

10. **Files:** *Combined Data Sets/23.xls/Raw and Data-Each Home Q2/23.xls/sheet1*

Comment: Concentration values provided in Exhibit 7 of the Riggs Park Comprehensive Human Health Risk Assessment Document for sample Q2-S23-VMP do not match with the corresponding values in Data-Each Home Q2/23.xls/sheet1 and Combined Data Sets/23.xls/Raw. This discrepancy should be corrected.

11. **Files:** *Combined Data Sets/258.xls/Raw and Data-Each Home Q1/258.xls/sheet1*

Comment: The tetrachloroethane concentration provided in Exhibit 7 of the Riggs Park Comprehensive Human Health Risk Assessment Document for sample Q1-S258-VMP does not match with the corresponding concentration in Data-Each Home Q1/258.xls/sheet1. There are two different values for tetrachloroethane concentration in Combined Data Sets/23.xls/Raw, and the value in Exhibit 7 matches with one of these. This should be corrected.

12. **Files:** *Combined Data Sets/37.xls/Raw and Data-Each Home Q1/37.xls/sheet1*

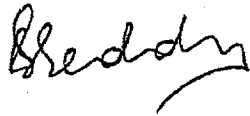
Comment: Concentration values provided in Exhibit 7 of the Riggs Park Comprehensive Human Health Risk Assessment Document for sample Q1-S37-VMP do not match with the corresponding values in Data-Each Home Q1/37.xls/sheet1. However, they match with Combined Data Sets/73.xls/Raw. It is not clear if correct concentrations were used in risk calculations.

Mr. Judson Polikoff
Chevron EMC
April 20, 2009
Page 7 of 7

The above evaluation leads us to believe that there are significant discrepancies and errors in the calculations and the risk assessment presented. Because no documentation is available for the spreadsheets, the only way to confirm the calculations and assumptions is to either (i) request detailed documentation of the data and calculations included in the spreadsheets, or (ii) have a face to face meeting with the authors of these spreadsheets to discuss the methodology, assumptions, and calculations.

If you have any questions, please do not hesitate to contact me. We will welcome the opportunity to discuss our comments in more detail with DC officials as well as the authors of the HHRA report as appropriate.

Sincerely,

For 

Atul M. Salhotra, Ph.D.
Vice President

Attachments: 1. Figure: Toxicologist Work Product: Data Received

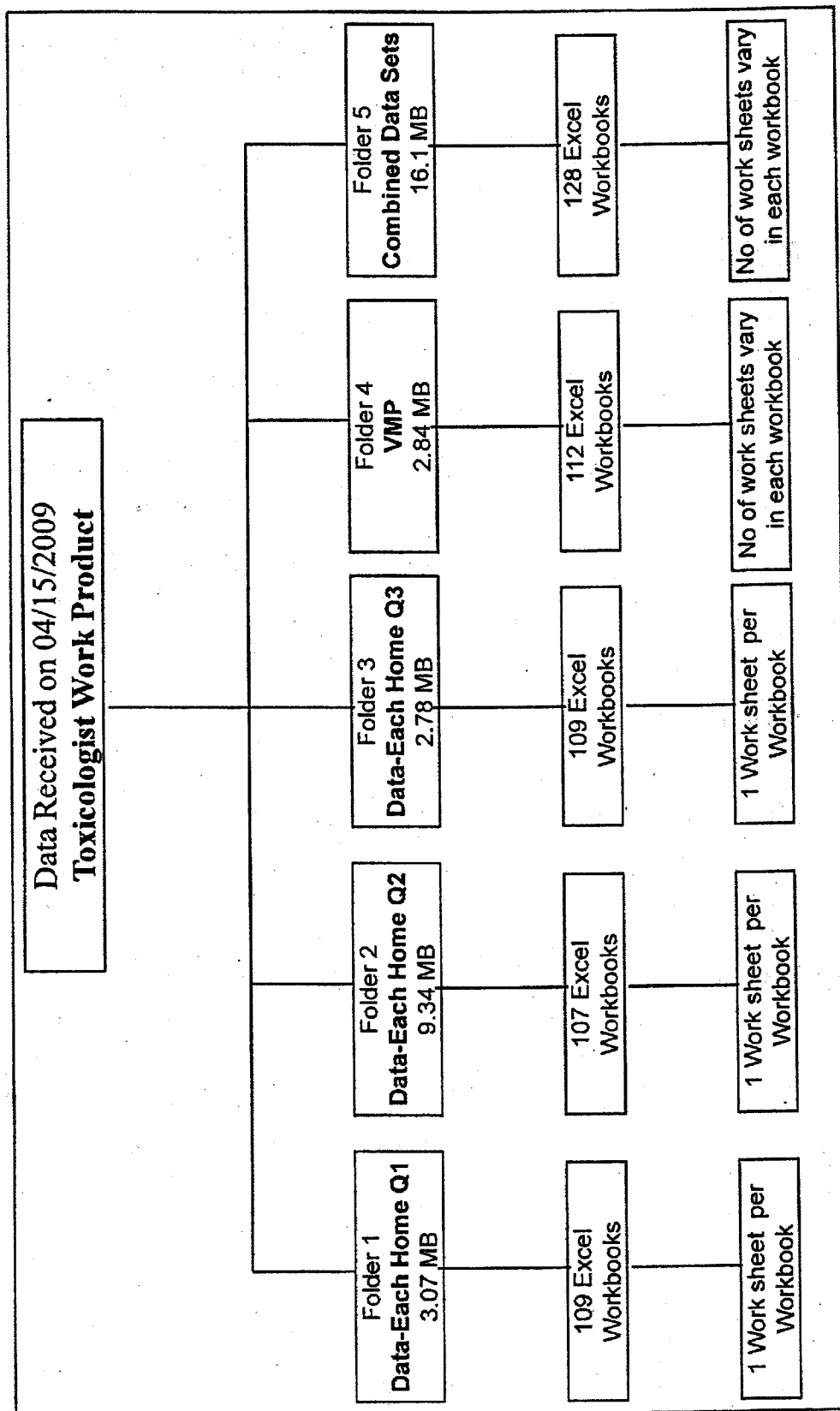


Figure 1: Data Received on 04/15/2009
Former Chevron Facility No. 122208, Chillum Maryland

Appendix B
Response to Comments

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INTRODUCTION

The following comments were received in response to DDOE's Request for Public Comment on the proposed Remedy Selection issued in February 2009 for Riggs Park.

The submitted comments have been reproduced here, as Appendix B of the Final Remedy Selection, in the exact format in which they were received, including grammatical and spelling errors, and/or typos.

DDOE has placed its response below each comment. For ease of reading, the comments are in bold type font, and the responses are in regular black font.

The actual comments that were submitted are attached as Appendix A of the Final Remedy Selection.

Comments 1-37 (Cleo Holmes)

Comment 1:

RPISS&GR, pg. [REDACTED], Table 8 states soil sample was collected was taken from my property.

Why, when on Feb 23, 2009 the DC DOE received a FOIA to provide copies of test results of all samples taken at this property, no soil sample results were delivered?

Response:

All of this information is included in the SSP&A Riggs Park Sampling & Analysis Report (2009) which is available at the Lamond Riggs Library, online at <http://ddoe.dc.gov/RiggsPark> , and on DVD by request.

Please also see the FOIA response to Ms. Freedman-Holmes's request provided by Mr. Bullo on February 27, 2009, which states:

"The SSP&A data is not currently in the home-by-home format you have requested. A home-by-home report is being prepared, and will be made available to each resident when it is ready. The complete SSP&A report, with *all* of its non-confidential attachments, will be available at the Lamond-Riggs library, and the complete SSP&A report, with *most* of its non-confidential attachments, will also be available online on the DDOE website. Due to the voluminous size (over 20,000 pages, total) of the SSP&A report, we are unable to upload all of its attachments onto our website."

Comment 2:

Does the District believe this public comment period a fair opportunity for residents to comment when the residents were not allowed to see or review results of soil and groundwater samples taken on their property?

Response:

The complete data were included in the Final Report completed by SSP&A Riggs Park Sampling & Analysis Report (2009) which is available at the Lamond Riggs Park Library, online at <http://ddoe.dc.gov/RiggsPark> , and on DVD upon request.

Comment 3:

Why does the DCRS not explain the relationship to the depth of the groundwater and the rate of soil vapor movement in different times of the year, as well as what conditions could cause soil vapor to migrate at a faster rate towards the slab of resident homes?

Response:

The February 2009 Remedy Selection addresses vapor migration at all times of the year by taking 3 seasonal samples, a conservative approach to its technical evaluation, and using maximum detected values. In general, a variety of soil, groundwater, and

physical or ambient conditions (such as contaminant concentrations in groundwater, soil moisture conditions, temperature, and possible cracks in building foundations) may affect the rate of vapor releases from the subsurface into a building; this is why multiple/seasonal samples have been taken, in order to capture a fuller spectrum of potential releases and migration. Also, please note that several other important factors are taken into account in the overall risk evaluation – to ensure that residents would be adequately protected.

Please note that the District contractor did consider the depth to groundwater under each home in its investigation. A figure illustrating the depth to groundwater is provided in the SSP&A Riggs Park Sampling & Analysis Report (2009).

Comment 4:

Why does the DCRS not mention how many years it would be before the soil would be considered clean of human carcinogenic chemical compounds?

Response:

Remediation of the soil and groundwater is under US EPA's oversight.

Comment 5:

Appendix O: Table 3 Compounds detected indoor Air Samples PERC Maximum Detection is [REDACTED] ppbv, my result for PERC reported at [REDACTED] ppbv.

Why are DOE and its contractor only quoting results in ppbv and not in ug/m3, is this being done so that when an uninformed reader looks at this report they will think these numbers to be small?

Example: 6.24 ppbv is equal to 42.3 ug/m3

Response:

All results in SSP&A Riggs Park Sampling & Analysis Report (2009) were cited in units of ug/m³. Appendix O of that report contains preliminary reports that were provided to DDOE during the investigation. The final results are included in the main report in units of ug/m³. The District will provide both values and units in the final remedy decision document when appropriate.

Comment 6:

With the DCRS pg. 14 listing 17 COC as "Human Carcinogens", why does the District feel cumulative cancer risk is not important issue to be evaluated?

Response:

The District has utilized cumulative risk assessment and has incorporated it into its February 2009 Remedy Selection. Please see the first paragraph of section IV of the remedy document which states:

"The District selects a cumulative hazard index of 1.0 for non-cancer risk, and a cumulative 1×10^{-5} level for cancer risk to be protective for the current and future residents of Riggs Park."

Comment 7:

The DCRS refer to there toxicologist being an expert, the definition of “expert” is, a person with a high degree of skill in or knowledge of a certain subject of field.

Did the Districts “expert toxicologist” agree with or advise the District not to address or evaluate the cumulative cancer risk in Riggs Park study?

Response:

The District has retained the services of a Toxicologist whose credentials clearly meet those required of “expert” status. The District’s Toxicologist has taken cumulative risk into account.

Comment 8:

First quarter VMP 1 PERC result of [REDACTED] ppbv-[REDACTED] ug/m3, increased to a 2nd quarter VMP 1 result of [REDACTED] ppbv – [REDACTED] ug/m3) and my 3rd quarter VMP 1 went to [REDACTED] ppbv to [REDACTED] ug/m3.

Does this increase in numbers warrant the installation of a Vapor Mitigation System at this property?

Response:

In the 2009 Remedy Selection, determination of the potential need for a Vapor Mitigation System was based on sub-slab vapor samples, as such, if the estimated risks based on the sampling results indicate unacceptable risks, then a VMS is generally recommended for the subject property. In addition, other important lines of evidence (related to the fate and behavior of the contaminant) are utilized in the final decision-making process – to ensure that residents are adequately protected.

In the 2010 HHRA and Remedy Selection, homes without sub-slab vapor samples were also evaluated. Homes in direct contact with contaminated ground water or that fell within kriged boundaries delineating clusters of homes with unacceptable sub-slab vapor concentrations were identified as homes requiring remediation. Additionally, any duplex home from which no data was collected and which shared a common concrete slab with a home already targeted for remediation (based on a high sub-slab sample vapor concentration), was automatically identified as requiring remediation.

Comment 9:

Why hasn’t the District applied any indoor air, sub- slab, or soil vapor action levels for this survey?

Response:

The District made the decision to base its 2009 Remedy Selection on an actual risk assessment, rather than on pre-selected action levels, or “published numbers”. Ultimately, if an unacceptable health risk is found to be present, then a decision is made to qualify the affected home for VMS installation.

Comment 10:

DCRS Pg. 6 references the District DOH development and administration of a health survey of Riggs Park residents who reside over the plume footprint caused by the leakage of gasoline from the Chevron gas station.

Will DCRS direct DOH to correct its development and administration of the RP health survey to include plumes related to PERC and its breakdown products as well?

Response:

The survey that was conducted by DOH was a health status update of residents who reside in Riggs Park. The survey was available online and was also mailed over a 60 day period.

DOH has provided a summary of the results of their health survey (please see Appendix C of the Final Remedy Selection).

Comment 11:

The Riggs Park Sampling & Analysis Report, Feb. 2009 makes reference to "Ambient air concentrations of Benzene and toluene, and PCE are within ranges observed both at Washington DC's McMillan Reservoir, and within ranges reported in the literature for other urban environments"

Why is the District using McMillan ambient numbers in this report and not ambient air samples taken from Riggs Park as the more representative sample collected?

Response:

As is stated in the quote from the SSP&A Riggs Park Sampling & Analysis Report (2009), DDOE did consider ambient air concentrations from the Riggs Park neighborhood, and these were similar in concentration to the other locations cited. McMillan Reservoir and other urban environments were referenced to provide context for the Riggs Park results.

Comment 12:

Table two:" Selected information from home surveys" state at my home:

- a "[REDACTED]", the fact is a [REDACTED] installed at least 12 months prior to the SSP&A testing period.

* This report says "[REDACTED]", inaccurate statement placed in the record.

* This report says [REDACTED] done within two weeks prior to testing, inaccurate statement Placed in the record.

Are these inaccurate statements being placed in the record to disqualify this property from having a Vapor Mitigation System installed at this property?

Response:

The District has never knowingly placed inaccurate statements in the Record for any reason. Items in this table are reported as transcribed during the home surveys. The remedy selection is based on subslab vapor results, not indoor or ambient air results, therefore this information can neither qualify nor disqualify a home from receiving a VMS. The information was used to provide a complete picture of the home.

Comment 13:

Why, when in our FOIA request to the DOE for copies of all contractor field note, none were provide in response to the FOIA we submitted?

Response:

All SSP&A field notes are provided in the appendices to the SSP&A Riggs Park Sampling & Analysis Report (2009).

Comment 14:

Since it has been stated in the February 09 public meeting by DOE Director Hawkins, the problem with locating the PERC plume is that the plume is moving from place to place. Would not it be prudent, as a protection to the community, to install Vapor mitigation Systems under each home in Riggs Park that request a system be installed?

Response:

Director Hawkins did not make this statement at the February 09 public meeting. Vapor mitigation systems will be installed on the basis of data illustrating potential risk.

Comment 15:

What date exactly did the District of Columbia repeal its" Risked Based Corrective Action guidance?

Response:

DDOE has not repealed the DC RBCA guidance. Although the District Department of the Environment continues to rely on DC RBCA for guidance in making risk-based decisions for clean-ups taking place in the District of Columbia, DC RBCA was intended to be used as a guidance document only, and, as such, it is not binding. Whether and to what extent it is used is determined on a case-by-case basis by DDOE's Director and staff. Also, recognize that other site-specific conditions and factors may necessitate the utilization of different but more appropriate technical evaluation protocols not necessarily found in the DC RBCA document – in order for public health to be adequately protected.

Comment 16:

why, when the SSP&A took groundwater samples from various locations in Riggs Park, did the District decide not to reveal laboratory results and the process DOE used to evaluate these results?

Response:

Although the results of all samples, including the soil and groundwater samples were presented in the SSP&A Riggs Park Sampling & Analysis Report (2009), the groundwater results were not evaluated for the February 2009 Remedy Selection.

The preliminary evaluation process was described in the February 2009 Remedy Selection document. The 2010 HHRA evaluation, including the evaluation of groundwater results, has now been completed, and is described in the Final Remedy Document.

Comment 17:

Why does the District feel that by testing only 20% of the homes is sufficient to protect all residents within the boundaries of the gasoline and PERC contaminated areas?

Response:

It is standard scientific practice to sample a statistically representative portion of the whole; as such, it is not necessary to sample all the homes. In making this determination, a good conceptual representation of the site (that accounts for the contaminant behavior, as well as the site-specific conditions) was developed to support the sampling design – in order that there would be an acceptable degree of confidence in using the results from the tested homes to make projections for all the homes. In addition, other important lines of evidence (related to the fate and behavior of the contaminant) are utilized in the final decision-making process – to ensure that residents are adequately protected.

Comment 18:

Page 5 Installations and operation of vapor mitigation systems in up to 45 residences with elevated sub-slab soil vapor levels attributable to contaminated groundwater.

is the District decision to perform evaluations to confirm that contaminants observed in sub-slab vapor samples are attributable to groundwater contamination, being done as the result of a prior agreement with chevron?

Response:

There are no prior agreements with Chevron related to Riggs Park.

DDOE recognizes the importance of correlating sub-slab contamination to groundwater to ensure a sound methodology.

Comment 19:

Is the cost of any re evaluation of any property results being paid for by chevron?

Response:

Chevron has borne the costs of compliance with EPA's orders respecting the gasoline release clean-up at Riggs Park, but the District of Columbia has paid for the costs of DDOE's and DOH's investigations.

Comment 20:

Has the District agreed to supply Chevron results of any test performed in the design or installation phase of the Papadopoulos study?

Response:

There is no agreement for the District to provide Chevron with the above referenced information. Like any other member of the public, Chevron has access to all of the public documents.

Comment 21:

Has DOE agreed to collaborate with Chevron or EPA prior to installations of VMS at any property?

Response:

As stated in other comments, DDOE currently has no agreement(s) with Chevron.

Comment 22:

What exactly is the agreed to Consent order between DOE and Chevron?

Response:

There is no Consent Order between the District and Chevron related to the Riggs Park site at this time. There are no agreements between the District and Chevron related to the Riggs Park site at this time.

There is an Administrative Order on Consent between EPA and Chevron, it is available on EPA's website. <http://www.epaossc.org/sites/abc/files/iporder.pdf>

Comment 23:

In February 09 public meeting Director Hawkins explained on PERC contamination is hard to follow because the way this chemical moves in the subsurface, since the DCRS is based of protective solutions why not install VMS devices under all properties in Riggs Park that which this system?

Response:

As previously stated in response to Comment #14, vapor mitigation systems will be installed on the basis of data illustrating potential risk.

Comment 24:

Many of the Riggs Park site related guidance documents since 2001 noted "District of Columbia's Risk Based Corrective Action as "The" guidance document of choice for this site.

Why has DC DOE abandoned the District's Risk Based Corrective Action Guidance when evaluating the Riggs Park community?

Response:

The District has opted to pursue a case-specific health assessment of the Riggs Park homes using updated toxicological methods and values – to ensure that residents are adequately protected.

Please also see the responses to Comments #15 and 27.

Comment 25:

Why does the “Regulatory Framework” listed in the DCRS not mention of DC RBCA?

Response:

As previously stated in the answer to Comment # 24, the District has opted to pursue a case-specific health assessment of the Riggs Park homes using updated toxicological methods and values – to ensure that residents are adequately protected.

Please also see the responses to Comments #15 and 27.

Comment 26:

Is the DC Risk Based Corrective Action no longer recognized by the District of Columbia?

Response:

As previously seen in the response to Comment # 15, DDOE has not repealed the DC RBCA guidance. Although the District Department of the Environment continues to rely on DC RBCA for guidance in making risk-based decisions for clean-ups taking place in the District of Columbia, DC RBCA was intended to be used as a guidance document only, and, as such, it is not binding. Whether and to what extent it is used is determined on a case-by-case basis by DDOE’s Director and staff. Also, recognize that other site-specific conditions and factors may necessitate the utilization of different but more appropriate technical evaluation protocols not necessarily found in the DC RBCA document – in order for public health to be adequately protected.

Please also see the responses to Comment #27.

Comment 27:

Does the District of Columbia DOE view the DC RBCA as not being adequate protection for the residents of the District?

Response:

As previously stated in the answer to Comment #15, DC RBCA is only a guidance document, and does not, in and of itself, provide protection to the residents of the District. Rather, DC RBCA is used by DDOE, together with other guidance tools available, to determine how to best protect the health of the residents of the District of Columbia from potential environmental hazards. New scientific data pertaining to DC RBCA’s propositions has come into existence since 2002, when DC RBCA was published. DDOE will be revising and updating DC RBCA in 2010 to reflect these latest scientific developments.

Comment 28:

Is DC DOE's decision not to follow its own RBCA at this site as a result on a signed AOC between the District and Chevron?

Response:

As previously stated in the answer to Comments # 22, there is no Consent Order between the District and Chevron related to the Riggs Park site at this time. There are no agreements between the District and Chevron related to the Riggs Park site at this time.

There is an Administrative Order on Consent between EPA and Chevron, it is available on EPA's website. <http://www.epaossc.org/sites/abc/files/iporder.pdf>

Comment 29:

The residents from day one have its asserted concerns to EPA and DC DOE repeatedly around the issue of having the cancer risk evaluated on a cumulative bases?

Since the issue of cumulative risk not being addressed as a part of a pre-existing agreement between DOE and Chevron?

Response:

Cumulative risk was addressed by DDOE in its selected remedy. As previously stated in the answer to Comment #22, there is no pre-existing agreement between DDOE and Chevron.

Comment 30:

How can the DOE consider its remedy to be protective of the health of the Riggs Park resident's without a proper evaluation of any cancer, diseases or other illnesses that could occur as a result of the accumulative exposure to multiple toxic chemicals on the resident population of Riggs Park?

Response:

The remedy does address health risks that may occur as a result of cumulative exposure to multiple chemicals.

Comment 31:

Director Hawkins in a Feb. 2009 public meeting stated the intention of DC DOE intention is to make the Riggs Park web page documents available for public review. As you know this community has repeatedly been asking for this web page to be accessible for sometime now.

Is the AOC between the District and Chevron the reason why the community has since October 2008, not been able to properly access and view documents on the DOE web page?

Response:

As previously stated in the answer to Comment #22, there is no AOC between the District and Chevron.

DDOE has made extensive efforts to employ the internet to provide information to Riggs Park residents; however, there are limitations placed on the size of documents which our system can support. DC also has no control over the quality of the internet service each resident receives from their providers. The documents are also available at the Lamond Riggs Park Library and on DVD upon request.

Comment 32:

In the Feb. 2009 public meeting Director Hawkins stated the District would be open and transparent with the Riggs Park community?

Why, in this public meeting, didn't Director Hawkins announce that DDOE and Chevron in January 2008 entered into an AOC?

Response:

As previously stated in the answer to Comment #22, there is no AOC between DDOE and Chevron. DDOE has made every attempt to be open and transparent with the Riggs Park community in accordance with Director Hawkins' decision.

Comment 33:

Please explain the parameters of the AOC and how this AOC affects the relationship between DC DOE and the residents of Riggs Park?

Response:

As previously stated in the answer to Comment #22, there is no AOC between the District (DDOE) and Chevron.

