Site Investigation Issues

Federal Remediation Technology Roundtable
Washington D.C.
November 10, 2009

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US EPA/ERT

Lines of Evidence:

- Groundwater spatial (and vertical profiling, if appropriate) data with modeling
- Soil gas spatial concentrations (and vertical profiling, if appropriate), including subslab, with vertical profiling
- Ambient, crawlspace, and inside air concentrations and source determinations
- Building construction and conditions
- Constituent ratios

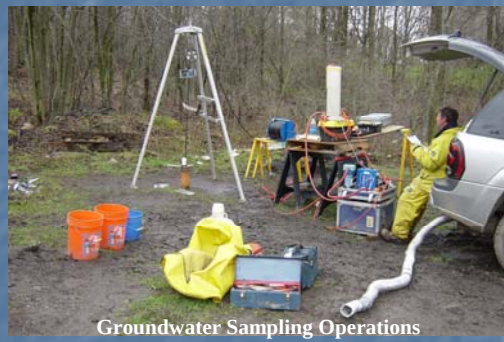
Groundwater Spatial (And Vertical Profiling, If Appropriate) Data With Modeling

Overburden Groundwater Installation

Oil Bailer Operations


Drilling Operations


Well Field Site


Groundwater Sampling Operations

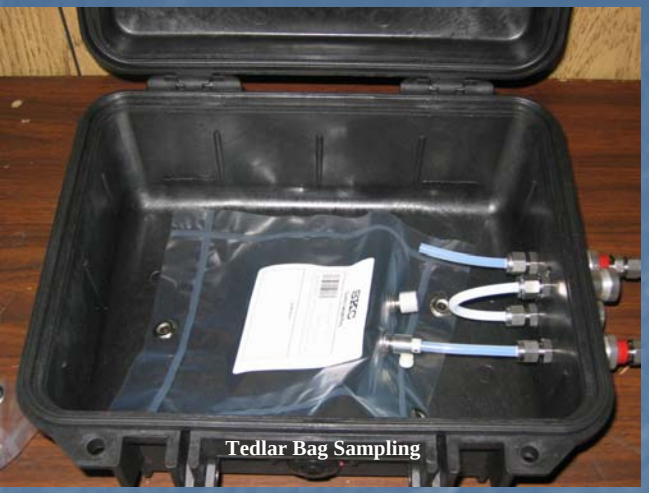

Soil Gas Probe Installation


Hollow Stem Augers with Geoprobe


Membrane Interface Probe with Geoprobe


Drilling Operations

Soil Gas Spatial Concentrations (And Vertical Profiling, If Appropriate), Including Subslab, With Vertical Profiling