Comment 34:

Has the gasoline plume seem to be diminished because Chevron has been permitted to inject cloaking chemicals (hydrogen peroxide) into the Sub- surface?

Response:

There is no such thing as "cloaking chemicals." The plume of gasoline-related contaminants has changed over time in response to natural processes in the subsurface, and Chevron's remedial efforts.

Comment 35:

The DCRS mentions DOH development and Administration of a health survey in Riggs Park for those who reside in the plume footprint caused by the leakage of gasoline from the gasoline station.

Does this footprint include carcinogens MTBE and PERC and in breakdown product as well?

Response:

A health survey was developed for the Riggs Park residents who reside within the boundaries of the plume. The health survey did not include information about carcinogens MTBE or PERC.

DOH has provided a summary of the results of their health survey (please see Appendix C of the Final Remedy Selection).

Comment 36:

Is Chevron collaborating through DOE or directly with DOH on the District health survey and its "specific questions" to be asked to the residents of Riggs Park?

Response:

Chevron did not collaborate with the DOH in developing the survey. The survey administered was an adaptation of the National Health Interview Survey through the National Center for Health Statistics within the Centers for Disease Control.

Comment 37:

Nowhere in the District Remedy Selection does it mention the continuing oversight of and distribution of Chevron regulatory monthly and semi annual groundwater sampling results to and on behalf of the residents of Riggs Park.

Will the resident be guaranteed to receive copies of all future test results complete with executive summaries for as long as testing regulatory testing of the groundwater is ordered?

Response:

EPA has lead on groundwater remediation, which includes groundwater monitoring and sampling. Groundwater remediation was not addressed in the February 2009 Remedy Selection.

At this time, DDOE continues to audit ground water monitoring and sampling activities.

EPA has issued requirements for reporting the groundwater monitoring and sampling results. Chevron places copies of the results in the Lamond Riggs Library. At this time, DDOE does not plan to issue additional requirements for reporting on the groundwater activities.

Comments 38 through 41 (Mary Wilkins)

Comment 38:

PERC results April, June, and August 2008: [Below results are in ppbv]

April 2008: VMP=■ June 2008: VMP=■ Aug 2008: VMP=■

Indoor air result April 2008:

April, 2008=■

When the June 2008 VMP increased from ■ to ■ why didn't the contractor sample in August 2008 to see if indoor air had increased as well? In fact, the August 2008 VMP went to ■ ppbv, proving that the contractor erred in his/her responsibility.

Response:

The study was designed to include one set of indoor air sampling per participating address. See the home owner information packets distributed in January of 2008. The quarterly vapor samples collected from beneath homes are a better measure of possible contamination from the subsurface, and thus a better indicator of where vapor mitigation may be required. The contractor followed proper designs and procedures – and overall, the sets of data collected were adequate to support the necessary decisions at these locations. In general, it is standard scientific practice to sample a statistically representative portion of the whole; as such, it is not necessary to sample all the homes at all times. In making this determination, a good conceptual representation of the site (that accounts for the contaminant behavior, as well as the site-specific conditions) was developed to support the sampling design – in order that there would be an acceptable degree of confidence in using the results from the sampling periods and/or homes to make projections for all the other sampling periods and/or homes. In addition, other important lines of evidence (related to the fate and behavior of the contaminant) are utilized in the final decision-making process – to ensure that residents are adequately protected.

Comment 39:

Do you intend to put Vapor Mitigation systems on Nicholson Street, N.E.? I'm concerned because the residents on Nicholson Street are so close to the water table. If you are not putting in the vapor remedial systems, how are you guaranteeing the protection of the residents from 500 Nicholson to 808 Nicholson Street, N.E.?

Response:

DDOE has determined that the use of a VMS is a suitable remedy for homes requiring remediation, regardless of the home's proximity to the water table. DDOE has determined the need for VMS installation using a risk-based determination for each home. Determination of the need for a Vapor Mitigation System has generally been based on sub-slab vapor samples except where none were available. In addition, other important lines of evidence (related to the fate and behavior of the contaminant) are utilized in the final decision-making process – to ensure that residents are adequately protected.

Once DDOE has identified the homes that qualify for VMS installation, each of those home-owners will be notified in writing.

Please see also the response to Comment #44.

Comment 40:

If my next door neighbor has a crack in her slab, how will this affect the selected remedial system for my property? If there is an alternative remedial system, how will this address the needs of two homes on one slab?

Response:

Each home was evaluated independently using the data associated with each home. If no data was collected from a home, an alternative evaluation strategy was utilized.

The decision was based on risk posed by potential vapor intrusion, not actual vapor intrusion. This method is meant to be preventive, as it is used to select homes for remediation which are potentially at risk, regardless of the current conditions of the home's sub-slab. Please also see page 5 of the Remedy Selection Document which states:

“Subslab soil vapor results are indicative of contaminants potentially emanating from groundwater and represent a source of potential indoor vapor intrusion. [...] Using subslab soil vapor results to make determinations protects against possible current and future exposures.”

Comment 41:

My final question addresses the oversight of the Vapor Mitigation system. Will the District be responsible for the oversight of the VMS, sampling and operation of the system?

Response:

The District will be responsible for oversight of VMS systems installed pursuant to District directives; EPA will exercise oversight for VMS systems installed pursuant to EPA orders.

Comments 42 to 55 (Hazel Lawson)

Comment 42:

Here are my SSP&A readings for this chemical.

Tetrachloroethene

Feb 08 VMP	████ ppbv	████ ug/m3
April 08 VMP	████ ppbv	████ ug/m3
July 08 VMP	████ ppbv	████ ug/m3

Why is it there are no published numbers that tell the residents what number, i.e. ppbv or ug/m3, is used to qualify their home to receive a vapor mitigation system. How can your remedy selection be consider adequate if there are no numbers published to tell the residents at what chemical level (reading) this home must receive protection?

Response:

As previously stated in the answer to Comment #9, the District has made the decision to base its 2009 Remedy Selection on an actual risk assessment, rather than on pre-selected action levels, or "published numbers".

DDOE used the numbers cited in the comment above to carry out a comprehensive and site-specific human health risk assessment. Ultimately, if an unacceptable health risk is found to be present, based on the risk calculations that utilize the numbers you have cited, then a decision is made to qualify the affected home for VMS installation.

Comment 43:

Your Remedy mentions to receive a Vapor Mitigation System the chemical of concern must be attributable to groundwater contamination.

In the interest of full disclosure, why hasn't the district released the groundwater test results for the residents to see?

Response:

All groundwater results from samples collected by SSP&A were included in the SSP&A Riggs Park Sampling & Analysis Report (2009) which is available at the Lamond Riggs Library, online at <http://ddoe.dc.gov/RiggsPark> and on DVD upon request. Groundwater results from samples collected by other contractors are also available at the Lamond Riggs Library.

Comment 44:

I do not see results for a groundwater sample taken at this property, so given the fact Tertrachloroethene is present in groundwater behind , doesn't my hoe being so close to the groundwater qualify my home for the installation of a vapor mitigation system?

Response:

In general, a variety of soil, groundwater, and physical or ambient conditions (such as contaminant concentrations in groundwater, soil moisture conditions, temperature, possible cracks in building foundations, and plume behavior) may affect the likelihood of vapor releases from the subsurface into a building. Data from the nearest groundwater well was evaluated and taken into consideration during the risk determination, as well as in the decision-making process for VMS installations.

As previously stated in the answer to Comment #14, vapor mitigation systems will be installed on the basis of data illustrating potential risk.

Each of those home-owners whose home has been identified as qualifying for VMS installation will be notified in writing.

Please also see the response to Comment # 43.

Comment 45:

With the depth to contaminated groundwater being within feet from my basement and slab, has the District or Papadopoulos taken groundwater samples directly under my slab to ascertain the length of time it would take for this contaminated water turned to vapor would take to come in contact with the slab of my home?

Response:

In general, a variety of soil, groundwater, and physical or ambient conditions (such as contaminant concentrations in groundwater, soil moisture conditions, temperature, and possible cracks in building foundations) may affect the rate of vapor releases from the subsurface into a building. As such, several important factors (including the groundwater depth) are taken into account in the overall sampling design and risk determination – to ensure that residents would be adequately protected.

Comment 46:

Why didn't the Papadopoulos, measure and report on, the depth to the groundwater under my slab as it is a relevant factor when considering if vapor intrusion is more apt to affect my home?

Response:

The District contractor did consider the depth to groundwater under each home in its investigation. A figure illustrating the depth to groundwater is provided in the SSP&A Riggs Park Sampling & Analysis Report (2009).

Comment 47:

Why didn't Papadopoulos, after evaluating my Feb. and April results, not take another indoor air sample to find out how much my indoor air was being affected by the increasing tetrachloroethene?

Response:

As previously stated in the answer to Comment # 38, the study was designed to include one set of indoor air sampling per participating address. See the home owner information packets distributed in January of 2008.

The quarterly vapor samples collected from beneath homes are a better measure of possible contamination from the subsurface, and thus a better indicator of where vapor mitigation may be required. The contractor followed proper designs and procedures – and overall, the sets of data collected were adequate to support the necessary decisions at these locations. In general, it is standard scientific practice to sample a statistically representative portion of the whole; as such, it is not necessary to sample all the homes at all times. In making this determination, a good conceptual representation of the site (that accounts for the contaminant behavior, as well as the site-specific conditions) was developed to support the sampling design – in order that there would be an acceptable degree of confidence in using the results from the sampling periods and/or homes to make projections for all the other sampling periods and/or homes. In addition, other important lines of evidence (related to the fate and behavior of the contaminant) are utilized in the final decision-making process – to ensure that residents are adequately protected.

Comment 48:

Did the District order the Papadopoulos not to do a July 08 verifying evaluation of indoor air as part of a pre-existing agreement with Chevron not to take 3rd quarter indoor air samples at any resident?

Response:

As previously stated in the answer to Comment #22, there is no Consent Order between the District and Chevron related to the Riggs Park site at this time. There are no agreements between the District and Chevron related to the Riggs Park site at this time.

Please also see the response to Comment # 38.

Comment 49:

Does the District consider not performing a third quarter indoor air sample in my home as being protective of health concerns for my home and family?

Response:

As previously stated in the answer to Comment #38, the study was designed to include one set of indoor air sampling per participating address. See the home owner information packets distributed in January of 2008. The quarterly vapor samples collected from beneath homes are a better measure of possible contamination from the subsurface, and thus a better indicator of where vapor mitigation may be required. The contractor followed proper designs and procedures – and overall, the sets of data collected were adequate to support the necessary decisions at these locations. In general, it is standard scientific practice to sample a statistically representative portion of the whole; as such, it is not necessary to sample all the homes at all times. In making this determination, a good conceptual representation of the site (that accounts

for the contaminant behavior, as well as the site-specific conditions) was developed to support the sampling design – in order that there would be an acceptable degree of confidence in using the results from the sampling periods and/or homes to make projections for all the other sampling periods and/or homes. In addition, other important lines of evidence (related to the fate and behavior of the contaminant) are utilized in the final decision-making process – to ensure that residents are adequately protected.

Comment 50:

Why doesn't the District Remedy Selection explain how tetrachlorethene can move from my property to my co-slab owner and, under what conditions can the amount of chemical be made to increase to cause harm to my co-slab neighbor and her family?

Response:

In general, a variety of soil, groundwater, and physical or ambient conditions (such as contaminant concentrations in groundwater, soil moisture conditions, temperature, and possible cracks in building foundations) may affect the rate of vapor releases from the subsurface into a building; this is why multiple/seasonal samples have been taken, in order to capture a fuller spectrum of potential releases and migration patterns. Also, please note that several other important factors are taken into account in the overall risk evaluation – to ensure that all residents would be adequately protected.

Comment 51:

My co slab neighbor has a newborn baby, since our slab has increasing tetrachloroethene VMP readings, what are the possible negative health affect can this chemical cause this child?

Response:

DDOE used the measured and estimated concentrations to carry out a comprehensive and site-specific human health risk assessment; such approach inherently accounts for the safe levels appropriate for all residents – including sensitive receptors, such as children. As such, no negative health effects would be anticipated for any resident in your or your neighbor's home. This conclusion is also supported by ATSDR's independent study carried out for the Riggs Park community. Note that ATSDR is tasked with investigating chemical effects on residents nationally.

Please note that if an unacceptable health risk is found to be present (i.e., based on the risk calculations), then a decision is made to qualify the affected home for VMS installation. Please also see the 2010 HHRA and Final Remedy Selection, which provide that, if one home of a co-slab pair is selected for remediation and if no data was collected from its pair, the un-sampled home is automatically selected for remediation.

Comment 52:

With the groundwater being so close to the homes on Oglethorpe Street, how will vapor mitigation systems be installed on Nicholson Street given that most of the homes are on the water table?

Response:

Consultation with VMS contractors indicates that Vapor Mitigation Systems can be installed in homes which are at or near the water table. The specific details will be determined during the design phase. Please see section VI B.1 of the Remedy Selection document.

Please note that only those homes identified by DDOE as meeting the requirements for VMS installation will be offered Vapor Mitigation Systems. Each of those homeowners will be notified in writing.

Comment 53:

How many inches or feet off the water table does the contaminant tetrachloroethene begin to turn into contaminated vapor?

Response:

Tetrachloroethene (PCE) is a volatile organic compound. When in contact with air (even air in soil pores), some portion of it transfers to the air. Dissolved PCE can potentially lead to vapors immediately above the saturated zone (water table).

Comment 54:

Why does the District not mention soil contamination at slab, does the District feel there remedy is complete and validated without a proper evaluation of how many feet of the soil under and around my home is contaminated?

Response:

DDOE has carefully evaluated the potential transport of groundwater contaminants via soil media which includes the soil columns under and around all homes which have been investigated. Therefore, any soil contamination under and around your home has been properly taken into consideration as part of the overall evaluation. In general, a variety of soil, groundwater, and physical or ambient conditions (such as contaminant concentrations in groundwater, soil moisture conditions, temperature, and possible cracks in building foundations) may affect the rate of vapor releases from the subsurface into a building. As such, several important factors (including the soil conditions, areas of contamination, groundwater depth, etc.) have been taken into account in the overall sampling design and risk determination – to ensure that residents would be adequately protected.

Comment 55:

Since the VMP is installed flush with the slab under my home, and the VMP results reveal the presence of contaminant tetrachloroethene, does this mean the soil directly under my home is contaminated as well?

Response:

PCE (tetrachloroethene) detected in the vapor samples is most likely associated with contaminants in groundwater, not soil. PCE has been seen in groundwater in Riggs Park. The scope of the investigation did not include identification of the source of the PCE. In any event, a variety of soil, groundwater, and physical or ambient conditions

(such as contaminant concentrations in groundwater, soil moisture conditions, temperature, and possible cracks in building foundations) may affect the rate of vapor releases from the subsurface into a building. As such, several important factors (including the soil conditions, groundwater depth, etc.) have been taken into account in the overall sampling design and risk determination – to ensure that residents would be adequately protected.

Comments 56 to 61 (Ethel Archie)

Comment 56:

Can the District explain the decision not to evaluate the cumulative affects these chemical could have on my family?

Response:

As previously stated in the answer to Comment #6, the District has consistently supported cumulative risk assessment and has incorporated it into its February 2009 Remedy Selection. Please see the first paragraph of section IV of the remedy document which states:

“The District selects a cumulative hazard index of 1.0 for non-cancer risk, and a cummulative 1×10^{-5} level for cancer risk to be protective for the current and future residents of Riggs Park.”

Comment 57:

I have a new born living in my home; does the District feel the lack of a proper investigation of the cumulative affects is the proper kind of investigation to protect the health of my grand daughter's child living in my home?

Response:

As previously stated in the answer to Comment #6, the District has consistently supported cumulative risk assessment and has incorporated it into its February 2009 Remedy Selection. Please see the first paragraph of section IV of the remedy document which states:

“The District selects a cumulative hazard index of 1.0 for non-cancer risk, and a cummulative 1×10^{-5} level for cancer risk to be protective for the current and future residents of Riggs Park.”

Comment 58:

Can the District assure me without the protection of a vapor monitoring system the health of my family members will not deteriorate, in the future, as a result of these toxic chemicals in the sub surface under and around my home?

Response:

DDOE used the measured and estimated concentrations to carry out a comprehensive and site-specific human health risk assessment; such approach inherently accounts for the safe levels appropriate for all residents – including sensitive receptors, such as children. Ultimately, the determination of an acceptable health risk also means that no significant/negative health effects would be anticipated for any resident in this home.

Comment 59:

Did Papadopoulos perform soil and groundwater sampling on my property? If so, why weren't the results released to our family for review prior to commencement of the comment period?

Response:

DDOE cannot provide information regarding sampling at your home in a public forum. All homes which participated in the SSP&A study will receive a home-by-home report which includes the results from samples taken at their residence.

The results are also in the SSP&A Sampling & Analysis Report (February 2009) which is available at the Lamond Riggs Library, online at <http://ddoe.dc.gov/RiggsPark> and on DVD upon request.

Comment 60:

I have been a member of the DDOE canceled Riggs Park Advisory Committee. Why in monthly meetings RPAC during the past year, after being asked repeatedly, did DOE, a member of RPAC, choose to hide the fact DOE had been in talks with Chevron prior to the start of the District funded Papadopoulos study?

Response:

DDOE has been engaged in communications with EPA and with Chevron, as the responsible party, from the time the District became involved in Riggs Park. DDOE has never hidden this fact.

Comment 61:

What effect did the agreed to District/Chevron Admin. Consent Order have on the resident not being able to see certain documents that were generated by the testing done by Papadopoulos paid for by District taxpayer money?

Response:

As previously stated in the answer to Comment #22, there is no AOC between the District and Chevron.

Aside from information that was identified as confidential (to protect the residents' identities), residents have not been restricted from seeing information developed by SSP&A. The results are in the SSP&A Sampling & Analysis Report (February 2009) which is available at the Lamond Riggs Library, online at <http://ddoe.dc.gov/RiggsPark> and on DVD upon request.

Comments 62 to 64 (Tamiko Lofty)

Comment 62:

Why did DDOE not order additional “indoor air” testing after receiving the high results which appeared in the 1st quarter?

Response:

As previously stated in the answer to Comment #38, the study was designed to include one set of indoor air sampling per participating address. See the home owner information packets distributed in January of 2008. The quarterly vapor samples collected from beneath homes are a better measure of possible contamination from the subsurface, and thus a better indicator of where vapor mitigation may be required. The contractor followed proper designs and procedures – and overall, the sets of data collected were adequate to support the necessary decisions at these locations. In general, it is standard scientific practice to sample a statistically representative portion of the whole; as such, it is not necessary to sample all the homes at all times. In making this determination, a good conceptual representation of the site (that accounts for the contaminant behavior, as well as the site-specific conditions) was developed to support the sampling design – in order that there would be an acceptable degree of confidence in using the results from the sampling periods and/or homes to make projections for all the other sampling periods and/or homes. In addition, other important lines of evidence (related to the fate and behavior of the contaminant) are utilized in the final decision-making process – to ensure that residents are adequately protected.

Comment 63:

What numbers have been set by the District of Columbia to determine action levels?

Response:

As previously stated in the answer to Comment #9, the District made the decision to base its 2009 Remedy Selection on an actual risk assessment, rather than on pre-selected action levels, or “published numbers”.

Ultimately, if an unacceptable health risk is found to be present, then a decision is made to qualify the affected home for VMS installation.

Comment 64:

Do high test results of known carcinogens warrant vapor mitigation systems?

Response:

As previously stated in the answer to Comment #9, the District made the decision to base its 2009 Remedy Selection on an actual risk assessment, rather than on pre-selected action levels, or “published numbers”.

DDOE used the measured and estimated concentrations of all contaminants (including known carcinogens) to carry out a comprehensive and site-specific human health risk assessment; such approach inherently accounts for the safe levels appropriate for all

residents – including sensitive receptors, such as children. Ultimately, the determination of an acceptable health risk also means that no significant/negative health effects would be anticipated for any resident in this home. Note that if an unacceptable health risk is found to be present (i.e., based on the risk calculations), then a decision is made to qualify the affected home for VMS.

Ultimately, if an unacceptable health risk is found to be present, then a decision is made to qualify the affected home for VMS installation.

Comments 65 to 70 (Gertrude Johnson)

Comment 65:

If as quoted in the DC Remedy Selection, “the district has based the decision on sub-slab soil vapor samples” and “sub-slab soil vapor results are indicative of contaminants potentially emanating from groundwater and represent a source of potential indoor air vapor intrusion”

Is “Chemical of Concern “Perchloroethene” mentioned of page 5 of DC Remedy another way word for Tetrachloroethene?

Response:

Yes. Please see the glossary section of the remedy document, pages 3 and 4.

Comment 66:

Why is the District and its contractor SSPA decide not to do 2nd or 3rd round of indoor air sampling at my home?

A.) The February 08 indoor air sample result for chemical compound Tetrachloroethene was [REDACTED] ppbv;

B.) Tetrachloroethene readings in my VMP went from negative in February 08 to [REDACTED] ppbv in June 08, to [REDACTED] ppbv in August 08?

C.) Tetrachloroethene readings in PVMP 1 went from [REDACTED] ppbv in February to [REDACTED] ppbv in June and [REDACTED] in August

D.) Tetrachloroethene readings in PMVP2 went from [REDACTED] ppbv in Feb. to [REDACTED] ppbv in June 08.

A,B,C, and D. is evidence tetrachloroethene is increasing. Why did the District not perform additional indoor air testing in Q3 to address this obvious concern?

Response:

As previously stated in the answer to Comment #38, the study was designed to include one set of indoor air sampling per participating address. See the home owner information packets distributed in January of 2008. The quarterly vapor samples collected from beneath homes are a better measure of possible contamination from the subsurface, and thus a better indicator of where vapor mitigation may be required. The contractor followed proper designs and procedures – and overall, the sets of data collected were adequate to support the necessary decisions at these locations. In general, it is standard scientific practice to sample a statistically representative portion of the whole; as such, it is not necessary to sample all the homes at all times. In making this determination, a good conceptual representation of the site (that accounts for the contaminant behavior, as well as the site-specific conditions) was developed to support the sampling design – in order that there would be an acceptable degree of confidence in using the results from the sampling periods and/or homes to make projections for all the other sampling periods and/or homes. In addition, other important lines of evidence (related to the fate and behavior of the contaminant) are utilized in the final decision-making process – to ensure that residents are adequately protected.

Comment 67:

Since EPA and Chevron are not going to clean up the groundwater under my home, why doesn't the District Remedy address the issue of the fact not potentially that Tetrachloroethene, is increasing, in the sub-surface under my home. What does the District plan to do to prevent my home from future exposure?

Response:

If a home is determined to qualify for VMS installation, pursuant to the District's risk-based analysis, a VMS will be installed and operated until such time that all contaminant sources contributing to the potential indoor air problems have been removed.

Comment 68:

In the Riggs Park Indoor Air, Sub-Slab, Soil and Groundwater Analysis Report, Table 3- states in Q1 "[REDACTED]" I have no memory of this ever happening. Table 8- reveals on 4-3-08 a soil sample was taken at the depth of [REDACTED] feet. No lab results were provided to me by the date of this my response to the DC Remedy.

Response:

As previously stated in the answer to Comment #12, the District has never knowingly placed inaccurate statements in the Record for any reason. Items in this table are reported as transcribed during the home surveys.

As previously stated in the answer to Comment #2, the complete data were included in the Final Report completed by SSP&A Riggs Park Sampling & Analysis Report (2009) which is available at the Lamond Riggs Park Library, online at <http://ddoe.dc.gov/RiggsPark> , and on DVD upon request.

Comment 69:

In February 2009 I sent, and the District DOE received my FOIA request, my request asked for results from all indoor air, soil, soil vapor, and groundwater tests taken in or on my property. This request also asked for copies of all field notes, log books and any other documents generated by S. S. Papadopoulos or its contractors during this sampling event. To-date DOE my FOIA has not satisfied my request.

Response:

All this information is included in the SSP&A Sampling & Analysis Report (2009) which is available at the Lamond Riggs Library, online at <http://ddoe.dc.gov/RiggsPark> and on DVD upon request.

Please also see the FOIA response provided by Mr. Bullo on 2/27/09 which states "The SSP&A data is not currently in the home-by-home format you have requested. A home-by-home report is being prepared, and will be made available to each resident when it is ready. The complete SSP&A report, with *all* of its non-confidential attachments, will be available at the Lamond-Riggs

library, and the complete SSP&A report, with *most* of its non-confidential attachments, will also be available online on the DDOE website. Due to the voluminous size (over 20,000 pages, total) of the SSP&A report, we are unable to upload all of its attachments onto our website.”

Comment 70:

In the District Administrative Record File, why is SSPA Final Report Appendix B,C,R, S, T considered to be “Confidential” when DC DOE Director Hawkins has come before this community and said this investigation and results are completely transparent and above board? Why is DOE keeping the aforementioned files “confidential”?

Response:

Sections of the report are marked “confidential” to preserve homeowner privacy. By limiting distribution of these sections of the report, DDOE intended to prevent anyone but individual homeowners from identifying specific sampling results with their home address. In addition, the home survey forms were marked “confidential” because these contained descriptive information about the interiors of residents’ homes, and the District wished to preserve the privacy of individual homeowners.

Individual home owners may request a copy of the portions of these confidential appendices, and DDOE shall provide them in a redacted form, so as to preserve other homeowner’s privacy. To request a redacted copy, please submit the request in writing to Sharon Cooke at 1200 First St NE, 5th Floor, Washington DC 20002.

Comment 71 (Mrs. Barbara Davis)

Comment #71:

Ms. Cooke the subject of this matter is a 'Formal Request for a 'Vapor Mitigation System' to be install at my address. Which is stated in the "District of Columbia Remedy Selection". Even thou I wasn't allow to participate in the 2008 S. S. Papadopolous Study, I'm Formally Requesting, again a 'Vapor Mitigation System' at my address.

Response:

The DDOE selection process is based on data collected by SSP&A, a human health risk assessment, and site specific risk management framework. Please see the 2010 HHRA for additional information. You will be notified via letter if your home meets the criteria.

Comments 72 through 77 (Glenda Theodore)

Comment 72:

RE: S- Comments District Remedy Selection

I notice the Naphtalene in April VMP 1 was [REDACTED] ppbv- [REDACTED] ug/m3 and June [REDACTED] ppbv- [REDACTED] ug/m3 indoor sample o8 reveal increase of almost a 3 times is this be proof that this chemical has entered into my home?

Response:

Although the results may suggest the presence of this chemical in your home, it does not point to the source. More importantly, it does not necessarily suggest there would be risk to residents. In any event, please note that DDOE used the measured and estimated concentrations to carry out a comprehensive and site-specific human health risk assessment; such approach inherently accounts for the safe levels appropriate for all residents – including sensitive receptors, such as children. Ultimately, the determination of an acceptable health risk also means that no significant/negative health effects would be anticipated for any resident in this home from contaminants in groundwater.

Comment 73:

Why did the District and Papadoupas elect not to retest the indoor air in the 3 quarter to validate in increasing and intrusion of this deadly chemical into my home?

Response:

See the response to comment #38. In general, it is standard scientific practice to sample a statistically representative portion of the whole; as such, it is not necessary to sample all the homes at all times. In making this determination, a good conceptual representation of the site (that accounts for the contaminant behavior, as well as the site-specific conditions) was developed to support the sampling design – in order that there would be an acceptable degree of confidence in using the results from the sampling periods and/or homes to make projections for all the other sampling periods and/or homes. In addition, other important lines of evidence (related to the fate and behavior of the contaminant) are utilized in the final decision-making process – to ensure that residents are adequately protected.

Comment 74:

For what reason can District defend this type negligent testing behavior as the proper way to evaluate how and if toxic chemicals are coming into my home?

Response:

It is standard scientific practice to sample a statistically representative portion of the whole; as such, it is not necessary to sample all the homes at all times. In making this determination, a good conceptual representation of the site (that accounts for the contaminant behavior, as well as the site-specific conditions) was developed to support the sampling design – in order that there would be an acceptable degree of confidence in using the results from the sampling periods and/or homes to make projections for all the other sampling periods and/or homes. In addition, other

important lines of evidence (related to the fate and behavior of the contaminant) are utilized in the final decision-making process – to ensure that residents are adequately protected.

Comment 75:

Please explain why the residents were told about the dangers of Naphtalene and its being a human carcinogen?

Response:

We assume Ms. Theodore intended to ask why the residents were not informed.

The residents were informed. Please see the SSP&A Riggs Park Sampling & Analysis Report (2009) and the remedy selection.

Comment 76:

When I come to meeting why does DOE give the impression as though they are not working in the best interest of the Riggs Park residents?

Response:

The District became involved with Riggs Park at the request of the Riggs Park community. Since then, the District has worked arduously to ensure the health and best interests of that community are protected. The District hired its own contractor(s) to corroborate the sampling results obtained by Chevron pursuant to EPA's orders.

Comment 77:

No matter what I the District should install a vapor mitigation system installed at my property to insure my family safety, does the District agree with me?

Response:

The DDOE used the measured and estimated concentrations to carry out a comprehensive and site-specific human health risk assessment; such approach inherently accounts for the safe levels appropriate for all residents – including sensitive receptors, such as children. Ultimately, the determination of an acceptable health risk also means that no significant/negative health effects would be anticipated for any resident in this home. If indeed an unacceptable health risk is found to be present (i.e., based on the risk calculations), then a decision is made to qualify the affected home for VMS.

Comments 78 to 89 (Bettye Tate)

Comment 78:

In selecting this Remedy, The District has evaluated the risk for healthy adults.

Question: Why didn't the Dc Remedy mention, adults that may already have health problems, their conditions can be aggravated by exposure to gasoline and PERC vapors coming into their homes?

Response:

DDOE used the measured and estimated concentrations of all contaminants to carry out a comprehensive and site-specific human health risk assessment; such approach inherently accounts for the safe levels appropriate for all residents – including sensitive/vulnerable receptors, such as children, the sick, and the elderly. Ultimately, the determination of an acceptable health risk also means that no significant/negative health effects would be anticipated for any resident in this home. Note that if an unacceptable health risk is found to be present (i.e., based on the risk calculations), then a decision is made to qualify the affected home for VMS.

Please also see the response to Comment # 25

Comment 79:

DDOE has not evaluate the indoor air results in any building in this study and the Actual Cumulative Risk Levels, therefore the Cumulative Risk Level in the Remedy is not known.

Response:

As previously stated in the answer to Comment #6, the District has consistently supported cumulative risk assessment and has incorporated it into its February 2009 Remedy Selection. Please see the first paragraph of section IV of the remedy document which states:

“The District selects a cumulative hazard index of 1.0 for non-cancer risk, and a cumulative 1×10^{-5} level for cancer risk to be protective for the current and future residents of Riggs Park.”

Comment 80:

Question: Is the DOE decision not to evaluate the Cumulative Risk Levels in Riggs Park a condition of the agreed to DC and Chevron Administrative Consent Order?

Response:

As previously stated in the answer to Comment #22, there is no Consent Order between the District and Chevron related to the Riggs Park site at this time. There are no agreements between the District and Chevron related to the Riggs Park site at this time.

There is an Administrative Order on Consent between EPA and Chevron, it is available on EPA's website. <http://www.epaossc.org/sites/abc/files/iporder.pdf>

Comment 81:

September 11, 2008, Mr. Andrew Fan stated that the upwelling of the contaminated deeper water rising up into shallow water and clean water appears in the Oglethrope Street area-this has something to do with El Nino year off the Coast of Peru, the Contaminated groundwater is still there.

Question: Can this be true?

Response:

DDOE is unable to confirm the exact nature, content and context of Mr. Fan's statement. Accordingly, DDOE is unable to say whether El Nino is a possible cause for "upwelling" in Riggs Park.

However, regardless of the causes of the "upwelling", it does not affect DDOE's evaluation of the potential vapor intrusion issues, which are the focus of DDOE's study.

Comment 82:

Question: Is the DOE decision not to challenge EPA decision not to clean up the groundwater a part of the Administrative Consent Order between DOE and Chevron?

Response:

As previously stated in the answer to Comment #22, there is no Consent Order between the District and Chevron related to the Riggs Park site at this time. There are no agreements between the District and Chevron related to the Riggs Park site at this time.

There is an Administrative Order on Consent between EPA and Chevron, it is available on EPA's website. <http://www.epaossc.org/sites/abc/files/iporder.pdf>

Comment 83:

Question: Why is the District not establishing toxicity value for the Chemicals in Table 2 that were detected in Riggs Park sub-slabs soil vapor samples?

Response:

The process of establishing toxicity values for chemicals found in various sectors of society and/or in the environment is generally a very involved and expensive undertaking; as such, it has become standard scientific practice to focus the development of toxicity parameters on the more dangerous and highly toxic chemicals that have significant potential to cause harm to human health and the environment. For this reason, both the federal EPA and the District (DDOE) have not established toxicity values for the chemicals in Table 2. However, the evaluation results for the more toxic chemicals (that have toxicity values) generally provide a good indicator of the relative risks presented by the type of chemicals in Table 2 as well. This information is taken into consideration in the overall decision-making process. Please note that the type of chemicals in Table 2 will generally present relatively insignificant

risk to human health in comparison to the other family of chemicals that were the focus of the overall risk characterization.

Comment 84:

Question: Does the District feel the District Remedy Selection is flawed because of the lack of a Cumulative Risk of evaluation?

Response:

The remedy selection does include a cumulative risk evaluation. See the first paragraph of section IV of the remedy document which states:

“The District selects a cumulative hazard index of 1.0 for non-cancer risk, and a cumulative 1×10^{-5} level for cancer risk to be protective for the current and future residents of Riggs Park.”

Comment 85:

In Jan. 08 a Indoor Air sample was taken at my home, Napthelene was [REDACTED] ppbv- [REDACTED] ug/m3

Question: Why didn't Papadopoulos not come back to my home and do another indoor air test to see if these numbers were increasing or decreasing?

Response:

As previously stated in the answer to Comment #38, the study was designed to include one set of indoor air sampling per participating address. See the home owner information packets distributed in January of 2008. The quarterly vapor samples collected from beneath homes are a better measure of possible contamination from the subsurface, and thus a better indicator of where vapor mitigation may be required. The contractor followed proper designs and procedures – and overall, the sets of data collected were adequate to support the necessary decisions at these locations. In general, it is standard scientific practice to sample a statistically representative portion of the whole; as such, it is not necessary to sample all the homes at all times. In making this determination, a good conceptual representation of the site (that accounts for the contaminant behavior, as well as the site-specific conditions) was developed to support the sampling design – in order that there would be an acceptable degree of confidence in using the results from the sampling periods and/or homes to make projections for all the other sampling periods and/or homes. In addition, other important lines of evidence (related to the fate and behavior of the contaminant) are utilized in the final decision-making process – to ensure that residents are adequately protected.

Comment 86:

Question: Why is the District asking for the residents to comment on a District Remedy Selection, without the community being able to read the District promised individual report we were promised at the prior to the start of the Papadopoulos contract?

Response:

The comment period initiation is tied to when the remedy document is issued.

All the indoor and subslab data was mailed to each home owner as it was generated. The individual home owner reports were not ready when the remedy document was issued. However, as was stated in the answer to Comment #21, all the data is available at the Lamond Riggs Library, online at <http://ddoe.dc.gov/RiggsPark>, and on DVD on request.

Comment 87:

Question: Why, when DOE, came into the picture, did the contract deliverables change to non existent?

Response:

The S. S. Papadopoulos and Associates contract did contain deliverables.

Comment 88:

Question: How much of the \$ 500,000.00 DOE paid to fund the Papadopoulos contract did Chevron refund to the District as a condition of the District and Chevron Administrative Consent Order?

Response:

As previously stated in the answer to Comment #22, there is no Consent Order between the District and Chevron related to the Riggs Park site at this time. There are no agreements between the District and Chevron related to the Riggs Park site at this time.

There is an Administrative Order on Consent between EPA and Chevron, it is available on EPA's website. <http://www.epaosc.org/sites/abc/files/iporder.pdf>

Comment 89:

Cancer is not the only health concerns that are affecting this community. We have residents with Respiratory, Kidney, Liver, and others.

Question: Will the District Remedy Selection give a strong recommendation that a gasoline and PERC related chemical(s) health study/survey be performed in Riggs Park?

Response:

The remedy selection stated that DOH would conduct a health survey (including both cancer and non-cancer issues). Please see section VII.B.3 of the remedy selection document.

DOH conducted a survey for residents who reside in Riggs Park. The health survey did not consist of questions about PERC related chemicals. However, it included various questions about access to primary care and chronic diseases, in addition to cancer.

DOH has provided a summary of the results of their health survey (please see Appendix C of the Final Remedy Selection).

Also, please note that DDOE used the measured and estimated concentrations of all contaminants (including both carcinogens and non-carcinogens) to carry out a comprehensive and site-specific human health risk assessment; such approach inherently accounts for the safe levels appropriate for all residents – including sensitive receptors, such as children. Ultimately, the determination of an acceptable health risk also means that no significant/negative health effects would be anticipated for any resident in this home. Note that if an unacceptable health risk is found to be present (i.e., based on the risk calculations), then a decision is made to qualify the affected home for VMS.

Comments 90 to 95 by (Darrel Johnson)

Here is a part of my

Tetrachloroethene

	VMP 1	VMP 2
Feb 08.	ppbv- ug/m3	ppbv- ug/m3
April 08	ppbv- ug/m3	ppbv- ug/m3
Sept 08	ppbv- ug/m3	ppbv- ug/m3

Comment 90:

Why did Papadopoulos and the District decide not to resample the indoor air of my home to see how much this chemical is increasing in our indoor air?

Response:

As previously stated in the answer to Comment #38, the study was designed to include one set of indoor air sampling per participating address. See the home owner information packets distributed in January of 2008. The quarterly vapor samples collected from beneath homes are a better measure of possible contamination from the subsurface, and thus a better indicator of where vapor mitigation may be required. The contractor followed proper designs and procedures – and overall, the sets of data collected were adequate to support the necessary decisions at these locations. In general, it is standard scientific practice to sample a statistically representative portion of the whole; as such, it is not necessary to sample all the homes at all times. In making this determination, a good conceptual representation of the site (that accounts for the contaminant behavior, as well as the site-specific conditions) was developed to support the sampling design – in order that there would be an acceptable degree of confidence in using the results from the sampling periods and/or homes to make projections for all the other sampling periods and/or homes. In addition, other important lines of evidence (related to the fate and behavior of the contaminant) are utilized in the final decision-making process – to ensure that residents are adequately protected.

Comment 91:

How can the District call this study-evaluation complete and accurate without properly evaluating all factors involved with publishing whether or not vapor intrusion is a happening at my home?

Response:

DDOE has evaluated all the factors to determine the risks associated with potential vapor intrusion at each home that participated in the study.

Comment 92:

What factors in the attached “District and Chevron Administrative Order” on Consent altered the manner in which the District’s contractor Papadopoulos performed the duties and responsibilities of the contract the District taxpayer funds paid to receive?

Response:

As previously stated in the answer to Comment #22, there is no Consent Order between the District and Chevron related to the Riggs Park site at this time. There are no agreements between the District and Chevron related to the Riggs Park site at this time. The document submitted with this question was a draft prepared by Chevron that was never agreed upon or executed by the District or Chevron.

There is an Administrative Order on Consent between EPA and Chevron, it is available on EPA's website. <http://www.epaosc.org/sites/abc/files/iporder.pdf>

Comment 93:

Why didn't the District notify the Riggs Park residents of the DC and Chevron Order of Consent was been negotiated and agreed to?

Response:

As previously stated in the answer to Comment #22, there is no Consent Order between the District and Chevron related to the Riggs Park site at this time. There are no agreements between the District and Chevron related to the Riggs Park site at this time.

Comment 94:

Why did the District Remedy Selection publish the amounts of chemical contamination that would trigger the installation of a vapor mitigation System?

Response:

We assume Mr. Johnson intended to ask why the District did not publish the levels of subslab vapor contamination that would trigger the installation of a VMS.

As previously stated in the answer to Comment #9, the District made the decision to base its 2009 Remedy Selection on an actual risk assessment, rather than on pre-selected action levels, or "published numbers".

Ultimately, if an unacceptable health risk is found to be present, then a decision is made to qualify the affected home for VMS installation.

Comment 95:

Since this chemical is on the increase, what is the possible accumulative health affects of this chemical and could this increasing chemical increase the carcinogenic effect of other chemicals and collectively increase the potential for illness at my property and my neighbors as well?

Response:

DDOE used measured and projected concentrations of all contaminants (including both carcinogens and non-carcinogens) to carry out a comprehensive and site-specific human health risk assessment; such approach inherently accounts for the safe levels appropriate for all residents – including people residing at your property and at your neighbors'. Also, please note that current scientific data indicates that the chemicals of concern found in your neighborhood do not exhibit 'synergistic' effects (i.e. the "possible accumulative health effects" you mention); in other words, the chemicals of

Comments # 96 to # 101 (Delores Ford)

Comment 96:

When are you going to ask Chevron to install additional monitoring wells in this particular area;

Response:

EPA has lead for groundwater monitoring and sampling.

Comment 97:

Why hasn't the District government and DDOE follow up with a health survey that addresses the cancer conditions between this locations since it was reported to you;

Response:

The District of Columbia Department of Health conducted a health survey from April 2009 to May 2009 through an online component as well as by mail. Over that period 64 residents responded to the 37 question survey primarily by mail. The purpose of the survey was to conduct a health status update of the residents of Riggs Park.

DOH has provided a summary of the results of their health survey (please see Appendix C of the Final Remedy Selection).

Comment 98:

When the RPAC members conducted their own health survey on Oglethorpe Street, it was found that alarming numbers of cancer has been and still is ramped between that section of homes;

Response:

DOH conducted a health survey for those who reside in Riggs Park. The survey was an attempt to collect data on the health status of the aforementioned residents.

DOH has provided a summary of the results of their health survey (please see Appendix C of the Final Remedy Selection).

Comment 99:

Data proves that there is liquid gasoline present on Oglethorpe Street. Where are additional monitoring wells going to be installed between 651 through 736 on Oglethorpe Street. Because there are not data producing wells in or around these addresses?

Response:

As previously stated in the answer to Comment #97, EPA has lead for groundwater monitoring and sampling.

Comment 100:

How clean is the ground water on Oglethorpe Street?

Response:

Please review the data available at the Lamond Riggs Library, online at <http://ddoe.dc.gov/RiggsPark> , or on DVD on request.

Comments # 101 to # 107 (Marion Drummond)

Comment 101:

I asked the District for 2 months and finally received one Papadopoulos identification number, I went to the library and researched I found there are two ID #s for my home. Why did the District not disclose I had a second identification number?

Response:

Please see the email response dated 4/6/09 from Ms. Cooke which states in part: [Please note, in the quote below the code # was replaced with ### to protect the resident's confidentiality.]

"[...] each home has an ID number Sxxx tied to its address. That code remained fixed through the entire sampling period.

Samples for the first, second and third quarter are designated with a Q1, Q2, or Q3 as appropriate. Samples from VMPs are designated VMP, samples from pre-existing VMPs are designated PVMP, samples from outdoor vapor ports are designated GMP, indoor air samples are designated INA, and outdoor air samples are designated AOA.

Putting it all together, a second quarter VMP sample from home S###, for example, would be labeled as: Q2-S###-VMP."

Comment 102:

How many other homeowners who participated in this study have been two ID numbers without their knowledge?

Response:

None, no homeowners have two ID numbers in the SSP&A study.

Comment 103:

Since the District did not disclose the 2nd number, this number revealed there was a soil sample taken at my home but did not give me the results of these test taken on my property. How can the District initiate a public comment period without allowing the residents the ability to view then comment on the soil and groundwater results of samples taken from their homes?

Response:

As previously stated in the answer to Comment #2, the complete data were included in the Final Report completed by SSP&A Riggs Park Sampling & Analysis Report (2009) which is available at the Lamond Riggs Park Library, online at <http://ddoe.dc.gov/RiggsPark> , and on DVD upon request.

Please also see the response to Comment #102.

Comment 104:

Has the District shared the soil, soil vapor, groundwater, and indoor air results with chevron prior to this resident public comment period?

Response:

The information is available to the public and is therefore accessible by Chevron. The information was made available to all of the public (including Chevron), in coded form, at the same time.

Comment 105:

I am very concerned about the depth to the groundwater under my property and the ability of the toxic chemical to come into my home now and in the future. How can the District protect me from these chemicals coming into my home?

Response:

In general, a variety of soil, groundwater, and physical or ambient conditions (such as contaminant concentrations in groundwater, soil moisture conditions, temperature, and possible cracks in building foundations) may affect the rate of vapor releases from the subsurface into a building. As such, several important factors (including the soil conditions, groundwater depth, etc.) have been taken into account in the overall sampling design and risk determination – to ensure that residents would be adequately protected into the future.

Comment 106:

Is the District or Chevron going to clean up this contaminated groundwater under my home?

Response:

Remediation of soil and groundwater is under US EPA's oversight, not DDOE's.

Comment 107:

S [REDACTED] Riggs Park Indoor Air, Sub slab vapor, soil and groundwater report makes reference to my basement [REDACTED] and resident refused removal of [REDACTED] from the basement. This statement is not correct, I never made this kind of statement and my basement was not [REDACTED].

Response:

As stated in the response to Comment #12, the District has never knowingly placed inaccurate statements in the Record for any reason. Items are reported as transcribed during the home surveys.

Comments # 108 to # 124 (John Dunston)

Comment 108:

I need someone to explain this chain of custody to me. i was looking through ssipa file h and i found this. about my sample. my id number is [REDACTED]. the chain of custody looks like the sample was taken from my house on [REDACTED], at [REDACTED] pm. on [REDACTED] at [REDACTED] am the samples left this location and arrived at the final destination, I assume the laboratory. i need the district to explain what appears to be two other persons doing something with the canisters on [REDACTED] it shows these persons leaving this location at [REDACTED] pm. this causes me to wonder were these canister tampered with in this time period, what was going on. i would like a detailed description for the actions of everyone who came in contact with my canister [REDACTED] for the entire time this chain of custody describes. i ask this email questions and answers be made a official apart of the dc remedy selection and the official record for the riggs park chillum investigation.

Response:

Because of the large number of samples collected each week, the canisters were picked up by representatives of the laboratory and driven from Maryland to the laboratory in Massachusetts (as opposed to being shipped via a shipping company). The additional signatures represent tracking of the samples from Maryland via personnel employed by DDOE's consultants or the laboratory.