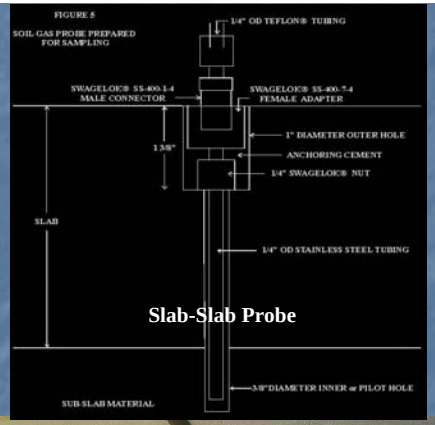
Tedlar Bag Sampling

Sorbent Tubes

Summa Canister with Flow Regulator and 3-Way Valve

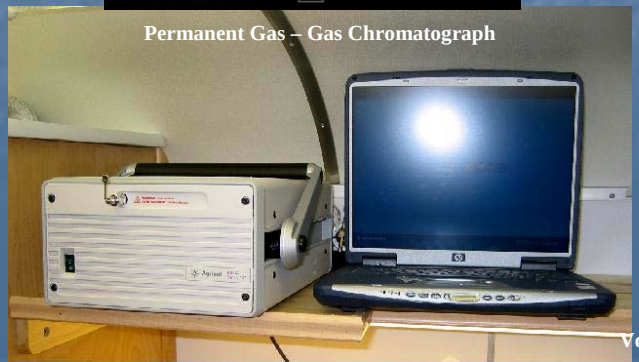
Sampling &

Analyses



Slab-Slab Probe

TAGA Mobile Laboratory



Permanent Gas – Gas Chromatograph

Volatile Organic Compounds – Gas Chromatograph/Mass Spectrometer

Ambient, Crawlspace, And Inside Air Concentrations And Source Determinations

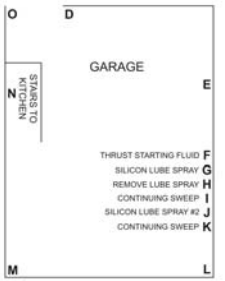

Ambient Air Sampling


Crawlspace Air Sampling


Indoor Air Sampling

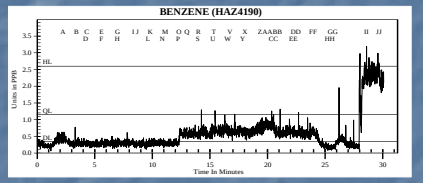
INVESTIGATION

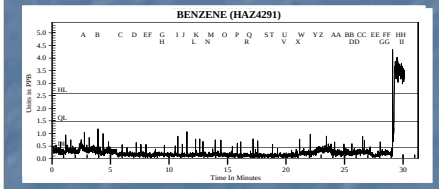
Monitoring Lifestyle Sources

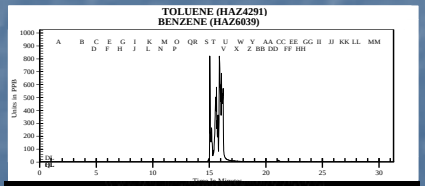


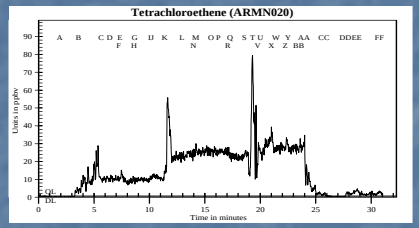
Q R - AMBIENT
A B
C - ENTER
P - EXIT

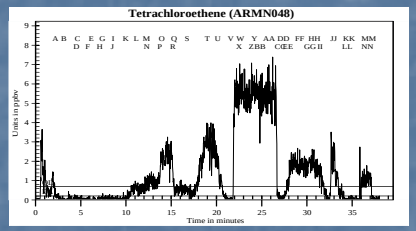
UNIT 010
UNIT INVESTIGATION
HP 1026
HOPEWELL PRECISION SITE
HOPEWELL JUNCTION, NY