Comment 109:

i have not received a copy of the results of a soil sample taken [REDACTED] at a depth of [REDACTED]. does the district think it is fair for them not to allow me the ability to view and comment on the soil sample as a part of this comment period?

Response:

As previously stated in the answer to Comment #2, the complete data were included in the Final Report completed by SSP&A Riggs Park Sampling & Analysis Report (2009) which is available at the Lamond Riggs Park Library, online at <http://ddoe.dc.gov/RiggsPark> , and on DVD upon request.

Comment 110:

what is acetone and why is it so high in gmp1 1 ([REDACTED] ppbv-[REDACTED] ug/m3 and gmp2 2 ([REDACTED] ppbv-[REDACTED] ug/m3)?

Response:

Acetone is a commonly used solvent. It is found in common consumer and household products – such as nail polish remover and paint thinner. The results in your indoor air may be a combination from several sources – including the household use of products containing acetone, and ambient air. Most importantly, the contaminant levels associated with groundwater contamination were not found to pose unacceptable risks.

Comment 111:

an indoor air test was taken from my property in february 2008. the laboratory results from this sample showed 1,4 dichlorobenzene in my indoor air as [REDACTED] ppbv - [REDACTED] ug/m3. why did the district not do another indoor air sample in april or august to investigate this high february number?

Response:

As previously stated in the answer to Comment #38, the study was designed to include one set of indoor air sampling per participating address. See the home owner information packets distributed in January of 2008. The quarterly vapor samples collected from beneath homes are a better measure of possible contamination from the subsurface, and thus a better indicator of where vapor mitigation may be required. The contractor followed proper designs and procedures – and overall, the sets of data collected were adequate to support the necessary decisions at these locations. In general, it is standard scientific practice to sample a statistically representative portion of the whole; as such, it is not necessary to sample all the homes at all times. In making this determination, a good conceptual representation of the site (that accounts for the contaminant behavior, as well as the site-specific conditions) was developed to support the sampling design – in order that there would be an acceptable degree of confidence in using the results from the sampling periods and/or homes to make projections for all the other sampling periods and/or homes. In addition, other important lines of evidence (related to the fate and behavior of the contaminant) are utilized in the final decision-making process – to ensure that residents are adequately protected.

Comment 112:

why does DOE feel by not disclosing results of all tests the residents will have a fair opportunity comment on issues related to the indoor air, soil, soil vapor and groundwater samples taken from their properties?

Response:

As previously stated in the answer to Comment #2, the complete data were included in the Final Report completed by SSP&A Riggs Park Sampling & Analysis Report (2009) which is available at the Lamond Riggs Park Library, online at <http://ddoe.dc.gov/RiggsPark>, and on DVD upon request.

Comment 113:

in the feb. public meeting doe director george hawkins stated the district would be transparent with the documents for the riggs park community. what documents are in appendix a, b,r,s, t, the districts administrative record file for the riggs park remedy selection that cause these files to be treated as confidential.

Response:

As previously stated in the answer to Comment # 70, sections of the report are marked “confidential” to preserve homeowner privacy. By limiting distribution of these sections of the report, DDOE intended to prevent anyone but individual homeowners from identifying specific sampling results with their home address. In addition, the

home survey forms were marked "confidential" because these contained descriptive information about the interiors of resident's homes, and the District wished to preserve the privacy of individual homeowners.

Comment 114:

through agreement with chevron, did the district share these confidential files with chevron when these files came available from papdaopulas?

Response:

As previously stated in the answer to Comments # 20 and 105, there is no agreement for the District to provide Chevron with the above referenced information. The information is available to the public and is therefore accessible by Chevron. The information was made available to all of the public (including Chevron), in coded form, at the same time.

Comment 115:

in the January 08 administrative order of consent between chevron and doe the chevron agreed to pay \$10,000.00 of the cost for the district expert toxicologist. did the district reveal the name of its expert toxicologist when negotiating this consent order with chevron?

Response:

As previously stated in the answer to Comment #22, there is no Consent Order between the District and Chevron related to the Riggs Park site at this time. There are no agreements between the District and Chevron related to the Riggs Park site at this time. The January 2008 document referenced by Mr. Dunston was a draft prepared by Chevron that was never agreed upon or executed by the District or Chevron.

There is an Administrative Order on Consent between EPA and Chevron, it is available on EPA's website. <http://www.epaossc.org/sites/abc/files/iporder.pdf>

Chevron has not paid for any of the activities directed by DDOE.

Comment 116:

how much money did chevron pay the doe prior to and while the papadoupas study was being done?

Response:

As previously stated in the answer to Comment #115, Chevron has not paid for any of the activities directed by DDOE.

Comment #117

as part of the aoc did chevron have access to resident results before the resident did?

Response:

As previously stated in the answer to Comment #114, there is no Consent Order between the District and Chevron related to the Riggs Park site at this time. There are

no agreements between the District and Chevron related to the Riggs Park site at this time. The January 2008 document referenced by Mr. Dunston was a draft prepared by Chevron that was never agreed upon or executed by the District or Chevron.

There is an Administrative Order on Consent between EPA and Chevron, it is available on EPA's website. <http://www.epaossc.org/sites/abc/files/iporder.pdf>

As previously stated in the answer to Comment #105, the information is available to the public and is therefore accessible by Chevron. The information was made available to all of the public (including Chevron), in coded form, at the same time.

Comment 118:

councilwoman bowers office held 10 to 12 monthly ward 4 public meetings, with representatives of dOE in attendance. why did doe choose not disclose the terms of the administrative order of consent at the request of chevron?

Response:

As previously stated in the answer to Comment #22, there is no Consent Order between the District and Chevron related to the Riggs Park site at this time. There are no agreements between the District and Chevron related to the Riggs Park site at this time.

There is an Administrative Order on Consent between EPA and Chevron, it is available on EPA's website. <http://www.epaossc.org/sites/abc/files/iporder.pdf>

Comment 119:

when exactly did doe inform the mayor office and councilwoman bower that doe had agreed to enter into an administrative order of consent with chevron?

Response:

As previously stated in the answer to Comment #22, there is no Consent Order between the District and Chevron related to the Riggs Park site at this time. There are no agreements between the District and Chevron related to the Riggs Park site at this time.

There is an Administrative Order on Consent between EPA and Chevron, it is available on EPA's website. <http://www.epaossc.org/sites/abc/files/iporder.pdf>

Comment 120:

since chevron paid for the services of victoria north, did the district agree to limit the monitoring of chevrons site activities and/or not continue monitoring chevron site activities on behalf of the residents of riggs park?

Response:

Chevron has not paid for the services of any of the DDOE staff.

Comment 121:

when the residents asked questions by email and public meeting did the doe agree limit answers to the residents questions as a result of an agreement with chevron?

Response:

As previously stated in the answer to Comment #22, there is no Consent Order between the District and Chevron related to the Riggs Park site at this time. There are no agreements between the District and Chevron related to the Riggs Park site at this time.

There is an Administrative Order on Consent between EPA and Chevron, it is available on EPA's website. <http://www.epaossc.org/sites/abc/files/iporder.pdf>

Comment 122:

as a result of the aoc between chevron and the district did chevron have access to the districts experts toxicologist prior to the release?

Response:

As previously stated in the answer to Comment #22, there is no Consent Order between the District and Chevron related to the Riggs Park site at this time. There are no agreements between the District and Chevron related to the Riggs Park site at this time.

There is an Administrative Order on Consent between EPA and Chevron, it is available on EPA's website. <http://www.epaossc.org/sites/abc/files/iporder.pdf>

Chevron has not had access to DDOE's expert toxicologist.

Comment 123:

what percentage of the district remedy selection was negotiated and modified with chevron prior to its release to residents of riggs park?

Response:

Chevron had no input in the preparation of the District's remedy selection.

Comment 124:

why when the district knew the mistrust the residents have of chevron, why did doe enter into secret activities with chevron without the knowledge of and against the will of the district very residents chevrons caused harm?

Response:

As previously stated in the answer to Comment #22, there is no Consent Order between the District and Chevron related to the Riggs Park site at this time. There are no agreements between the District and Chevron related to the Riggs Park site at this time.

There is an Administrative Order on Consent between EPA and Chevron, it is available on EPA's website. <http://www.epaossc.org/sites/abc/files/iporder.pdf>

Comment # 125 (EPA)

[addresses have been redacted to protect the residents' identity]

Chillum Resampling Locations

HSCD has reviewed all of the Indoor Air data for the 151 homes sampled, and identified the following 7 homes as locations where the Contaminant of Concern (COC) in basement readings exceed EPA's 10-4 cancer Risk Screening Levels (RSLs) or result in a non-cancer hazard index (HI) > 1 (using standard residential exposure assumptions). HSCD further reviewed the historical sampling results, and provides the following house specific recommendations:

██████████ - COC is Naphthalene, which is not related to either the suspect gas station or dry cleaner releases. DDOE performed the one sampling event in 2008. DDOE should advise the residents of the risk value exceedance, and consider further identification of an indoor source. Relative to investigation of the Chillum Site gasoline or dry cleaner releases, no additional sampling is recommended.

██████████ - COC is 1,4 Dichlorobenzene; it is unclear whether this is related to the suspect gas station leak but it is not known to be a dry cleaning chemical. Only one indoor air and subslab sampling event was performed by DDOE. Subslab concentrations were significantly less than the indoor air results. Therefore, it is recommended that an additional round of contemporaneous sampling be performed to more fully characterize subslab and indoor air at this residence.

██████████ - COCs are Carbon Tetrachloride and Chloroform, which may be related to the suspect dry cleaner release. These COCs were detected by EPA above the 10-4 cancer risk level in the July 2003 sampling event. The data from the April 2005 EPA and the DDOE 2008 sampling events are within acceptable risk levels. Subslab levels were either comparable to or less than the Indoor Air levels. Therefore, it is recommended that an additional round of contemporaneous indoor air and subslab sampling be performed to confirm that no further work is required.

██████████ Avenue - COCs are 1,2,4 Trimethylbenzene and 1,3,5 Trimethylbenzene; it is unclear whether the results are related to the suspect gas station leak but they are not known to be dry cleaning chemicals. Only one indoor air and subslab sampling event was performed (by DDOE). The COCs were detected in only one of the 6 Subslab samples, and this one sample concentration was significantly less than the indoor air. Therefore, it is recommended that an additional round of contemporaneous indoor air and subslab sampling be performed to more fully characterize this residence.

██████████ – COC is Chloroform, which may be related to the suspect dry cleaner release. Only one indoor air and subslab sampling event was performed by DDOE. The three subslab concentrations for Chloroform were significantly less than the indoor air. Therefore, it is recommended that an additional round of contemporaneous indoor air and subslab sampling be performed to more fully characterize this residence.

██████████ – Vapor Mitigation System has been installed. Therefore, no further evaluation of historical data was conducted.

██████████ – COC is 1,2,4 Trimethylbenzene; it is unclear whether this is related to the suspect gas station leak but it is not known to be a dry cleaning chemical. This COC was detected above the RSL in an April 2004 EPA sampling event. The data from the April 2003, July 2003, June 2005, and April 2006 EPA sampling events and the DDOE 2008 sampling event were non-detect for this COC. Subslab levels for this compound also were non-detect. This residence will be discussed further under the Subslab data review, and it is recommended that an additional round of contemporaneous indoor air and subslab sampling be performed to confirm that no further work is required.

HSCD has reviewed all of the subslab data for the 151 homes sampled, and identified the following 3 homes as locations where the Contaminant of Concern (COC) exceeds EPA's 10-3 cancer Risk Screening Levels (RSLs) or results in a non-cancer hazard index (HI) > 10. By applying this screening level, we are using the conservative Attenuation Factor of 0.1 for vapors migrating from subslab to indoor air. HSCD further reviewed the historical sampling results, and provides the following house specific recommendations:

██████████ - COC is Naphthalene detected by DDOE, which is not related to either the suspect gas station or dry cleaner releases. It should be noted that Naphthalene was not detected in any of the 4 Indoor Air samples collected by EPA in July 2003, April 2004, February 2005 or DDOE in 2008, nor in 5 of the 6 Subslab samples collected in 2008 by DDOE. DDOE should advise the residents that a public health threat exists. No additional sampling relative to the Chillum Site groundwater releases is recommended.

██████████ – COC is Chloroform, detected by DDOE in 2008, which may be related to the suspect dry cleaner release. Only one indoor air sampling event was performed by DDOE, which was non-detect. It should be noted that Chloroform levels exceeded the RSL in five out of the 6 DDOE subslab samples in 2008. Therefore, it is recommended that an additional round of contemporaneous indoor air and subslab sampling be performed to more fully characterize this residence.

██████████ – COC is Tetrachloroethene; which is likely related to the suspect dry cleaner release. This COC had significant levels detected in all of the Subslab samples collected in EPA's July 2003 and DDOE 2008 sampling events. It should be noted that the COC was not detected in indoor air in EPA's April 2003, July 2003, April 2004, June 2005, April 2006 sampling events and the DDOE 2008 sampling events. It is recommended that an additional round of contemporaneous indoor air and subslab sampling be performed to confirm that no further work is required.

Response:

Pursuant to its commitment in EPA Region 3's Administrative Order on Consent dated Jan 16, 2009, EPA Region 3 reviewed the SSP&A data and provided recommendations to DDOE. EPA Region 3 is currently evaluating its findings.

DDOE is in discussion with EPA Region 3 regarding the nature of the public health threat about which EPA has suggested DDOE advise the residents. DDOE will notify the residents of the addresses referenced by EPA where additional investigation, if any, will be performed after the decision has been made.

DDOE notes that ATSDR indicated that there is no public health threat at homes in Riggs Park related to the petroleum fuel spill.

“ATSDR categorizes this site as No Apparent Public Health Hazard for exposures to reported VOC levels. This means human exposure to contaminated indoor air could be occurring, could have occurred in the past, or could occur in the future to the reported VOC levels, but such exposure is not expected to cause any adverse health effects.” (Page ii of ATSDR's April 9, 2008 Public Health Consultation.)

RESPONSE TO CHEVRON'S COMMENTS

On April 20, 2009 Chevron Corp. submitted comments on DDOE's Remedy Selection for Riggs Park Community, Washington, D.C., pursuant to a Notice of Opportunity for Public Comment, published in the *D.C. Register* on March 6, 2009. Chevron's comments were composed of 4 sub-sets as follows:

- (1) Review of Remedy Selection for Riggs Park Community, Washington, DC – Former Chevron Facility 122208, Chillum, Maryland.,
- (2) Review of Riggs Park Indoor Air, Sub-Slab Vapor, and Groundwater Sampling and Analysis Report.
- (3) Review of Methods: Riggs Park Comprehensive Human Health Assessment Long Version, and Summary Tables Supplied by Expert Toxicologist 2/13/09.
- (4) Review of Riggs Park Comprehensive Human Health Risk Assessment – Toxicologist Work Product Data Tables.

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SUBSET #1

- (1) Review of Remedy Selection for Riggs Park Community, Washington, DC – Former Chevron Facility 122208, Chillum, Maryland

Gannett Fleming, Inc. (GF) has reviewed the *Remedy Selection for Riggs Park Community, Washington, D.C.*, prepared for the residential area surrounding Former Chevron Facility 122208, Chillum, Maryland, dated February 20, 2009. The report was prepared by the Government of the District of Columbia Department of the Environment (DDOE) and Department of Health (DOH).

The following references were used in the review of the report:

Agency for Toxic Substances and Disease Registry (ATSDR), 2008. Health Consultation, Indoor and Outdoor Air Data Evaluation for Chillum Perc Site. Dated April 2008.

Gannett Fleming, 2003. Description of Current Conditions Report. Former Chevron Facility 122208, Chillum, Maryland. Dated July 2003.

Gannett Fleming, 2006. Site Investigation Report. Former Chevron Facility 122208. Dated July 2006.

Gannett Fleming, 2007a. Interim Measures Report for Indoor Air Sampling at 5846 Eastern Avenue. Former Chevron Facility 122208, Chillum, Maryland. Dated July 2007.

Gannett Fleming, 2007b. Baseline Risk Assessment. Former Chevron Facility 122208, Chillum, Maryland. Dated January 2007.

Interstate Technology & Regulatory Council (ITRC), 2007. Vapor Intrusion Pathway: A Practical Guide. Dated January 2007.

McHugh, T., P. DeBlanc, and R. Pokluda, 2006. Indoor Air as a Source of VOC Contamination in Shallow Soils Below Buildings. Soil and Sediment Contamination, Vol. 15, pages 103-122.

S.S. Papadopoulos & Associates, Inc., 2009. Riggs Park Indoor Air, Sub-slab Soil Vapor, Soil, and Groundwater Sampling and Analysis Report. Dated February 2009.

U.S. Environmental Protection Agency (EPA), 1989. Risk Assessment Guidance for Superfund, Volume 1, Part A. EPA, 2002. Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils. EPA 530-D-02-004.

EPA, 2007. Letter to Ms. Denise Dixon of Chevron, re: Comments on Corrective Measures Study. Dated June 2007.

EPA, 2008. Final Decision and Response to Comments, Chevron Gasoline Release at Chillum, Maryland. Dated April 2008.

GF reviewed the report for technical content, data gaps, validity, accuracy, completeness, and compliance with regulations and guidance.

General Comment 1(a):

The District of Columbia's (the District's) remedy for the Riggs Park community was selected after reviewing data collected by S.S. Papadopoulos & Associates (SSP&A) (2009), additional documents contained in the administrative record, and conducting an extensive human health risk assessment. The selected remedy described in this document is the "installation and operation of vapor mitigation systems in up to 45 residences with elevated sub-slab soil vapor levels attributable to contaminated groundwater." However, groundwater was not evaluated as part of the remedy selection. Rather, the District states the sub-slab soil vapor "results are indicative of contaminants potentially emanating from groundwater and represent a source of potential indoor vapor intrusion." However, a review of the September 2008 groundwater analytical results for shallow wells screened across the water table indicated only 17 compounds were detected above laboratory reporting limits and only 13 of these compounds were detected by DDOE in sub-slab soil vapor (Attachment 1). Thus, of the 36 compounds identified in sub-slab soil vapor and assumed by the District to be potentially emanating from groundwater, only 13 were actually detected in shallow groundwater in September 2008. As a result, the DDOE HHRA likely overestimated the risk to residents by including 36 compounds in the assessment instead of the 13 present in shallow groundwater.

Response:

Identifying all contaminants detected in sub-slab vapor (VMP) samples represents only the first step of the human health risk assessment (HHRA). According to U.S. EPA's Risk Assessment Guidance for Superfund (RAGS; EPA 1989) and generally accepted risk assessment practice, all detected chemicals should be defined as chemicals of interest. Therefore, DDOE did not eliminate any chemicals detected in (VMP) samples. Once detected, they became chemicals of interest and were evaluated in the 2009 HHRA. Seventeen compounds were initially identified as chemicals of interest. Subsequent to the 2009 HHRA, a further detailed evaluation revealed that only 6 were detected at elevated levels. Based on the frequency of detection and the elevated concentration the following 6 chemicals are identified as chemicals of concern (COCs):

- Tetrachloroethene (PCE)
- Chloroform
- 1,4-Dichlorobenzene
- Naphthalene
- Carbon tetrachloride
- Methylene chloride

The remaining 11 compounds (of the initial 17) were eliminated from further consideration because they were detected only sporadically at low concentrations and thus did not pose unacceptable levels of human health risks.

It is contrary to U.S. EPA risk assessment guidance to eliminate chemicals based on an *a priori* presumption of what the chemical "source" should be. That approach could lead to the unintended result of ignoring a chemical source that simply had not been heretofore considered or identified. Accordingly, the first step taken by DDOE was to identify *all* potential health threats from vapor intrusion, regardless of the contaminant source(s) and to report all chemicals detected in the sub-slab soil vapor space below the homes.

The second step of the process is to determine whether the chemicals found in the sub-slab soil vapor are linked to the underlying groundwater, potentially resulting in long-term vapor intrusion. While there was insufficient time to conduct a ground water analysis in the 2009 HHRA, DDOE has since finished such an analysis as part of the 2010 HHRA. Based on the analysis in the 2010 HHRA, DDOE has determined that of the 6 previously identified COCs, only two chemicals detected in VMP samples—namely tetrachloroethene, (perchloroethene or PCE) and chloroform—can be definitively linked to groundwater contamination in the Riggs Park community. It should be emphasized that although other chemicals (including those associated with petroleum releases) have been detected in sub slab samples at high concentrations, the groundwater dataset is not sufficiently complete to conclude those chemicals are also present in ground water.

Chevron correctly points out that some contaminants detected in VMP samples have not historically been detected in groundwater. However, it should also be noted that the historic groundwater dataset has many data gaps and uncertainties due to high

detection limits and limited analyte lists. That is, since the focus of the groundwater monitoring effort has, for the most part, been limited to a relatively small number of contaminants, the historical dataset may not be sufficient for identifying all groundwater sources of contamination. Moreover, since the detection limits for many target analytes were significantly elevated, the historical groundwater dataset is unreliable for conducting a forensic source analysis for numerous contaminants identified in the VMP samples. If contaminants were actually present but just below the elevated detection limits, they could pose unacceptable risk via vapor intrusion. Furthermore, in many instances the groundwater monitoring wells are not co-localized with the home undergoing sampling, so any inferred relationship would be tenuous. In some instances, it was necessary to extrapolate groundwater data from monitoring wells that were located a significant distance from a home undergoing sub-slab vapor sampling. To DDOE's knowledge, no detailed analysis of groundwater contamination by the six COCs identified in the VMP samples had yet been conducted so it was necessary to conduct such an analysis in order to ensure that no part of the investigation was ignored or overlooked.

Overall, Chevron seems to have provided a selective view of the groundwater data collected in late 2008. First, the data provided by Chevron (122208_GW_Data_12-08-08.xls) indicate that during groundwater sampling between 9/22/08 and 10/1/08, twenty (20) compounds were reported in groundwater, 18 of which were also detected in sub-slab monitoring ports. Secondly, Chevron confuses reporting limits with detection limits. Laboratory reporting limits exceed the instrument detection limits and method detection limits, and do not indicate the presence or absence of a compound except with respect to that reporting limit. We note that the frequency of "detections" is also dependent upon the analytical methods used, and dilution of individual samples. Thus, simply stating whether a compound was reported to be present in groundwater is not an adequate evaluation of whether that compound may actually be present in groundwater at concentrations sufficient to cause the observed vapor concentrations.

Please see the final sentence in section IV of the remedy document which states:

"The District will evaluate contaminant levels detected in subslab soil vapor in comparison to contaminant levels attributable to groundwater to confirm that the levels detected in soil vapors, that the District will require be remediated, result from contaminated groundwater."

The District has now completed this task. Please see the 2010 HHRA.

General Comment 1(b):

The likely source of the compounds detected in sub-slab soil vapor that are not present in groundwater is indoor air (McHugh, et al., 2006). As noted in the SSP&A data set for indoor air, ambient air, sub-slab soil vapor, and outdoor soil vapor, this phenomenon is observed in Riggs Park (SSP&A, 2009). To summarize the SSP&A data, Freon 11 and 12 are observed in ambient air, indoor air, and sub-slab soil vapor, but not in the outdoor vapor monitoring ports. Freon compounds are commonly detected in ambient and indoor air, but are not likely attributable to subsurface contamination (SSP&A, 2009). Therefore, the Freon

compounds are present in the sub-slab soil vapor as a result of infiltration of ambient and/or indoor air through the basement slab. Benzene and other hydrocarbons are also present in ambient and indoor air and it is reasonable to assume that some portion of the concentration of hydrocarbons in sub-slab soil vapor is attributable to ambient and indoor air infiltration into the sub-slab environment as well. Previous investigations conducted by Chevron have demonstrated that contaminants present in indoor air have been detected in sub-slab soil vapor samples (GF, 2007a).

Response:

DDOE has conducted a detailed and thorough analysis of any possible downward migration of indoor air contaminants into the sub-slab soils. All evidence was conclusive and shows downward migration was not occurring in any of the 106 homes that were sampled.

It is noteworthy that Chevron's comment on downward migration is directly contradicted by the findings and conclusions presented in an early Chevron study in which Chevron determined the attenuation factor (AF) for one home to be approximately 0.0026. That is, it is contradictory to conclude that vapor intrusion is presently negligible (based on the very low calculated AF value) but also conclude that indoor air vapors are migrating downward to contaminate the sub-slab soil vapor space. The number and size of cracks and openings in the concrete slab govern vapor intrusion in both upward and downward directions. If the AF is indeed negligible, as suggested by Chevron's own calculations), vapors are apparently migrating in any direction.

All evidence indicates that net vapor migration is only occurring in one direction: upward from the sub-slab soils into Riggs Park homes. It should be stressed that a single AF cannot be equally applied to all homes sampled because the number and size of cracks and openings in the concrete slab are specific and unique for each home depending on the physical state of the concrete slab. For this reason, DDOE calculated the AF for each chemical detected in either indoor air or VMP samples for each home.

It should be noted that when vapor migration through the concrete slab occurs, the exact same chemicals detected on one side of the slab must be detected on the other side. This is because the concrete slab cannot act as a "semi-permeable membrane" in which it selectively blocks some chemicals from migrating while permitting others to migrate through. Furthermore, in the case of downward migration the concentration detected in indoor air needs to be significantly higher than the concentration detected in VMP samples because the AF factor applies to migration in both directions. In DDOE's detailed analysis of paired indoor and VMP samples for each of the 106 homes, neither of these two conditions were satisfied. For example, the specific chemicals detected in indoor air was not matched by those detected in VMP samples for any home. Additionally, the PCE level in VMP samples was significantly higher than that detected in indoor air samples. Indeed, in many homes, the PCE concentration in the VMP sample was far greater than in the paired indoor air sample

(in which it was frequently non-detect). These 2 findings provide compelling evidence downward migration is not occurring.

It is noteworthy that, for those compounds detected in groundwater and in VMP samples, a simple examination of the maximum groundwater concentrations and the Henry's Law constants indicates that these groundwater concentrations are sufficient to produce the observed sub-slab vapor concentrations, warranting concern over transport from the subsurface.

Chevron cites the paper by McHugh et al (2006) as support for the downward migration theory. This paper does not support the argument Chevron is making.

As noted by McHugh et al. (2006):

"newer residences are more likely than older residences to operate with positive building pressures. In addition, larger buildings with central Heating, Ventilation, and Air-Conditioning (HVAC) systems are typically designed to operate under positive pressure."

The Riggs Park residences were built in the 1950s and do not meet the current residential design standards cited. Nor do the single-family residences meet the criteria of "larger building" mentioned. The pressure transducer data provided by McHugh et al. (2006) clearly illustrate that while some positive pressure excursions did occur over a 24-hour period, so did negative pressures. (Note the contrast with the large commercial warehouse data set also included.)

Finally, it must be noted that the McHugh et al. article is largely devoted to development of a theoretical model of vapor transport from indoor air to the subsurface, and that the only data provided to support this theory are circumstantial, no empirical data are presented. It is also noteworthy that the model of contaminant transport described by McHugh (2006) is bi-directional; very specific circumstances are required under which indoor contaminants may cause subsurface contaminants at higher concentrations than observed indoors. 1) a transient source of indoor air contamination (<1 day as illustrated by McHugh 2006 in Figure 4), and 2) a continuous pressure gradient from indoor air to the subsurface. Residential home pressure transducer data presented in that article make such circumstances unlikely for the Riggs Park neighborhood (see above).

Chevron notes the presence of Freon in the sub-slab samples and suggests that "the Freon compounds are present in the sub-slab soil vapor as a result of infiltration of ambient and/or indoor air through the basement slab." In reality, the basement slab is the least likely route for Freon migration, as it provides far more resistance to flow and attenuation than infiltration of ambient air through the soil. The presence of Freon in the sub-slab merely reflects the ubiquitous nature of these compounds in ambient air, and the mixing of that air with the subsurface vapors.

General Comment 2:

The District conducted a "home-by-home" risk assessment (the DDOE HHRA) whereby the individual risk for each residence within the study was calculated. More than 1,700 separate risk assessments were conducted. Chevron has several concerns regarding this approach. First, it greatly compartmentalizes the site into small microcosms and neglects larger trends in sampling data that are observed site-wide. Each home may have a very small data set, perhaps one set of indoor, ambient, and sub-slab data taken at one or a few points in time. Soil vapor concentrations can vary over a wide range both spatially and temporally (SSP&A, 2009). In contrast, the Baseline Risk Assessment for the site (GF, 2007b) took into account thousands of samples from multiple media collected over nearly a decade. Second, this approach introduces a large amount of uncertainty into the risk assessment for each home. The list of factors that influence indoor air concentrations is long and includes personal habits such as smoking, dry cleaning, use of cleaning products, building materials, among many others (SSP&A, 2009). Each of these factors contributes additional uncertainty to a very small data set that already has considerable inherent uncertainty. It is Chevron's position that the home-by-home risk assessment does not provide much value for determining risk to the residents from vapor intrusion.

Response:

The approach used here was so chosen to provide a more cost-effective way of determining if an individual Riggs Park home requires a vapor mitigation system and that is to determine whether vapor intrusion poses a current or future risk to the residents who live in the home. What is more, the approach used is not inconsistent with what Chevron used in an earlier evaluation. In fact, Chevron's objection to the evaluation of potential risk at individual homes is puzzling since this is precisely the approach that Chevron has taken in response to USEPA oversight; we note that in response to increased risk, Chevron has agreed to install vapor mitigation systems in individual homes identified by EPA, rather than in an entire block or neighborhood, as suggested by their comments here.

In any case, it should be noted that DDOE followed all pertinent U.S. EPA risk assessment guidance, based on estimating human health risks for the "reasonable maximum exposed" (RME) individual. Moreover, EPA's risk management framework is solely based on protecting the RME receptor. For the Riggs Park residents, this corresponds to the RME individual who actually lives in each home. Under the most realistic set of exposure scenarios for the project site, it seems most appropriate to estimate the RME risk for each of the participating Riggs Park homes based on current and future vapor concentrations for that particular home. The purpose of both the 2009 and 2010 DDOE HHRA is to determine whether the health risks estimated for an individual's chemical exposure to contaminants inside his or her home is unacceptable based on the risk calculated based on the VMP concentration. If the calculated risk exceeds an acceptable level, then a source analysis is necessary to determine if a link to groundwater contamination exists. As previously discussed this second step has now been completed and is presented in the 2010 HHRA.

It is not clear how DDOE has neglected sampling "trends" for the larger population since each individual indoor, VMP, geoprobe, and groundwater samples were carefully evaluated for each of the homes. Lastly, if the population risks were to be calculated based on the entire population of Riggs Park homes (rather than on a house-specific basis), that information could not be used to make cost-effective risk management decisions about mitigating risks for any particular home. It also should be noted here that, the sampling data used in the risk determinations do indeed consist of a more current and representative data set; as such, the HHRA results should provide more value to the risk management decisions than could otherwise be obtained from other alternative evaluation approaches.

The DDOE 2009 Remedy Selection document was based solely on sub-slab vapor concentration data, and is entirely independent of resident habits such as smoking, pesticide use, etc. that impact indoor air concentrations.

The homes were carefully inventoried prior to any sample, and all potential confounding sources of household chemicals were removed. However, DDOE agrees that chemicals used in the home by Riggs Park residents can influence indoor air measurements. That is why DDOE based the 2009 HHRA and the subsequent risk management decisions on VMP measurements, which we have demonstrated are not confounded by chemicals used inside or outside the home. Chemicals used inside or outside the home do not impact VMP samples - EPA guidance states this clearly. The analysis of indoor air samples was strictly limited to an evaluation of the attenuation factor. Time did not permit a thorough evaluation of the AF in the 2009 HHRA. However, the AF was analyzed in detail in the 2010 HHRA where the AF was calculated for each chemical detected in VMP samples on a home by home basis.

SPECIFIC COMMENTS:

Specific Comment 1. Section I, page 5, bullets 1 and 4.

The first bullet states "No residences have gasoline related contaminants such as benzene in the SSP&A study in the sub-slab soil vapor at concentrations that exceed the 1×10^{-5} cancer risk level after the application of an attenuation factor of 10%." The last bullet in this section, as well as text in Section III states "that out of 106 homes, additional residences require vapor mitigation systems (VMS) where gasoline-related contaminants are still present in sub-slab soil vapor." These two statements are contradictory. It is unclear why vapor mitigation systems would be required for residences where the concentrations of gasoline-related compounds in soil vapor are considered to be acceptable.

Response:

The two statements are not contradictory - DDOE has determined that no VMP sample concentration of the gasoline components Chevron has routinely measured as part of routine groundwater and vapor sampling—namely benzene, toluene, ethylbenzene, and xylene (BTEX) and MTBE—posed unacceptable risks. However, naphthalene concentrations measured in VMP samples from 6 homes did exceed a cancer risk of 1×10^{-5} . It was important to note this finding in the decision document for purposes of

full disclosure to the Riggs Park residents since naphthalene is a component of gasoline. Indeed, DDOE has conducted a statistical regression analysis of the groundwater monitoring data that clearly shows naphthalene is present in groundwater as a component of the Chevron gasoline release. This analysis revealed that naphthalene in groundwater is associated with the entire group of BTEX compounds and is highly correlated with individual gasoline constituents. For example, the correlation coefficient between naphthalene and each of the individual gasoline constituents—toluene and ethylbenzene—was 0.7.

Even based on the most recent 2008 and 2009 groundwater monitoring data, the evidence is compelling; where naphthalene is detected in groundwater, it is present as a gasoline constituent. Since the highest naphthalene detections were observed in monitoring wells on or near the Chevron facility, there is little doubt the naphthalene detected in groundwater is present as part of the Chevron gasoline release. However, there are large gaps in the existing groundwater data, which makes it difficult to determine the areal extent of naphthalene contamination in groundwater under Riggs Park homes. Lacking a more extensive and complete groundwater dataset for naphthalene, DDOE cannot definitively conclude that there is not a link between the 6 homes with unacceptable naphthalene risks (based on the VMP samples) and naphthalene in groundwater under those homes. Simply put, because naphthalene has not been analyzed in monitoring wells near those homes, there is at least the possibility that naphthalene is present but has gone undetected. Nevertheless, based on the limited groundwater data that is available, it does not appear as though there is a current naphthalene groundwater source under those homes.

With regard to gasoline contaminants in soil vapors that could pose unacceptable risk, it should be stressed that the DDOE decision document only addresses human health risks associated with conditions that existed in 2008 based on the samples that were collected in that year. It is clear from earlier groundwater and vapor sampling conducted by Chevron that gasoline contaminants did pose unacceptable human health risks under the current DDOE risk management framework. For example, in 2002, Chevron collected soil vapor samples from under basements in 12 Riggs Park homes. To determine whether the concentrations in those samples posed an unacceptable risk, Chevron compared these sampling results with calculated "acceptable" vapor levels. It has long been assumed that, based on this Chevron study, the gasoline components did not pose unacceptable risks. This conclusion was in error. As part of the 2010 HHRA, DDOE reviewed this document to determine whether contaminant conditions had changed in the intervening 6 years. Our review and recalculation of human health risks based on the 2002 Chevron soil vapor data revealed that the gasoline constituents measured at that time did pose unacceptable risks.

Specific Comment 2. Section I, page 5, bullet 3.

According to the third bullet in this section, the homes requiring VMS are those where site specific chemicals of concern: perchloroethene [PCE] and its degradation products, 1,4-dichlorobenzene, chloroform, naphthalene, carbon tetrachloride, and methylene chloride) "have the potential to pose a cumulative health risk from sub-slab soil vapor to exceed the 1×10^{-5} cancer risk level after the application of an attenuation factor of 10%." It should be made clear that

these compounds are not related to the petroleum release at the former Chevron Facility (SSP&A, 2009).

Response:

DDOE has been unable to determine if each of the above mentioned chemicals are or are not associated with the Chevron spill. DDOE issued 2 information demands to Chevron to determine the historic use of chemicals at the site, and the responses provided by Chevron were insufficient to make this determination.

The historical source of the uncontrolled release of PCE into groundwater has not yet been identified. However, DDOE's initial review of historical PCE sampling maps prepared by EPA Region 3 and Chevron for the years 2002-2004 show the highest concentrations were detected in the Northernmost portion of Riggs Park just across the street from the former Chevron station. What the maps do not show is that some of the highest PCE concentrations detected during that period were collected from groundwater under the Chevron Station itself. Further analysis of the more recent 2008 and 2009 data continues to show the highest concentrations are detected in groundwater on the property of the former Chevron facility. Unfortunately, no groundwater samples have been collected up-gradient from the facility, so no definitive proof exists to point to one or more potentially responsible parties for the PCE release.

In reviewing businesses that routinely use PCE in manufacturing operations, dry cleaning services most often come to mind. However, it is well known that PCE has been widely used in automotive repair services to clean metal parts such as brakes. In fact, PCE is still used in brake cleaning formulations. Accordingly, without further delineation of the PCE groundwater contamination around the former Chevron facility, and based on data from groundwater under the Chevron facility, it is reasonable to conclude the facility could be the source of the PCE.

Specific Comment 3. Section I. page 6. bullet 4.

The District's remedy includes a health survey of Riggs Park residents who reside in the plume footprint caused by the release of hydrocarbons at the former Chevron Facility. It should be noted that the Agency for Toxic Substances and Disease Registry (ATSDR) has issued three health consultations for the site to evaluate the public health implications through the vapor intrusion pathway. ATSDR has concluded that all indoor and outdoor volatile organic compound (VOC) concentrations detected at the site are at levels not expected to cause adverse cancer or non-cancer health effects and has categorized the site as No Apparent Public Health Hazard for exposures to reported VOC levels (ATSDR, 2008). The goals and purpose of additional health surveys administered by DOH are unclear.

Response:

Chevron is correct that ATSDR has concluded that the vapors measured indoors at Riggs Park are not expected to cause adverse health effects. However, ATSDR's health evaluation was incomplete for several reasons. First, ATSDR did not quantitatively evaluate the actual site subsurface data to identify site-specific COCs and

estimate cancer and non-cancer risk, although they did evaluate the indoor air data. Additionally, the Agency did not calculate the actual cancer risk or health hazard according to EPA risk assessment guidance, and there is considerable difference between the type of analysis of human health risks conducted by EPA and ATSDR. Recently, EPA Region 3 explained the difference between the two approaches in *Vapor Intrusion Framework* (June 2009) in the following statement:

At times there may be confusion over how a “risk assessment” (EPA determination) compares to a “public health assessment” (ATSDR determination), and which of these measures should be used in making decisions about Remedial or Removal actions. Although it may seem counter-intuitive, a “no apparent public health hazard” determination by ATSDR may not necessarily imply that no mitigative action is warranted at a site. EPA risk assessors/toxicologists calculate numerical risks in order to provide risk managers with information to determine the need for Removal or Remedial action at a contaminated site. ATSDR performs a health assessment or consultation, using both quantitative and qualitative data, in order to provide information to community members and inform regulatory partners about the likelihood of actual public health effects.

The 2010 HHRA DDOE shows that PCE concentrations in VMP samples far exceed acceptable concentrations. ATSDR did not evaluate these samples nor did it calculate current and future risks, as ATSDR primarily focused on indoor air samples. As Chevron has correctly noted in its comments, any HHRA based on indoor air samples is, for the most part, unreliable due to the numerous confounding contributions of source (vapor intrusion) and non-source contaminants.

It is also important to stress that the methodology used by ATSDR and U.S. EPA to identify potential health threats is very different. While U.S. EPA requires that the cumulative cancer risk and non-cancer health threat be calculated—and represented by a numerical estimate of total risk—ATSDR’s methodology does not permit cumulative risks to be calculated. Rather, the Agency makes a chemical-by-chemical comparison in which the detected concentration for a single contaminant is compared with a tabulated acceptable concentration for that chemical.

At the time of the publication of the 2009 selected remedy document, DOH had not established goals for the survey. Please see DOH’s summarized health survey results in Appendix C of the Final Remedy Selection for additional information

Specific Comment 4. Section II.A, page 7, paragraph 2.

This section states that in October 1989, the release of gasoline into the subsurface was confirmed after Chevron conducted a tightness test on its underground storage tanks. Although this statement is true, it should be noted that vehicle accident damage to a fuel dispenser caused the product line to fail the tightness test (GF, 2003).

Response:

This section was intended to be a brief, not a comprehensive summary of the history of the site. DDOE will revise the Remedy Document to reflect this detail.

Specific Comment 5. Section II.A, page 7, paragraphs 3 and 4.

The first sentence in the fourth paragraph should be replaced with "Final Decision and Response to Comments", which was issued in April 2008 and outlined the corrective measures to be implemented (EPA, 2008).

Response:

DDOE will so note.

Specific Comment 6. Section III, page 9, paragraph 3.

This section describes the regulatory framework allowing the District to require and secure corrective actions at the site. Paragraph 3 describes corrective actions under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Corrective actions undertaken under CERCLA use the risk management tool to select appropriate corrective actions. A human health risk assessment is used by risk managers to determine if corrective actions are warranted for a site. Without the full text and tables of the DDOE HHRA, it is not feasible for risk managers to evaluate the need for, or appropriateness of, corrective action. All text and tables used in the DDOE HHRA are required to adequately determine the appropriateness of the selected remedy. The complete DDOE HHRA was not available for review, therefore the District's conclusions concerning the appropriateness of the selected remedy can not be fully evaluated, and the District's conclusions are not supported by other available information, as described in other comments and documents referenced by the comments.

Response:

DDOE's threshold responsibility in relation to this site is to ensure that the health of Riggs Park residents is protected. The residents urged the Department to develop a Remedy as soon as the results of the 2009 HHRA were known. While the preliminary risk analysis served that purpose, DDOE has now completed a more detailed HHRA that presents the risk results as well as a groundwater analysis. It also presents a risk management approach that was applied to homes where VMP samples were not available.

Specific Comment 7. Section III, page 10, paragraph 6.

This paragraph states that "The Don Clay Memo provides that US EPA remedial action is generally not warranted where cancer risk is found to be below 1×10^{-4} ." The word "below" (less than) should be replaced with the word "above" (greater than).

Response:

The DDOE statement is correct as written. According to the Don Clay memo, risks below (less than) 1×10^{-4} do not need remediation. For example, a home with a risk of 1×10^{-6} (which is less than 1×10^{-4}) would not need remediation according to the Don Clay Memo. 1×10^{-4} is scientific short hand for 1 out of 1,000, 1×10^{-6} is scientific short hand for 1 out of 1,000,000. 1 out of 1,000,000 is less than 1 out of 1,000.

Specific Comment 8. Section IV, page 10. paragraph 3.

An attenuation factor of 0.1 (10%) was selected, based on Draft EPA Vapor Intrusion Guidance, to represent the amount of sub-slab soil vapors that may be entering the home or that might enter the home in the future (EPA, 2002). Attenuation factors for the migration of sub-slab soil vapor to indoor air are generally based on empirical data and range from 0.01 to 0.1 (ITRC, 2007). The recommended criterion established by EPA in the Draft Vapor Intrusion Guidance is a conservative estimate that assumes the chemicals do not degrade as they migrate upward through the vadose zone; however petroleum hydrocarbon vapors are known to biodegrade in the presence of oxygen (EPA, 2002). Site investigation data collected at the site from 2002 to 2004 suggested that biodegradation of hydrocarbons in soil vapor was occurring in the vadose zone (GF, 2006). In addition, Chevron has calculated a site specific attenuation factor for one residence of 0.0026 based on sub-slab soil vapor and indoor air sampling results conducted in 2007 (GF, 2007a). Since its publication of the Draft Vapor Intrusion Guidance in 2002, EPA has determined that its recommended sub-slab to indoor air attenuation factor of 0.1 may be overly conservative (ITRC, 2007). It is Chevron's position that using an attenuation factor of 0.1 is a very conservative estimate which leads to an overestimation of risk from vapor intrusion of petroleum hydrocarbons.

Response:

This comment has several contradictory statements. The comment seems to present (and support) the ITRC-recommended AF range of 0.01 to 0.1 (0.1 is the value DDOE selected for its Remedy), while at the same time indicating that 0.1 may be too conservative.

An AF value of 0.1 was the default AF value recommended in the EPA Vapor Intrusion Guidance (EPA 2002). More recently, EPA Region 3 (EPA 2009) reaffirmed this is the appropriate default AF value in its June 2009 guidance, stating:

“Appendix F of the 2002 HQ Guidance presents a review of groundwater, soil gas, sub-slab and indoor air data from fifteen vapor intrusion sites nationwide and, based on an evaluation of the data, makes recommendations for “default” generic attenuation factors (except under certain conditions as noted in the Guidance). For example, Appendix F recommends a default attenuation factor of 0.1 (i.e., 1/10) be used to predict indoor air concentrations from vapors migrating from the sub-slab. This value is for the upper bound statistical measure, the 95th percentile. In general terms, the attenuation factor of 0.1 indicates that a specific sub-slab vapor concentration would result in an indoor air concentration that was ten times lower (e.g., if the sub-slab value is 25 ppb, the indoor air value would be 2.5 ppb).

Since 2002, in an effort to calculate empirically-derived attenuation factors and compile a robust database from vapor intrusion sites nationwide, EPA HQ and Helen Dawson, EPA Region 8 Hydrogeologist, have been formulating the national “Vapor Intrusion Database”. The database currently contains approximately 2,989

paired data sets (e.g., sub-slab/indoor air sample results, groundwater/indoor air results) from over 41 vapor intrusion sites nationwide. The database is expanding as data from new sites is added. As the data is input and evaluated, recommended generic default attenuations factors may well change.

Currently, using the larger database with the added feature of accounting for background indoor air concentrations, the Vapor Intrusion Database suggests that the default values appearing in the 2002 Guidance generally do not change when using the upper bound statistical measure. That is, 0.1 is identified as an interim default value for sub-slab to indoor air (95% percentile) and 0.001 as an interim default value (95% percentile) for groundwater to indoor air.”

The factors governing the AF were discussed previously and it was noted that, in practice, each home has a different actual AF depending on the condition of the concrete slab in the home. It must be stressed that the AF is not a constant for a particular home but will change as the home ages and the concrete slabs deteriorate or they are compromised by home renovation, construction, or remodeling activities.

Chevron is correct to note DDOE did not calculate the AF in the 2009 HHRA for any Riggs Park home based on empirical evidence. However, this was not a necessary step in order for the Department to formulate a health-protective Remedy because the threshold requirement for a DDOE risk management decision is to ensure human health is protected based on not only current, but *future* site conditions as well. Calculating the site-specific AF value based on empirical data would address the issue of current conditions but may not be adequately protective of future conditions.

It should be noted that this regulatory approach is precisely the approach that U.S. EPA uses to determine the appropriate remedy for the vast majority of contaminated sites where soil or water is contaminated. That is, for most sites (particularly abandoned CERCLA sites), there are no current complete exposure routes because there are no currently exposed individuals. Nevertheless, a risk assessment is conducted for a “hypothetical” receptor. If the risks are determined to be unacceptable for the hypothetical receptor (typically, a hypothetical future residential receptor), the site is remediated even though no one is currently exposed. In fact, the District’s and U.S. EPA policy is always proactive, and it is unacceptable to wait to take remedial steps until exposure actually occurs. For example, according to “The Don Clay memo,” the site *must* be remediated based on current and *future* conditions. Since the District cannot predict the future condition of the concrete slab in each of the Riggs Park homes, it was prudent to select an AF of 0.1 (10%) to ensure the health of *all* Riggs Park residents is protective.

Chevron states that it calculated an AF of 0.0026 for one home, however that value was not based on an actual paired analysis of all chemicals detected in indoor air and VMP samples. As noted in recent EPA Region 3 guidance, the Agency has conducted such an analysis on nearly 3,000 datasets. Likewise, in the 2010 HHRA DDOE has conducted paired analysis indoor and VMP samples since and the AF analysis is presented in the compendium risk assessment document. However, DDOE still believes it is prudent to apply an AF of 0.1 because DDOE cannot *predict* with

certainty what the appropriate AF value will be for each of the Riggs Park homes in the future.

Chevron also notes that biodegradation is likely in the petroleum fraction of vapors in the vadose zone. DDOE concurs this is a likely scenario. However, it is irrelevant to the DDOE CHSA and Remedy since the majority of VMP samples were collected in the shallow soils approximately 3 inches below the slab. Any biodegradation would have occurred prior to the vapors migrating to this point and, therefore, the VMP samples would have biodegradation already incorporated into the result.

Specific Comment 9. Section IV, page 10, paragraph 4.

This paragraph makes the statement that Hazard Indices were calculated using toxicity values for both healthy adults and children. Toxicity values are selected on a chemical-specific basis and do not vary based on the age of the receptor. "Exposure parameters" are adjusted to reflect the specific age of the receptor. It appears that the District meant exposure parameters rather than toxicity values.

Response:

DDOE did evaluate all toxicity values and determined that modifying toxicity values (which were based on adult exposure) to reflect the increased sensitivity for children did not ultimately change the results or conclusions of the 2009 HHRA. This evaluation was consistent with U.S. EPA's A Review Of The Reference Dose And Reference Concentration Processes (EPA/630/P-02/002F December 2002 Final Report) and Exploration Of Perinatal Pharmacokinetic Issues (EPA/630/R-01/004 May 2001).

It is important to note that children are not just "small adults." Children are more susceptible than adults based not only on behavioral (exposure) factors but also on physiological differences. Children are more vulnerable to toxic chemicals because their organs are immature and are at a susceptible stage, predisposing them to effects from some toxic compounds. For example, the metabolic pathways and detoxification systems of infants and children have reduced capacity for neutralizing and eliminating toxins from the body as compared with adults. Children's major excretory organs—namely, the liver and kidney—are not nearly as efficient as adult organs. This results in the body burden of many toxic chemicals remaining higher in children compared with adults for longer periods of time, thereby resulting in more damage. A child's brain (and peripheral nervous system) is also more vulnerable because of the immaturity of the blood-brain-barrier, which is designed to protect it from toxins. These factors (among others) were taken into account developing child-specific toxicity values for noncarcinogenic effects based on U.S. EPA guidance and generally accepted toxicological practice.

Non-carcinogenic toxicity values are based on 2 factors—namely, the dose-response endpoint (such as the no-adverse-effect-level [NOAEL]) and the necessary safety factor (SF), which is the product of the uncertainty factor [UF] and modifying factor [MF]. Since most toxicity studies are based on adult animals or human responses, DDOE did investigate the appropriateness of introducing an additional safety factor when the toxic effect observed in adults is potentially more severe in infants and

children based on physiological factors. This evaluation revealed that even when child-specific toxicity values were used (for just a very few chemicals), the cumulative HI did not exceed 1.0. Based on the preliminary analysis, introducing new child-specific toxicity values would not likely change the DDOE Remedy.

DDOE also evaluated the appropriateness of developing child-specific cancer slope factors to calculate the cumulative cancer risk according to U.S. EPA's 2005 guidance *Assessing Susceptibility from Early-life Exposure to Carcinogen*. It is well recognized that children are more sensitive to carcinogens when they are exposed during earlier life stages. When the carcinogen's mode of action (MOA) is mutagenic (i.e., it binds to or alters DNA or the genetic material in cells), an additional safety factor is used to modify the cancer slope factor. Among other things, it should be noted that PCE degradation products are thought to be mutagenic, and the presence of PCE may warrant developing a child-specific carcinogenic slope factor.

In addition to the evaluations of child-specific toxicity values, DDOE also made the dosimetric adjustment noted by Chevron (as "exposure assumptions") to account for children's greater breathing volume per body weight (which is approximately 4 fold), etc.

Specific Comment 10. Section V, page 11, paragraph 4.

This paragraph details the methods for calculating risk based on sub-slab soil vapor samples. According to the Draft EPA Vapor Intrusion Guidance, the sampling of sub-slab air provides a direct measure of the potential for exposures from vapor intrusion (EPA, 2002). It is noted that "for homes with multiple sub-slab soil vapor sample results, the basis of the cancer risk was the sample posing the maximum calculated cancer risk." Text in the SSP&A report indicates that several of the sub-slab soil vapor samples from homes with multiple samples were obtained from several feet below the bottom of the basement slab. The depth ranges of the sub-slab soil vapor samples should be specified, because EPA considers sub-slab air to be soil vapor samples obtained from directly below the foundation or from depths less than 5 feet below the foundation level (EPA, 2002). Deeper soil vapor samples are a more direct measurement of the source vapor concentration and will likely result in higher concentrations than shallow soil vapor samples. The EPA recommended attenuation factor for deep (greater than 5 feet below the foundation level) soil vapor samples to indoor air is 0.01 (EPA, 2002).

Response:

DDOE concurs that VMP samples provide a direct measure of potential vapor intrusion and that is why the 2009 HHRA and Remedy were based on those sampling results. All the VMP samples were collected at intervals of less than 5 feet below the slab, the majority were collected at less than 2 feet below the slab. This data was presented in the SSP&A report.

Specific Comment 11. Section V, page 12, paragraph 5.

This paragraph states that indoor air samples were not evaluated as part of the DDOE HHRA because of the numerous "background" sources of indoor air

(discussed in General Comment #1). It should be noted, however, that all of the indoor air samples collected during the SSP&A investigation were reported to be below EPA's Indoor Air Standards for the site (EPA, 2007).

Response:

Chevron notes that DDOE did not evaluate indoor air samples due to numerous background sources of indoor air vapors. Chevron would like DDOE to note that contaminant levels in all of the indoor air samples were below EPA's Indoor Air Standards for the site (EPA 2007).

This is unnecessary for two reasons. First, EPA's "Standards" were incorrectly calculated because they were developed by incorporating the wrong background concentration into the "Standard." Secondly, EPA did not follow any past or current EPA risk assessment guidance in developing those standards because they do not represent or take into account cumulative risk, which is a standard requirement in all risk assessments. This requirement was reaffirmed in the June 2009 EPA Region 3 guidance, which states:

"For sites with multiple contaminants, CERCLA and the NCP indicate that cumulative risks and hazards need to be within or below the acceptable cancer risk range or HI. Thus, sites that have vapor intrusion problems associated with multiple contaminants need careful evaluation to ensure that the mitigation decision meets the requirement of protecting human health and the environment at a cumulative level."

Therefore, the EPA "standard" is not relevant to the DDOE decision.

Lastly, DDOE will not make the Chevron-suggested note in the decision document because it is not accurate. DDOE has calculated the actual cumulative risk based on the indoor air sampling results for all detected chemicals. For some homes, the risks associated with breathing indoor air vapors are so high that they exceed the maximum risks that can even be quantified with EPA methodology. The results of this analysis are presented in the 2010 HHRA.

Specific Comment 12. Section V, page 12, paragraph 6.

The District has evaluated the cumulative risk posed to healthy adults by 66 compounds reported in the samples collected by SSP&A. Of those 66 compounds, 36 compounds detected in sub-slab soil vapor samples (SSP&A, 2009) have been identified as compounds of interest, and were included in the DDOE HHRA. As stated in General Comment #1, of the 36 compounds of interest shown on Table 1 on page 14, only 13 of those compounds have been detected in shallow groundwater (Attachment 1). The compounds evaluated in the DDOE HHRA should only include those compounds that are attributable to groundwater.

Response:

Please see the response to subset #1, general comment # 1a.

Specific Comment 13. Section V, page 12, Exhibit 1.

This table presents exposure assumptions used to calculate the chronic daily dose for the adult receptor. No exposure parameters have been provided for the child receptor. Exhibit 1 should be modified to include exposure parameters for the child receptor. Also, the Risk Assessment Guidance for Superfund (RAGS), which provided the basis for health risk calculations for this risk assessment, requires that references be provided for all exposure parameters (EPA, 1989). Per RAGS, Exhibit 1 should be modified to include the assumptions for the child receptor.

Response:

To be consistent with EPA Region 3, DDOE used the same exposure parameters to calculate cumulative risk.

DDOE has evaluated child exposure for Hazard Index separately from adult exposure and found it does not pose a non-cancer health threat. When calculating carcinogenic risk it is not necessary to differentiate between adult and children, because a traditional risk-assessment method averages over a 30-year continuous exposure period. Please see the responses to Comments # 9 and 79.

SUBSET #2

Review of Riggs Park Indoor Air, Sub-Slab Vapor, and Groundwater Sampling and Analysis Report

Gannett Fleming, Inc. (GF) has reviewed the *Riggs Park Indoor Air, Sub-slab Vapor, and Groundwater Sampling and Analysis Report*, prepared for the residential area surrounding Former Chevron Facility 122208, Chillum, Maryland, dated February 2009. The report was prepared by S.S. Papadopoulos and Associates, Inc. for the District of Columbia Department of Health and Department of Environment (DDOE).

The following references were used in the review of the report:

Gannett Fleming, 2007. Interim Measures Report for Indoor Air Sampling at 5846 Eastern Avenue. Former Chevron Facility 122208, Chillum, Maryland. Dated July 2007.

McHugh, T., P. DeBlanc, and R. Pokluda, 2006. Indoor Air as a Source of VOC Contamination in Shallow Soils Below Buildings. *Soil and Sediment Contamination*, Vol. 15, pages 103-122.

McHugh, T., D. Hammond, T. Nickels, and B. Hartman, 2008. Use of Radon Measurements for Evaluation of VOC Vapor Intrusion. *Environmental Forensics*, Vol. 9, March 2008.

U.S. Environmental Protection Agency (EPA), 2002. Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils. EPA 530-D-02-004.

EPA, 2008. Final Decision and Response to Comments, Chevron Gasoline Release at Chillum, Maryland. Dated April 2008.

GF reviewed the report for technical content, data gaps, validity, accuracy, completeness, and compliance with regulations and guidance. Several of the appendices were labeled as confidential and not provided in the public version of the report, thus they could not be reviewed.

General Comment 1

Several figures and appendices of this report were considered confidential and were not provided in the public version of this report. This included maps showing the distribution of contaminants in various media and appendices documenting home surveys of chemicals removed from residences prior to sampling. These are critical pieces of information that are required to fully evaluate the conclusions of this report.

Response:

Some information was retained by DDOE as confidential to maintain the privacy of Riggs Park residents. This information included addresses of specific homes sampled,

and information about the interior of the homes, as noted on home survey forms. However, redacted versions of the confidential documents which were retained were made public, where possible.

General Comment 2

An immense amount of data were collected as a part of this study. Tables for many of the media sampled were prepared to summarize the data using percentages and other summary statistics. However, broad conclusions regarding the validity of the site conceptual model were made based on specific sample data. No data tables with individual sample results were provided for any of the media sampled. Figures with few or vague reference points were prepared to summarize some of the data (e.g., Figure 23). Some of the conclusions and assertions made in this report cannot be substantiated without the specific sample data.

Response:

All of the relevant data are reproduced in appendices to the Sampling & Analysis Report. Data specific to a home is considered confidential and is not made available (except as coded or redacted) to the public.

SPECIFIC COMMENTS

Specific Comment 1. Section 2, page 4, paragraph 5.

This section states that perchloroethene (PCE), a halogenated compound, was detected in groundwater during the summer of 2002. The first detection of halogenated compounds at the site by Chevron was during the September 2001 investigation along the south side of Eastern Avenue summarized in the following document:

Gannett Fleming, 2001. Geoprobe and Membrane Interface Probe (MIP) Investigation http://www.epaos.org/site_profile.asp?site_id=A3Q3%20 . Results. Former Chevron Facility 122208, Chillum, Maryland. Dated October 2001.
The text should be revised.

Response:

Comment noted. The date referenced was based on EPA's PCE investigation, which began in the summer of 2002. EPA's first reported PCE detection was that summer.

Specific Comment 2. Section 5. Page 16. paragraph 4.

This paragraph describes the pre-indoor air sampling survey. Careful detection and removal of potential indoor air sources of chemicals is critical to obtaining quality samples. This section does not provide enough detail to determine whether quality samples were collected during the sampling event. Clarification of the following items should be provided in the text:

- a. It is unlikely that the ppbRAE photoionization detector (PID) was calibrated prior to surveying activities at each residence. Calibration sheets from Appendices D, E, and F indicated the PID calibration was checked daily and

calibrated when required, which was once every 3 days on average. These instruments tend to drift with use, particularly after detecting a high concentration source, such as moth balls or perfume.

b. It is unclear if the sampling protocol prohibited the fueling of vehicles by the sampling team prior to collecting samples. This prevents cross contamination of samples.

c. Based on the observations noted in Table 3 and Appendix D, various chemicals were inadvertently not removed during the survey for several residences (e.g., refer to line 185 of the table that states "additional can of paint found during sample setup, removed"). It is unclear whether the residence was allowed to ventilate for 24 hours after these items were removed as is stated in the text.

d. Table 3 also indicates that items potentially containing petroleum products such as gas cans and lawn mowers, were removed from several residences. It is unclear whether the residence was allowed to adequately ventilate prior to sampling.

e. Several observations from Table 3 and Appendices D and E state that the basement air had an odor during sampling. For example, on line 184 of the table, the observation for indoor air sample Q1-S289-INA is "smell of mothballs in home". This suggests that either all sources of indoor air contaminants were not removed or the residence may not have had adequate time to ventilate.

f. The text states there were several homes with attached garages that were sampled. It is unclear whether residents were requested not to park or run vehicles within the garage before or during sampling.

g. Observations from Table 11 indicate that numerous residents that smoke were encountered during the study. It is unclear whether they were discouraged from smoking indoors during the ventilation and sampling period. It is also unclear whether an exit interview was conducted to determine whether smoking occurred indoors during the sampling period.

Response:

- a. re ppb RAE PID: Comment noted. PID instruments, however, were used solely for qualitative evaluations prior to sampling. Results of the PID readings were not used in the remedy selection or risk assessment.
- b. re: Sampling Protocol: DDOE notes the comment, but notes that the remedy selection, based upon the 2009 HHRA, is not influenced by the chemicals most strongly associated with gasoline vapors.
- c. re: Removal of additional items from home: details on the sampling times for specific samples are contained on the sampling records in Appendices D through F
- d. re: Table 3: observations under the heading "Sampling Observation" were made during both the pre-sampling home surveys and sample collection events; the context of each comment can be ascertained from those forms in their respective appendices.

- e. re: Odors: observations under the heading "Sampling Observation" were made during both the pre-sampling home surveys and sample collection events; the context of each comment can be ascertained from those forms in their respective appendices.
- f. re: attached garages: Residents were requested to remove cars from garages prior to sampling
- g. re: Smoking residents: No exit interviews of the type suggested were undertaken.

Specific Comment 3. Section 5, page 18, paragraph 2.

This section provides information on the outdoor vapor monitoring ports. The text states that some of the ports were replaced and were installed at depths of 1 to 2 feet. Analytical results from outdoor ports installed to a final depth of less than 5 feet are considered unreliable (EPA, 2002; Appendix E) due to the high potential for short-circuiting of ambient (outdoor) air into the sample. EPA recommended that these samples be excluded from evaluation in their 2002 Draft Vapor Intrusion Guidance. There are some areas of the site, however, where groundwater is found at depths shallower than 5 feet. In this case, shallow soil vapor sample collection with quantitative leak detection is the only available option. If this situation was encountered, it should be clarified in the text. To aid in clarification, the text should include a construction table for all vapor monitoring ports along with corresponding depth to groundwater or perched water (if known). A map of the ports should also be released to better evaluate spatial trends.

Response:

As noted by Chevron, at some locations, the shallow depth to groundwater prevented installation of outdoor VMPs at depths greater than 2 feet. In these types and similar situations, alternative protocols were used to generate appropriate sets of data to evaluate the potential risks, and subsequently to determine the need for vapor mitigation systems at individual homes covered under this project.

Specific Comment 4. Section 5, page 20, paragraph 1.

This section provides information on sampling of the sub-slab and outdoor vapor monitoring ports.

a. The text does not mention if leak detection was conducted during the sampling. Based on the field notes in Appendices D, E, and F, leak detection was not conducted for any of the soil vapor samples collected. If leak detection was not conducted, then the soil vapor samples could have been diluted by ambient air intrusion into the sample collection apparatus or through the port itself. This is of particular concern for shallow outdoor and sub-slab vapor monitoring ports. This should be clarified in the text.

b. The text does not mention if the vapor monitoring ports were purged and what the general purge volume target was (e.g., 3 well volumes, etc.). Appendices D, E, and F indicated purging was completed prior to sampling. This information is critical to evaluate sample quality and should be added to the text. In addition, there were many samples in Appendices D, E, and F (as summarized in Table 3)

that appeared to have excessive purge volumes. For example, line 162 of Table 3 indicates that for sub-slab vapor monitoring port sample Q1-S293-VMP2 purging of two liters of soil vapor was attempted. According to Appendices D, E, and F, all the sub-slab soil vapor ports were purged of at least one liter of vapor prior to sampling. This volume seems excessive given the typical sub-slab vapor monitoring port contains less than 10 milliliters of air. This issue and its affect on sample quality for sub-slab ports as well as outdoor vapor wells should be discussed in the text.

c. The text does not mention what size canister was used. Typically, one-liter canisters are used for soil vapor sampling to minimize the volume of vapor removed from the subsurface. This information should be provided in the text.

d. The industry standard for collecting soil vapor samples from implants, probes and ports is generally to use grab sampling techniques while maintaining a low (e.g., less than 200 milliliters per minute) soil vapor flow rate. The 24 or 20 hour composite samples collected for this study are not considered grab samples. Although the soil vapor flow rate was sufficiently low, the text should provide justification why the samples were collected in this manner.

e. The text states that a PID was used to screen each of the ports on the initial visit. Although good for the general screening for presence or absence of volatile organic compounds (VOCs), a PID does not provide data that is of sufficient accuracy or reliability to make definitive conclusions, particularly if the PID was not calibrated regularly. The data quality objectives and use of these data should be provided in the text. Furthermore, the PID readings were collected prior to collecting the summa canister sample, effectively purging the vapor port. It is unclear whether the port was purged a second time with the sampling apparatus attached to the port. If this was the case, a discussion of the effect on sample quality should be added to the text.

Response:

- a. Although leak detection was not part of the sampling protocol, review of the data collected at the Riggs Park site indicates that the sample results were not compromised by leaks.
- b. All vapor ports were purged prior to sampling, with a target purge volume of 1 liter; when conditions prevented a 1 liter purge, a lower purge volume was used. The volume of air in the VMP is insignificant compared to the volume of air in the attached tubing that must be purged prior to sampling.
- c. 6 liter canisters were used for all samples
- d. The comment regarding grab sampling is noted. We point out, however, that by using 20-hour integrated samples rather than grab samples, sample results indicating the type of transient reversal of concentration gradient described by McHugh (2006) can be minimized.
- e. As noted above, the PID was not used for any quantitative analysis, and purging was required not only for the VMP, but also for the attached tubing.

Specific Comment 5. Section 7, page 31, paragraph 1.

This paragraph raises concerns over false negative results from outdoor vapor monitoring ports and infers that sub-slab samples are of higher quality for use in determining vapor intrusion problems. Although this statement is true to some extent, it should also be noted that the indoor air inside the residence can also serve as a source of contaminants to sub-slab soil vapor (McHugh, et al., 2006). This phenomenon is observed in the lists of detected compounds for indoor air, ambient air, sub-slab soil vapor, and outdoor soil vapor on pages 22 through 24. Both Freon 11 and 12 are detected in ambient air, indoor air, and sub-slab air, but not in the outdoor vapor monitoring ports. Text on page 31 indicates that the Freon compounds are commonly detected in ambient and indoor air, but not likely attributable to subsurface contamination. Therefore, the Freon compounds are present in the sub-slab soil vapor as a result of infiltration of ambient and/or indoor air through the basement slab. Benzene and other hydrocarbons are also present in ambient and indoor air and it is reasonable to assume that some portion of the concentration of hydrocarbons in sub-slab soil vapor is attributable to ambient and indoor air infiltration into the sub-slab environment as well. The inference that sub-slab soil vapor samples are of higher quality when compared to results from outdoor vapor monitoring ports should be qualified.

Response:

Chevron again cites McHugh et al. (2006) as support for the theory of indoor air percolation to the subsurface. The limitations of this argument are noted above in Subset 1, General Comment 1(b). Chevron is factually wrong when they assert that some Freon compounds are not observed in the outdoor vapor monitoring ports. Freon 11 and 12 were detected in the outdoor vapor monitoring ports (GMPs) with a frequency of 25% and 43% of the samples. Chevron's argument that the freons are strong evidence for downward infiltration of vapors through the slab is not supported by the evidence. The freons are notable components of atmospheric air in part because they are persistent in the environment. Freon 11 and 12 were detected in 92% and 100% of the ambient air samples, respectively. The ambient atmosphere is in contact with, and mixes with air in the subsurface. It is also the source for some observed contaminants in the subsurface, particularly those that do not degrade under subsurface conditions.

This argument is particularly difficult to reconcile with a physical model of vapor movement, as there are demonstrably contaminants, such as PCE that are present under many homes in concentrations one to two orders of magnitude higher than observed either in the home, or in ambient air.

Specific Comment 6. Section 6, page 25, paragraph O.

This section indicates that liquid-phase hydrocarbons (LPH) or gasoline from the release at the service station migrated into the alley south of Eastern Avenue in the vicinity of monitoring well MW-24A. This assertion was based on soil concentrations from the groundwater interface provided on page 24. Xylenes were detected at approximately 6 parts per million (ppm) and naphthalene at 3 ppm. A reference with representative concentrations of these compounds in soil indicative of LPH should be provided in the text. In addition, these soil results are but one line of evidence. Other lines of evidence include groundwater

concentrations, total petroleum hydrocarbons (TPH) analysis, product fingerprinting (if the LPH is mobile), observation in soil cores, occurrence in monitoring wells, and others. LPH has never been detected in well MW-24A since it was installed in 2004. The assertion that LPH migrated to the vicinity of monitoring well MW-24A is not founded based on the information provided in the text.

Response:

The text states clearly that the soil sample collected from near MW-24A is consistent with the presence of *residual gasoline* in soil. It does not imply that any LPH is currently mobile as a free phase in the alley behind Oglethorpe Street. Residual gasoline may persist in soil long after all mobile free-phase product has dissipated or been trapped as an immobile phase. Releases of gasoline from the Chevron station in Chillum Road are understood to have occurred before and during 1989, fifteen years before the installation of well MW-24A, thus the absence of LPH observations in that well is irrelevant.

Multiple lines of evidence do support the inference that free product was present in the alley:

- This location is situated approximately 180 feet downgradient of another well (MW-18) in which liquid hydrocarbons were detected in 2002; LPH will travel down-gradient at the top of the saturated zone while mobile,
- The contaminated soil is present at the top of the water-bearing zone, precisely where it would be expected to be found if it represented residual gasoline contamination
- The compounds detected at ppm levels (and those not detected) are consistent with weathered, residual gasoline. The absence of benzene and toluene at the detection limits in these samples are consistent with their higher solubility and weathering potential of these compounds compared to xylenes and naphthalene
- These soil concentration data can be converted to equivalent groundwater concentrations using reasonable assumptions regarding soil porosity and soil density. These calculations indicate that 3,000 ug/kg of naphthalene, and >6,000 ug/kg of xylenes are equivalent to aqueous concentrations that exceed the effective solubility of those compounds in gasoline. They even constitute a substantial percentage of the total solubility of those compounds in water; these factors are clearly indicative of groundwater in contact with residual product.
- Finally, we note that EPA's remedy for the site (USEPA, 2007 and 2008) explicitly considers Area B (the area in which this sample was collected) as part of the "Source Area", and a zone where liquid phase hydrocarbons are present.

The only implication of these new soil data is to indicate that residual product is present approximately 180 feet further down-gradient than previously recognized in Well MW-18.

Specific Comment 7. Section 7, page 34, paragraph 3.

This paragraph compares the results obtained during this study to others, including previous indoor air sampling conducted by Building Sciences and Engineering Associates (BSEA) on behalf of DDOE. Specifically, the maximum concentration of benzene in indoor air from the BSEA study was used for comparison purposes. It should be noted that Chevron sampled this residence after BSEA and found numerous indoor air contaminant sources in an attached shed, including an open gasoline can. After removal and ventilation, the residence had a benzene concentration in indoor air of $2.9 \mu\text{g}/\text{m}^3$, which was much lower than the BSEA study maximum of $26.8 \mu\text{g}/\text{m}^3$ used for comparison in the text. The BSEA results should be qualified in the text or omitted.

Response:

Comment noted.

Specific Comment 8. Section 7, page 35, paragraph 2.

A thorough discussion of potential sources of contaminants for indoor air is provided in this paragraph. Table 3 indicates that moth balls were found in a fair number of residences during the building survey. Naphthalene is one of the primary ingredients in moth balls, however, this is not mentioned in this paragraph. Text on page 29 indicates that naphthalene was detected in 21 percent of indoor air samples but only 2 percent of sub-slab samples. The presence of moth balls in residences likely explains the prevalence of naphthalene in indoor air. The text should include a brief discussion of this issue.

Response:

Comment noted. DDOE is making its determination based on potential exposure, as has been previously discussed. For this task, VMP data is used. The indoor air data shows current exposure, not future exposure and is not relevant to the determination process.

Specific Comment 9. Section 7, page 36, paragraph 1.

This paragraph provides the conclusion that the currently accepted conceptual site model that the sewer line along Nicholson Street is the groundwater discharge point may be flawed. This assertion cannot be supported with the data provided in the public version of the report. Neither individual sample results nor figures showing sample points were provided. Chevron will review the data collected for this study in conjunction with its extensive data set for this area to determine the validity of this claim when the data are released to Chevron.

Response:

The comment misrepresents the text of the SSP&A report. The SSP&A report does not "assert" a specific conclusion, but instead presents two alternative hypotheses (a flawed conceptual model for groundwater flow, or an additional source of contamination), that may apply if the relevant data are confirmed. DDOE welcomes Chevron's evaluation of these hypotheses in light of all the available data.

Specific Comment 10. Section 9, page 38, paragraph 1.

This section provides a formula for the observed ratio of contaminant concentrations between the subsurface and indoor air and indicates that it is one measure for the potential occurrence of vapor intrusion. There are several issues with this equation and its usage with respect to vapor intrusion:

- Most of the compounds of interest in the study are not conservative tracers. That is, they have documented indoor or ambient air sources that are not related to vapor intrusion.**
- The equation was not corrected for indoor air. EPA (2002) indicates that the average building exchanges a full volume of air over 6 times per day. Therefore, ambient air has a large effect on the concentrations of contaminants in indoor air. By subtracting the ambient air concentration out of the denominator as suggested in McHugh, et al. (2008) this effect is reduced.**
- As noted in comment 5, indoor air contaminants can migrate downward through the basement slab and into the subsurface. The concentrations of some contaminants detected in sub-slab air in this study are attributable to indoor air infiltration into the subsurface. Based on the points above, the inverted attenuation factor equation presented in the text is not a good indicator of the potential for vapor intrusion. Any conclusions based on this equation should be qualified accordingly. To determine an accurate attenuation factor, a conservative tracer must be used such as radon (McHugh, et al, 2008, Gannett Fleming, 2007).**

Response:

- No claim is made in the SSP&A report that the compounds discussed are conservative tracers; in fact the degradation of compounds is discussed; the presence of non-conservative compounds such as PCE under the homes, at concentrations greater than observed indoors highlights the need for a continuing source of these compounds, and their potential for indoor intrusion.**
- DDOE accepts the fact that air exchange may impact indoor air concentrations. We note, however, that the evaluation procedure presented is reasonably appropriate for its intended use (as a screening process, and as a supplementary line of evidence in the overall evaluation).**

Specific Comment 11. Section 10, page 42, paragraph 2.

This paragraph presents the recommendations of the study. A "home-by-home" risk assessment was recommended whereby individual risk for each individual residence within the study would be calculated. This is not a small undertaking and should be evaluated carefully. Chevron has several concerns regarding this approach. First, this approach greatly compartmentalizes the site into small microcosms and neglects larger trends in sampling data that are observed site-wide. Each home may have a very small data set, perhaps one set of indoor, ambient, and sub-slab data taken at one or a few points in time. As stated in the report, soil vapor concentrations can vary over a wide range spatially and temporally. Contrast this to the Baseline Risk Assessment prepared for the site, which took into account thousands of samples from multiple media collected over

nearly a decade. Secondly, this approach introduces a large amount of uncertainty into the risk assessment for each home. As stated in the report, the list of factors that influence indoor air concentrations is long and includes personal habits such as smoking, use of dry cleaning, use of cleaning products, building materials, the building exchange rate, ambient air concentrations, and attached garages, among many others. All of these factors contribute additional uncertainty to a very small data set with considerable inherent uncertainty. It is Chevron's opinion that a home-by-home risk assessment would not provide much value for determining risk to residents from vapor intrusion.

Response:

It is not realistic to expect that every home in the Riggs Park neighborhood will have the same potential risk due to vapor intrusion of contaminants. As illustrated in the SSP&A report, the contaminants are not uniformly distributed over the neighborhood. In addition, the depth to groundwater varies across the site – a significant variable in mass transfer from the groundwater to subsurface vapor. Consequently, a home-by-home assessment is warranted. See also the previous discussion for Subset 1, general comment 2 on pages 56 to 57.

Specific Comment 12. Appendices 0, E, and F.

These appendices provide field documentation sheets for each of the samples collected during the investigation. According to the field sheets, there was no vacuum at the conclusion of the 24-hour sampling period for 27 out of 128 indoor air samples (21 percent) and 10 out of 39 ambient air samples (26 percent). The true sampling period cannot be known for these samples, but it was less than 24 hours. Therefore, these samples may not be truly representative of indoor and ambient air concentrations. This issue should be discussed in the text.

Response:

The concern presented by this comment directly contradicts Chevron's comment # 4, suggesting the preference for grab samples over integrated samples. Nonetheless, all regulators on the sampling canisters were calibrated by the laboratory for 24 hours prior to shipment. Prior to leaving each canister, the sampling crew observed it for 10 minutes to ensure that the flow rate was sufficient to collect an air sample over a full day. While it is true that the residual pressure difference read "0" on some canisters at collection, we note that 1) the regulators are designed to stop collecting vapor prior to a true pressure equilibrium, so that the vapor flow is one-way, into the canister, and 2) in some cases because of accessibility to the homes, it was not possible to retrieve canisters precisely after 24 hours. DDOE is confident that the samples represent true integrated samples representing most of a full day, if not a complete 24 hour cycle in all cases.

Specific Comment 13. Appendix 0, Memorandum from H. Cohen of SSPA to Dr. V. Sreenivas (CCCOH) dated July 22, 2008.

This memorandum provides a summary of activities related to the outdoor vapor port sampling. The memo states that "some of the PVC casings and Teflon sample tubing contained unacceptable levels of tetrahydrofuran, acetone, and 2-butanone (methyl ethyl ketone)." These chemicals are the main ingredients in

PVC primer and glue, As a result, all existing outdoor vapor ports were abandoned and reinstalled, This is a significant event that was not discussed in the text. A thorough discussion of the well abandonment should be provided in the text along with how the construction of the vapor wells may have affected sample quality, For instance, if the concentrations of these compounds decreased after replacing the wells, then it is clear that leaks were present in the well during sampling.

Response:

The replacement of GMPs is discussed in Appendix O. The construction of the GMP sampling locations is discussed on page 17 of the report.

SUBSET #3

Review of Methods: Riggs Park Comprehensive Human Health Risk Assessment Long Version, and Summary Tables Supplied by Expert Toxicologist 2/13/09

RAM Group of Gannett Fleming, Inc. (RAM Group) has reviewed the *Methods: Riggs Park Comprehensive Human Health Risk Assessment Long Version, and Summary Tables Supplied by Expert Toxicologist 2/13/09*, prepared for the residential area surrounding Former Chevron Facility 122208, Chillum, Maryland. The Human Health Risk Assessment (HHRA) report was found to be missing several key sections necessary for proper review of the estimate of risk. In addition, it does not follow typical USEPA guidance or the practice of risk assessment. Therefore, any remedy proposed as a result of these data and conclusions cannot be properly substantiated. The missing data and sections should be provided so that the HHRA can be adequately reviewed.

Attachments:

- 1. References**
- 2. Shallow Groundwater Analytical Detections - September 2008**
- 3. Figure: Mean Soil-Building Pressure Differential**

General Comments

General Comment 1.

In page 1, paragraph 1, the report states "The goal of the HHRA was to determine whether any unacceptable adverse health effects associated with vapor intrusion originating from ground water contamination are present in any of the 106 homes, based on current and future exposures." The report makes no attempt to relate the sub-slab vapor (SSV) concentrations to the groundwater concentrations. Rather, the report states the SSV "results are indicative of contaminants potentially emanating from groundwater and represent a source of potential indoor vapor intrusion." No evidence is presented that the 36 chemicals detected in the various SSV samples are due to volatilization of these COCs from the groundwater. Our review of the September 2008 groundwater analytical results for shallow wells screened across the water table indicated that only 17 compounds were detected above laboratory reporting limits and only 13 of these compounds were detected in SSV. Thus, of the 36 compounds identified in SSV and assumed by the report to be potentially emanating from groundwater, only 13 were actually detected in shallow groundwater in September 2008. As a result, the report likely overestimated the risk to residents by including 36 compounds in the HHRA instead of the 13 present in shallow groundwater.

Response:

This comment was addressed in the response to Subset 1, general comment # 1 (a). Risks were not overestimated and only 6 COCs contributed to the cumulative risk assessment.

Please also see the final sentence in section IV of the remedy document which states:
"The District will evaluate contaminant levels detected in subslab soil vapor in comparison to contaminant levels attributable to groundwater to confirm that the levels detected in soil vapors, that the District will require be remediated, result from contaminated groundwater."

The District has now completed this task. Please see the 2010 HHRA.

General Comment 2.

The source of chemicals measured in the SSV samples may be indoor air that has advected downward through the slab and into the vadose zone, This phenomenon has been reported in peer reviewed literature, McHugh et al. (2006) indicates that the likely source of the compounds detected in sub-slab soil vapor that are not present in groundwater is indoor air, Previous investigations conducted by Chevron have demonstrated that airborne contaminants can be transported both downward and upward through the basement slab (GF, 2007), For ease of reference, Figure 1 from this report is attached which shows that during an entire week in June 2007, the pressure gradient in one residence at the site was downward through the slab, When this occurs, the airborne contaminants in indoor air are advected downward through the slab and into shallow soil vapor. Therefore, it is reasonable to assume that some portion of the concentration of hydrocarbons (and other airborne contaminants) in sub-slab soil vapor is attributable to ambient and indoor air infiltration into the sub-slab environment. This should be taken into account in the HHRA.

Response:

This comment was previously addressed [see response to comments above regarding McHugh article, at Subset 1, General Comment 1(b) and at Subset 2, Comment 5.

General Comment 3.

Page 4, paragraph 3 indicates that "The results of this HHRA were based on 357 vapor monitoring port SSV samples collected from 106 Riggs Park homes. In total, 1,785 separate cumulative health risk analyses were performed on each of the 357 SSV samples." This is not consistent with the practice of risk assessment as described in the various USEPA guidance documents referred to in the report (although the report did not include a reference list). For a detailed site-specific HHRA, it may be reasonable to perform exposure and risk calculations for each home to account for the variability in the inputs for each home. However, no home-specific information has been used in the calculations.

Response:

It is correct that DDOE did not collect home-specific information to conduct a site-specific risk assessment because that is unnecessary and would not provide the type of risk management information necessary to make a decision regarding remediation. DDOE used site-specific sampling data and default exposure assumptions as is suggested by EPA risk assessment guidance. Risk management decisions are based on

current and future conditions; for future conditions, the current exposure conditions are irrelevant. See also, response to 'General Comments' #2 [Subset #1]; and see p.21 – 22 of the 'Remedy Selection' document, as well as the AR for reference list.

General Comment 4.

The report does not present the data for the 357 sub-slab vapor (SSV) samples. A comprehensive HHRA must present all the data, evaluate the data, and comment on the variability in the data. The report does not include any discussion about the quality of the data or whether sufficient representative data has been collected to support a realistic estimate of risk.

Response:

VMP samples were reviewed by a third-party to evaluate the data quality and were judged to be of sufficient quality to conduct the 2009 HHRA and make risk management decisions.

General Comment 5.

RAGS Part A (USEPA, 1989), Sections 5.8 and 5.9 describe the process for the selection of chemicals of concern (COCs). It suggests that the following criteria be used to determine the COCs:

- **Positively detected in a medium;**
- **Detected at levels above the concentration in blank samples;**
- **Detected at levels above naturally occurring levels;**
- **Only tentatively identified but associated with the site or confirmed by special analytical services;**
- **Transformation products;**
- **Not detected chemicals but present at the site if an evaluation of the risks at the detection limit is desired; and**
- **Further criteria:**
 - o **Chemicals by class;**
 - o **Frequency of detection;**
 - o **Essential nutrients; and**
 - o **Concentration-toxicity screen,**

All of the chemicals analyzed for or detected in a sampling program are not considered COCs for the purposes of a HHRA. For example, the frequency of detection has not been discussed in the report and as presented in Specific Comment 6, not detected chemicals were eliminated without proper review.

Therefore, this HHRA is deficient in that it does not follow the methodology described in RAGS. Thus, the statement on page 2, paragraph 2 "HHRA was conducted strictly according to RAGS" is misleading.

Response:

The guidance that Chevron cites is generally applicable to soil and groundwater where multiple samples are collected to characterize a large area. Those sampling designs are not relevant and are not appropriate for vapor intrusion studies. For example, it is difficult to see how relevant applying the essential nutrient criteria would be for

vapors migrating through basement slabs since essential nutrients are not volatile. Likewise, it is not clear how the frequency of detection would apply for a single home since the elimination criteria states that a chemical can be eliminated when the frequency of detection is 5 percent or less. The minimum number of samples that must be collected for each home for that particular criterion to apply is 20 (i.e., $1/20=0.05$). It is neither technically feasible nor necessary to collect 20 samples for each home in a vapor intrusion study. Lastly, EPA's sole purpose of applying those criteria to large soil and groundwater datasets is to reduce the number of COCs to a manageable size so that the risk assessment does not become overwhelming. DDOE did not consider it overwhelming to evaluate 6 carcinogens.

General Comment 6.

RAGS Part A (USEPA, 1989) requires a section devoted to uncertainty analysis to discuss the impact of various assumptions and variability in the data used. The report does not include such a section. Therefore, again it does not follow USEPA guidance. A discussion of the uncertainty, especially the large amount of uncertainty inherent in the home-by-home risk assessment methodology described, should be clearly discussed in detail in the HHRA.

Response:

It is correct that an uncertainty analysis was not presented in the 2009 HHRA. The 2010 HHRA prepared in support of DDOE's Revised Remedy Decision issued with this Response to Comments addresses uncertainty.

General Comment 7.

Review of the calculated risks indicates that the majority of the calculated risk is from chloroform. This compound is a common disinfectant byproduct present in drinking water. In addition, a review of the September 2008 groundwater sampling results for shallow (water table) monitoring wells indicates that chloroform was present in only 3 of 29 wells at a maximum concentration of 1.6 µg/L. Based on Henry's Law, this concentration is not elevated enough to cause diffusion into soil vapor at the concentrations observed in shallow soil vapor. The chloroform concentrations in soil vapor likely were advected through the basement slab as described in general comment 2 above. Thus, for residences where chloroform was the major risk driver, the risk is likely overestimated.

Response:

While chloroform was identified as a COC, PCE poses the majority of risk at Riggs Park. To identify the source of chloroform, DDOE conducted a detailed statistical regression analysis of both drinking water and VMP samples. Briefly summarizing, chloroform is highly correlated to bromodichloromethane (BrDCIM; another disinfectant trihalomethane) in tap water. Therefore, if the source of chloroform in VMP samples was the result of vaporization from tap water (as suggested by Chevron), both BrDCIM and chloroform would be detected in the same sample, whether it is an indoor air or VMP sample. Furthermore, paired sampling analysis should reveal that they are detected in each sample as a constant ratio. DDOE's analysis reveals they are not. Not only were the 2 chemicals not detected in the same ratio, but BrDCIM was only detected in 11 homes out of the 106 sampled.

It is possible that tap water is the source of chloroform at homes where it was detected at very low concentrations where it posed insignificant risk. However, in those homes where the chloroform concentration and corresponding risk was high, tap water was not a source. Although the evidence clearly points to a source other than tap water, the definitive source of chloroform in the high-risk homes has not yet been identified.

General Comment 8.

It is interesting to note that the measured sub-slab benzene concentrations presented in the various tables in Exhibit 7 are all below or within the range of benzene indoor air background concentrations and for most of the samples cause a very small percentage of the risk. This HHRA indicates that petroleum hydrocarbons are not a major risk driver at the site.

Response:

While benzene does not pose unacceptable risk on its own based on the levels detected in VMP samples, it is not the only carcinogenic petroleum constituent. As discussed previously, naphthalene has been detected in a few homes at levels posing unacceptable risk. However, in DDOE's more recent groundwater evaluation a link between VMP samples and ground water could not be unequivocally confirmed.

SPECIFIC COMMENTS:

Specific Comment 1. Section 1.0, page 1, paragraph 2.

The cumulative non-carcinogenic health hazard index (HI) was calculated based on four different toxicity values from four different sources. The rationale for using various toxicity values is not provided and the values used could not be verified. The toxicity values and their source should be provided in the HHRA.

Response:

The toxicity values and their sources are presented in the Riggs Park Comprehensive Human Health Risk Assessment Long Version, and Summary Tables Supplied by Expert Toxicologist 2/13/09.

To clarify: cancer risk was calculated using toxicity values adopted by EPA Region 3 in September 2008. HI were calculated using 2 different sources and a modification for children. The highest calculated risk was used for decision making.

Specific Comment 2. Section 1.0, page 2, line 6.

The cumulative cancer risk is referred to as "Incremental Lifetime Cancer Risk (ILeR)", but it is referred as "ELCR" several times. This difference should be clarified and consistent terminology used throughout the HHRA to prevent confusion.

Response:

Both terms are correct. In the 2010 HHRA one term will be used in the interest of consistency.

Specific Comment 3. Section 1.1, page 3, paragraph 1.

This section refers to the draft vapor intrusion (VI) guidance (EPA, 2002). This is a draft guidance that has not been updated by USEPA to date due to considerable controversy about the contents of the document, and overly conservative assumptions, such as conservative attenuation factors.

In addition, this draft guidance is not applicable to underground storage tank (UST) sites. Page 2 of the draft EPA VI guidance states that: "*The draft guidance is suggested for use at RCRA Corrective Action, CERCLA (National Priorities List and Superfund Alternative Sites), and Brownfields sites, but is not recommended for use at Subtitle I Underground Storage Tank (UST) sites at this time. The draft guidance recommends certain conservative assumptions that may not be appropriate at a majority of the current 145,000 petroleum releases from USTs.*"

As such, the draft guidance is unlikely to provide an appropriate mechanism for screening the vapor pathway at UST sites.

Response:

EPA's recommendation stated in the above quote pertains to investigations at petroleum sites. It is intended as cautionary note to not place too much emphasis on ground water data in evaluating vapor intrusion. Relying on groundwater data to predict vapor intrusion could produce conservative results because it ignores the process of degradation of gasoline components as they migrate through the vadose zone up to the concrete slab. DDOE recognized this complicating issue and consequently did not rely on groundwater data to predict vapor intrusion and calculate risks. DDOE relied on VMP samples because the measured concentration represents the level directly under the concrete slab after the process of degradation has already occurred.

As previously discussed, based on DDOE's analysis of VMP and ground water data the Riggs Park site should be considered a multiple chemical release site. Although Chevron's gasoline release triggered the numerous investigations that were conducted historically in which toxic gasoline components were the central focus, DDOE's more comprehensive investigations reveals that investigation and remediation efforts be all inclusive to target all chemicals detected in VMP samples that can be linked to groundwater.

Chevron's opinion that the AF is overly conservative is inconsistent with the most recent EPA Region 3 reevaluation of the most appropriate AF value. In their reevaluation of the AF value that should be used in vapor intrusion studies (which is presented in *EPA Region 3 Vapor Intrusion Framework. June 2009*) Region 3 concludes an AF of 0.1 remains the most representative and scientifically tenable assumption based on actual empirical data collected from numerous sites.

As previously discussed, based on the current conditions, the Riggs Park site should be considered a multiple chemical release site and not a petroleum site. Please also see the previous discussion of petroleum degradation (Subset 1, specific comment #2).

Although Chevron considers the AF to be overly conservative, this is inconsistent with the opinion of EPA Region 3. The region has reevaluated the AF value of 0.1 based on empirical data collected from numerous sites and they have concluded it is still the correct and appropriate default assumption for vapor intrusion sites. The choice of AF has been previously discussed, please see (Subset 1, general comment 1(b), general comment 2 and specific comment #8).

Specific Comment 4. Section 1.1, page 3, paragraph 2.

The text states that "According to EPA VI guidance (EPA 2002), the recommended attenuation factor for sub-slab soil gas samples is 0.1." The recommended criterion established by EPA in the Draft *Vapor Intrusion Guidance* is a conservative estimate that assumes the chemicals do not degrade as they migrate upward through the vadose zone; however petroleum hydrocarbon vapors are known to biodegrade in the presence of oxygen (EPA, 2002). Site investigation data collected at the site from 2002 to 2004 suggested that biodegradation of hydrocarbons in soil vapor was occurring in the vadose zone (GF, 2006). In addition, Chevron has calculated a site specific attenuation factor for one residence of 0.0026 based on sub-slab soil vapor and indoor air sampling results conducted in 2007 (GF, 2007). Since its publication of the Draft *Vapor Intrusion Guidance* in 2002, EPA has determined that its recommended sub-slab to indoor air attenuation factor of 0.1 may be overly conservative (ITRC, 2007). It is Chevron's position, as well as that of most experts in this field, that using an attenuation factor of 0.1 is a very conservative estimate which leads to an overestimation of risk from vapor intrusion of petroleum hydrocarbons.

Response:

The AF factor of 0.1 is appropriate to evaluate current and future conditions and is the value recommended by EPA Region 3. Please see the previous discussion of the selection of the AF factor at response to Subset 1, specific Comment 8, pages 63 to 65.

Specific Comment 5. Section 1.1, page 4, paragraph 1.

The statement "This assumption has become so integral to the U.S. EPA risk management frame work that a site is automatically remediated when chemicals contaminate soil, water, or air above acceptable risk levels" is not accurate. There are many sites where the USEPA, state regulators, and the responsible party have agreed to implement institutional controls or used mechanisms other than remediation to reduce the risk to an acceptable level. This statement should be revised or removed from the text.

Response:

Chevron incorrectly interpreted the point of DDOE's statement. The point was not what type of remedial response is warranted, but that a remedial action is automatically triggered simply based on the potential for future exposures. That is, the

Agency does not wait for actual exposures to occur before taking action. Likewise, DDOE is responsible for preventing exposure before it occurs and does not wait for the vapors to actually penetrate the Riggs Parks homes and inhalation to occur before taking action.

Furthermore, use of the term "remediation" did not imply actual removal of contamination. Implementing institutional controls is, by definition, a remedial option intended to prevent exposures from occurring, which is identical to the risk management decision made by DDOE at the Riggs Park site. This is far different from a no-further-action decision because there are no current exposures and human health risks.

Specific Comment 6. Section 1.1, page 4, paragraph 4.

Text in this section states that chemicals not detected in any home were not considered to be chemicals of concern. It is not reasonable to eliminate chemicals that were not detected without a proper review of detection limits.

Response:

The text will be rewritten for added clarity in the 2010 HHRA. In general, chemicals were not arbitrarily eliminated from the chemicals of concern (COCs) list simply because they were not detected in VMP samples; rather, among other things, a thorough/deliberate evaluation of the detection limits vis-à-vis the risk-based or acceptable concentrations of the target chemicals becomes part of the overall data evaluation and screening process used in the selection of the COCs.

Specific Comment 7. Section 1.2, page 6, exhibit 2.

Exhibit 2 presents the dose equation for both carcinogenic and noncarcinogenic effects. However, the chronic daily dose (CDD) equation presented in Exhibit 2 is applicable for noncarcinogenic exposure only. The parameter "BW" included in the exhibit should be deleted. The unit for averaging time should be hours instead of days, and values should be 262,800 and 613,200 for noncarcinogenic and carcinogenic, respectively. As per the recent EPA's document (USEPA, 2009), CDD is referred as exposure concentrations (EC). The EC for carcinogenic effects should be as below:

$$EC = \frac{CxET \times EF \times ED}{AT}$$

It was confirmed that cancer risks presented in Exhibit 7 were calculated based on the equation above using an averaging time of 613,200 hours, not the equation presented in Exhibit 2 of the report. The revised equations and the resulting calculations should be provided. In addition, the calculation of the noncarcinogenic hazard quotient could not be verified. Supporting information for this calculation should be provided in the HHRA.

Response:

All exposure assumptions will be presented in the 2010 HHRA. DDOE used the same exposure assumptions that are recommended and used by EPA Region 3.

Specific Comment 8. Section 1.3, page 9.

The unit for CDD is presented as mg/kg-day, however, it should be mg/m³ for inhalation.

Response:

The units used in the 2009 HHRA are presented in the 2010 HHRA and are the same units used and recommended by EPA Region 3.

Specific Comment 9. Section 1.3, page 10, paragraph 1.

This section states that the Hazard Index (HI) is calculated for the sample. Please note that the HI is calculated for a receptor not a sample.

Response:

Text will be rewritten for added clarity.

SUBSET #4

**RE: Review of Riggs Park Comprehensive Human Health Risk Assessment
Toxicologist Work Product Data Tables
Former Chevron Facility 122208, Chillum, Maryland**

As requested, RAM Group of Gannett Fleming, Inc. (RAM Group) has reviewed the *Riggs Park Comprehensive Human Health Risk Assessment Toxicologist Work Product Data Tables*, prepared for the residential area surrounding Former Chevron Facility 122208, Chillum, Maryland.

This review was conducted on an expedited basis and should not be considered a comprehensive review of the data provided. However, unless additional documentation and information is provided, a comprehensive review would not add value.

Representative calculations and input values to the risk assessment were spot checked for consistency with applicable U.S. Environmental Protection Agency (EPA) risk assessment guidance. The comments provided are general in nature and represent general issues and discrepancies in the data files provided.

SUMMARY OF DATA REVIEWED

The data were provided on CD with no associated key to the files or supporting information. The following narrative describes our presumption of the data and calculations based on the S.S. Papadopoulos and Associates Report and inferences made from the calculations provided in the files. As shown in the attached figure, the data consist of five folders labeled:

1. Data-Each Home Q1
2. Data-Each Home Q2
3. Data-Each Home Q3
4. VMP
5. Combined Data Sets

Folders 1 to 3 presumably contain analytical data for three quarters. Folder 4 contains raw data, calculated risks, and hazard indices for each sample. Folder 5 contains compiled raw data for each sampling location or home and comparison of calculated risks and hazard indices using U.S. Environmental Protection Agency (EPA) Region 3 toxicity values. The data and associated calculated risk values are not clear because most of the files are missing column headings and other necessary information (e.g., references). The contents of each folder are discussed in detail below.

Folder 1: Data-Each Home Q1

Folder 1 contains data from sampling conducted during quarter 1; 104 excel workbooks named "number".xls where the number varies from 8 to 426. All of the numbers in this range are not used and presumably represent different

measurement locations or homes. In addition, the folder contains 5 workbooks named 4-663 Oglethorpe.xls, 7-5902 8th.xls, 8-5908 8th.xls, 107-643 Kensington.xls, and 120-5618 Eastern.xls. Each workbook contains one excel sheet with the following column headings:

Sample Name, Week, Analyte, ppb, Detect Flag, $\mu\text{g}/\text{m}^3$

The sample names in each workbook start with "S" followed by sampling location number and presumably the type of sample (AOA, INA, VMP, GMPR, VMP&, GMPR&, and PVMP, where the symbol "&" is 1, 2 or 3). All excel workbooks do not contain all sample types mentioned above. For the sample types included, concentrations in parts per billion (ppb) and micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) are presented for over 60 chemicals.

Folder 2: Data-Each Home Q2

Folder 2 contains data from sampling conducted during quarter 2; 107 excel workbooks also named "number".xls where the number varies from 4 to 426. All of the numbers in this range are not used and presumably represent different measurement locations or homes. Each workbook has one excel sheet with the following column headings (although not indicated in each worksheet):

Sample Name, Analyte, ppb, Detect Flag, $\mu\text{g}/\text{m}^3$ although not labeled as such. The sample names in each workbook start with "S" followed by sampling location number and presumably type of sample (AOA, INA, and VMP). All excel workbooks do not contain all sample types mentioned above. For the sample types included concentrations in ppb and $\mu\text{g}/\text{m}^3$ are presented for over 60 chemicals.

Folder 3: Data-Each Home Q3

Folder 3 contains data from sampling conducted during quarter 3; 109 excel workbooks also named "number".xls where the number varies from 4 to 426. All of the numbers in this range are not used and presumably represent different measurement locations or homes. Each workbook has one excel sheet with the following column headings (although not indicated in each worksheet):

Sample Name, Analyte, ppb, Detect Flag, $\mu\text{g}/\text{m}^3$ although not labeled as such.

The sample names in each workbook start with "S" followed by sampling location number and presumably type of sample (AOA, INA, VMP, GMPR, VMP&, GMPR&, and PVMP, where the symbol "&" is 1, 2 or 3). All excel workbooks do not contain all sample types mentioned above. For the sample types included concentrations in ppb and $\mu\text{g}/\text{m}^3$ are presented for over 60 chemicals.

Folder 4: VMP

This folder contains 112 excel workbooks named *No. of Homes.xls* and *RiskSummary.xls* in addition to "S#".xls where the "#" varies from 4 to 426. All

of the numbers in this range are not used and presumably represent different measurement locations or homes. Each of these is described below.

No. of Homes.xls: This file includes presumably 103 homes and for each home the VMP (sub-slab soil vapor) samples are identified. For example home NO.5 is associated with Q3-S21-VMP2, Q3-S21-VMP1, Q2-S21-VMP2, Q2-S21-VMP1, Q1-S21-VMP2, and Q1-S21-VMP1; whereas home No. 37 is associated with only one sample number Q1-S144-VMP.

Risk Summary.xls: This file contains five sheets. First sheet named "Number Homes" contain the following column headings:

Sample No., Week, HI, "Unlabeled", Risk, Risk;

The first two columns have number of homes and sample number information in the same fashion as *No. of Homes.xls*. The Hazard Index (HI) is assumed to be a cumulative hazard coefficient (HQ) for non carcinogenic chemicals and risk is cumulative for carcinogenic chemicals. The HI and risk are calculated for each sample. An unlabeled column presents the ratio of carcinogenic risk to the 1×10^{-6} risk level (acceptable risk). A second sheet named "Original" presumably contains the same information as the first sheet. The rest of the three sheets Sheet 5, Sheet 4, and Risk > 1×10^{-5} do not have any column headings.

S#.xls: These excel workbooks contain three work sheets named VMP, INA, and Tox V.

No column headings are presented in these sheets.

Folder 5: Combined Data Sets

This folder contains 128 excel workbooks named "number".xls (except for nine files named Book2.xls, Combined Data.xls, Dosimetric Child PERC.xls, HI for Carcinogens.xls, List of COCs.xls, New Tox Values.xls, RISK SUMMARY.xls, VMP SUMMARY.xls, and VMP-New Region 3 Values.xls) where the number varies from 4 to 426. All the numbers in this range are not used and presumably represent different measurement locations or homes. Each of these is described below.

Book2.xls: This file contains HI and risk for different samples collected in the three quarters.

Combined Data.xls: This file presents the concentration data for chemicals analyzed for different samples. This file presumably contains all of the raw data except nondetects and non toxic chemicals, which are excluded.

Dosimetric Child PERC.xls: This file contains one sheet with average ventilation rate information.

HI for Carcinogens.xls: This file contains reference concentration (RfCi) values for carcinogenic chemicals. These sheets also contain other columns with sample numbers and analytes but the values provided here are not labeled.

List of COCs.xls: This file contains EPA Region 3 toxicity values.

New Tax Values.xls: This file does not have any column headings, but presumably contains toxicity values.

Risk Summary.xls: This file contains eight sheets presumably presenting calculated HI and risk values for each sample using EPA Region 3 and Integrated Risk Information System (IRIS) toxicity values.

VMP Summary.xls: This file contains one sheet, but there are no column headings.

VMP-New Region 3 Values.xls: This file contains three sheets presumably presenting EPA Region 3 toxicity values in the first sheet. There are no column headings in the second and third sheets.

Number.xls: These files have a variable number of sheets in each file, each containing raw data for different sampling types.

General Response:

The EXCEL Files referenced above were provided to Chevron in response to Chevron's request in a letter dated April 6, 2009, and no attempt was made to apply any quality control measures to ensure "consistency." Indeed, the spreadsheets were produced independently as interim internal and iterative calculations for different purposes and accordingly should not be interpreted as originating from a single dataset. Not all of the spreadsheets were used to quantify risks and many were interim spreadsheets intended to provide information unrelated to the HHRA. In other words, they are not final work products that can or should be carefully reviewed as they are irrelevant to the DDOE Decision document, which is the subject of the request for comments.

As a consequence, the specific comments below are irrelevant to the DDOE decision document and the discrepancies noted.

Specific Comments:

Specific Comment 1.

Files: *Combined Data Sets/8.xls/data, Data Each Home Q1/8.xls/sheet1, and Data Each Home Q2/8-2.xls/sheet1*

Comment: Data listed as Q1 for samples S8-AOA and S8-INA in Combined Data Sets/8.xls/data do not match with that for the same samples in Data Each Home Q1/8.xls/sheet1. Instead, they match with Data Each Home Q2/8-2.xls/sheet1. This discrepancy should be corrected.

Response:

As the above General Response indicates, the spreadsheets were not intended to "match" as they are interim spreadsheets. Therefore, there it is not necessary to correct any discrepancy.

Specific Comment 2.

Files: *Combined Data Sets/8.xls/data and Data Each Home Q1/8.xls/sheet1*

Data for the chemicals 1,3-dichlorobenzene, 2-butanone (MEK), 2-hexanone (MBK), benzene, and toluene in sample Q1 S8-VMP in Combined Data Sets/8.xls/data do not match with that for the same sample in Data Each Home Q1/8.xls/sheet1. This discrepancy should be corrected.

Response:

As the above General Response indicates, the spreadsheets were not intended to "match" as they are interim spreadsheets. Therefore, there it is not necessary to correct any discrepancy.

Specific Comment 3.

Files: *Combined Data Sets/8.xls/data and Data Each Home Q1/8.xls/sheet1*

Data for the chemicals 2-butanone (MEK), 2-hexanone (MBK), acetone, and benzene for sample 02 S8-VMP in Combined Data Sets/8.xls/data do not match with that in Data Each Home Q1/8.xls/sheet1. This discrepancy should be corrected.

Response:

As the above General Response indicates, the spreadsheets were not intended to "match" as they are interim spreadsheets. Therefore, there it is not necessary to correct any discrepancy.

Specific Comment 4.

Files: *Combined Data Sets/402.xls/Raw and Data-Each Home Q2/402.xls*

Q2 sample data from individual tables from Folder 1, Folder 2, and Folder 3 do not match with the data in Folder 5. Conversions from ppb to $\mu\text{g}/\text{m}^3$ are not verifiable with the following formula:

$$\mu\text{g}/\text{m}^3 = (\text{ppb} * P * \text{MW}) / (R * T)$$

where: ppb: Value from raw data table in parts per billion
P: Atmospheric pressure; 760 mmHg
MW: Molecular weight of chemical obtained from EPA Regional Tables (12Sep2008) ;
R: Ideal gas constant; 62.4 L·mmHg /(mol·°K)
T: Temperature; 298 °K

The above formula can be used to match the conversion from ppb to $\mu\text{g}/\text{m}^3$ for data in the Q1 and Q3 folders. Therefore, it is evident that there is a discrepancy in conversions that should be corrected.

Response:

As the above General Response indicates, the spreadsheets were not intended to "match" as they are interim spreadsheets. Therefore, there it is not necessary to correct any discrepancy.

Specific Comment 5.

Files: *Combined Data Sets/402.xls/VMP and /RAW*

As per the Riggs Park Comprehensive Human Health Risk Assessment document Exhibit 2, chronic daily dose (CDD) is calculated using the following equation:

$$\text{CDD} = (\text{C} \cdot \text{ET} \cdot \text{EF} \cdot \text{ED}) / (\text{AT} \cdot \text{CF})$$

This equation is not correct. Refer to specific comment 7 in the Riggs Park Comprehensive Human Health Risk Assessment Document review for the correct equation.

The hazard index calculations were made using the actual concentration with an attenuation factor of 10 instead of using the CDD. For example, in worksheet VMP cell "E2", which is the concentration used in HQ calculation (with an attenuation factor of 10) for acetone in Q3-s402-VMP matches with the corresponding value in worksheet RAW. The CDD should be used in this calculation.

Response:

As the above General Response indicates, the spreadsheets were not intended to "match" as they are interim spreadsheets. Therefore, there it is not necessary to correct any discrepancy.

Please also see the response to Subset #3, comment #7, page (insert page # 89).

Specific Comment 6.

Files: *Combined Data Sets/107-643 Kensington.xls/Raw, Data-Each Home Q1/107-643 Kensington.xls/sheet1, and Data-Each Home Q2/107.xls/sheet1*

There is no data for sample Q2 S107-GMPR in Data-Each Home Q2/107.xls/sheet1, however, the data are presented in Combined Data Sets/107-643

Kensington.xls/Raw. In addition, conversion to $\mu\text{g}/\text{m}^3$ is not consistent. These discrepancies should be corrected.

In addition, sample Q2 S107-INA data presented in Data-Each Home Q2/107.xls/sheet1 is not included in Combined Data Sets/107-643 Kensington.xls/Raw. This discrepancy should be corrected.

Response:

As the above General Response indicates, the spreadsheets were not intended to “match” as they are interim spreadsheets. Therefore, there it is not necessary to correct any discrepancy.

Specific Comment 7.

Files: *Combined Data Sets/VMP-New Region3 Values.xls/Region3 Tox*

There are no column headings for this file and there are no units to identify the reference and check the toxicity values. This information should be provided.

Response:

As the above General Response indicates, the spreadsheets were not intended to “match” as they are interim spreadsheets. Therefore, there it is not necessary to correct any discrepancy.

Specific Comment 8.

Files: *Combined Data Sets/30.xls/Raw and Data-Each Home Q2/30.xls/sheet1*

Concentration values provided in Exhibit 7 of the Riggs Park Comprehensive Human Health Risk Assessment Document for sample 02-S30-VMP do not match with the corresponding values in Data-Each Home Q2/30.xls/sheet1 and Combined Data Sets/30.xls/Raw. However, they match with the concentrations in Combined Data Sets/30.xls/Raw, if the conversions from ppb to $\mu\text{g}/\text{m}^3$ were made according to the formula in comment 4 above. This discrepancy should be corrected.

Response:

As the above General Response indicates, the spreadsheets were not intended to “match” as they are interim spreadsheets. Therefore, there it is not necessary to correct any discrepancy.

Specific Comment 9.

Files: *Combined Data Sets/13.xls/Raw and Data-Each Home Q1/13.xls/sheet1*

Concentration values provided in Exhibit 7 of the Riggs Park Comprehensive Human Health Risk Assessment Document for sample Q1-S13-VMP do not match with the corresponding values in Data-Each Home Q1/13.xls/sheet1. However, they match with Combined Data Sets/13.xls/Raw. It is not clear if the correct concentrations were used in risk calculations.

Response:

As the above General Response indicates, the spreadsheets were not intended to “match” as they are interim spreadsheets. Therefore, there it is not necessary to correct any discrepancy.

Specific Comment 10.

Files: *Combined Data Sets/23.x/s/Raw and Data-Each Home Q2/23.xls/sheet1*

Concentration values provided in Exhibit 7 of the Riggs Park Comprehensive Human Health Risk Assessment Document for sample Q2-823-VMP do not match with the corresponding values in Data-Each Home Q2/23.xls/sheet1 and Combined Data Sets/23.xls/Raw. This discrepancy should be corrected.

Response:

As the above General Response indicates, the spreadsheets were not intended to “match” as they are interim spreadsheets. Therefore, there it is not necessary to correct any discrepancy.

Specific Comment 11.

Files: *Combined Data Sets/258.x/s/Raw and Data-Each Home Q1/258.xls/sheet1*

The tetrachloroethane concentration provided in Exhibit 7 of the Riggs Park Comprehensive Human Health Risk Assessment Document for sample Q1-S258-VMP does not match with the corresponding concentration in Data-Each Home Q1/258.xls/sheet1. There are two different values for tetrachloroethane concentration in Combined Data Sets/23.xls/Raw, and the value in Exhibit 7 matches with one of these. This should be corrected.

Response:

As the above General Response indicates, the spreadsheets were not intended to “match” as they are interim spreadsheets. Therefore, there it is not necessary to correct any discrepancy.

Specific Comment 12.

Files: *Combined Data Sets/37.xls/Raw and Data-Each Home Q1/37.xls/sheet1*

Concentration values provided in Exhibit 7 of the Riggs Park Comprehensive Human Health Risk Assessment Document for sample Q1-837-VMP do not match with the corresponding values in Data-Each Home Q1/37.xls/sheet1. However, they match with Combined Data Sets/73.xls/Raw. It is not clear if correct concentrations were used in risk calculations.

The above evaluation leads us to believe that there are significant discrepancies and errors in the calculations and the risk assessment presented. Because no documentation is available for the spreadsheets, the only way to confirm the calculations and assumptions is to either (i) request detailed documentation of the data and calculations included in the spreadsheets, or (ii) have a face to face

meeting with the authors of these spreadsheets to discuss the methodology, assumptions, and calculations.

Response:

As the above General Response indicates, the spreadsheets were not intended to “match” as they are interim spreadsheets. Therefore, there it is not necessary to correct any discrepancy.

APPENDIX C

to DDOE Final Remedy Selection and Response to Comments

DEPARTMENT OF HEALTH HEALTH SURVEY SUMMARY OF RESULTS

**GOVERNMENT OF THE DISTRICT OF COLUMBIA
DEPARTMENT OF HEALTH**



Office of the Director

April 12, 2010

In March 2009 DOH convened a team of DOH staff from the Office of the Director to respond to a request for a health survey by the residents of Riggs Park. The purpose of this survey was for DOH to determine a health profile of the Riggs Park community through the voice of its residents. The survey sought to gain knowledge of resident's perceptions of current health status, insurance status, access to healthcare and relevant demographic information. Summarily, the results of this survey could be utilized to address the subsequent unmet healthcare needs of the residents of Riggs Park.

Upon the commencement of an open Riggs Park community meeting (March 2009), the survey was vetted by the group and revised to reflect their concerns. The survey was loaded online and also mailed with an initial deadline of April 15th, 2009. Due to slow response, the survey deadline was extended to May 30, 2009. The majority of residents responded to the survey by mail and all data was manually entered into the database by June 2009.

The results were as follows:

Sixty four participants completed the Riggs Park health survey during the allotted timeframe. Participants' consisted of 45.3% male and 54.7% female responses. Over 90% of participants were African Americans, with a median age of 70.7, and living alone. Of the 64 respondents, 8.5% reported asthma compared to 11%, nationally, in a similar age related cohort. Other health related issues included high blood pressure of which 72.6% of respondents were clinically diagnosed compared to the national average of 57.9% for the respective age cohort. Further, 29.6% of African Americans over 60 years of age are likely to develop cancer in various sites which is slightly above the 22.2% of residents who had been diagnosed with some form of cancer. Prostate cancer was the cancer most reported in the survey at 7.2% and the national data suggests that it accounts for 34% of reported cancer in African American men over the age of 60.