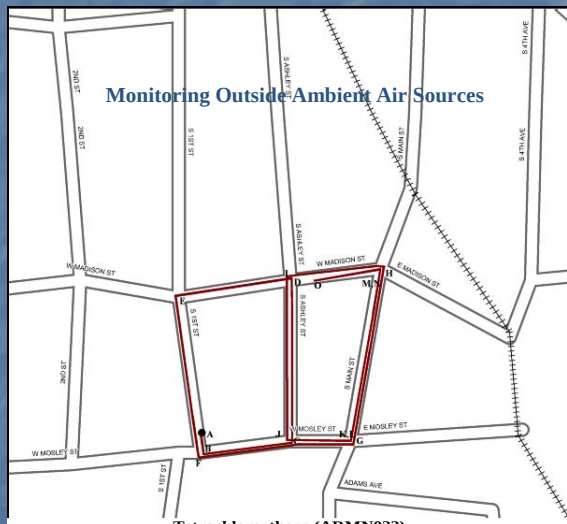


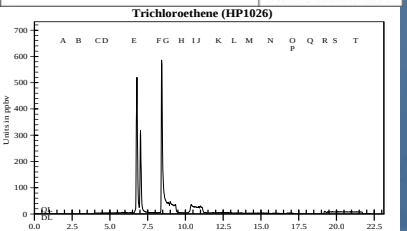




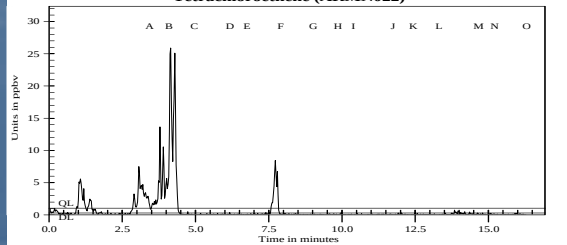




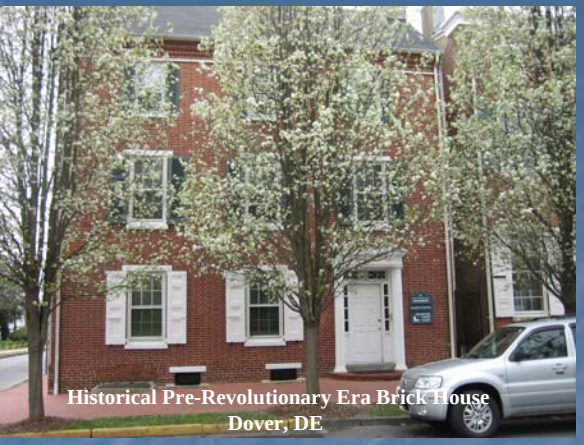




MONITORING FOR ACCIDENTAL OR INTENTIONAL RELEASES



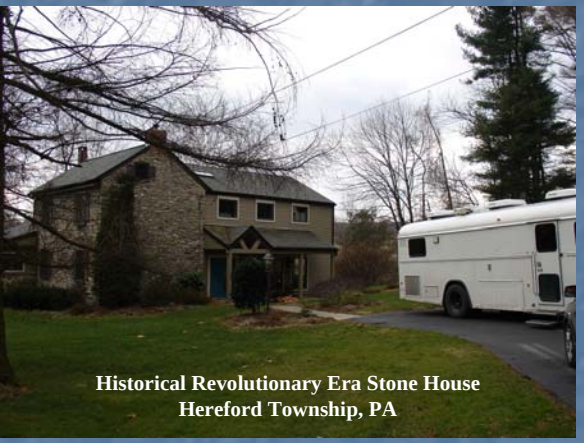
Building Construction And Conditions



Historical Pre-Revolutionary Era Brick House
Dover, DE

Split-Level House
Hopewell, NY

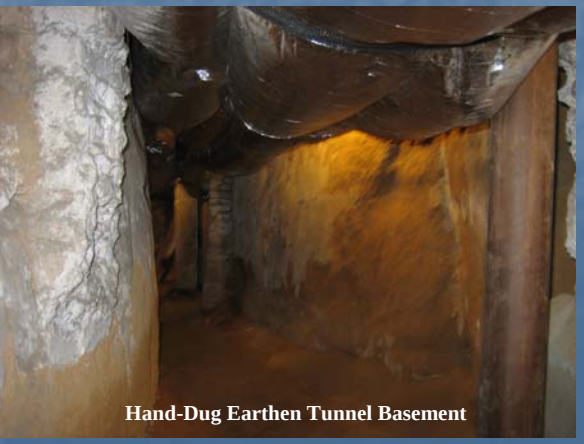
Multi-Apartment Building
Ann Arbor, MI



Historical Revolutionary Era Stone House
Hereford Township, PA

Single –story House with Crawlspace
San Antonio, TX

2-Story New Construction House
Hopewell, NY



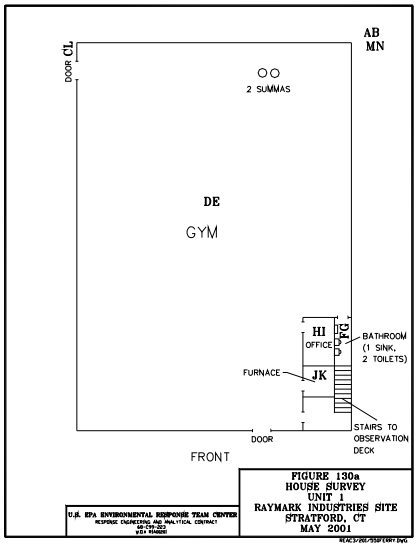
Hand-Dug Earthen Tunnel Basement

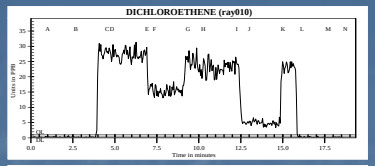
Stone-Walled Basement

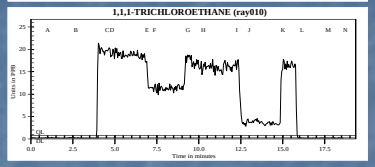
Rough Poured Cement Floor with Hand-Hewned Posts

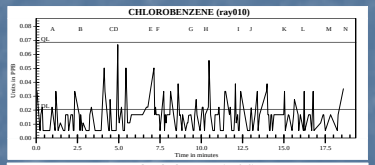
Constituent Ratios

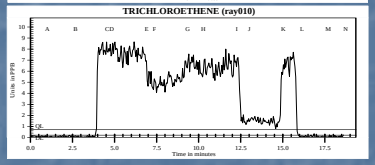
Children's Gymnasium



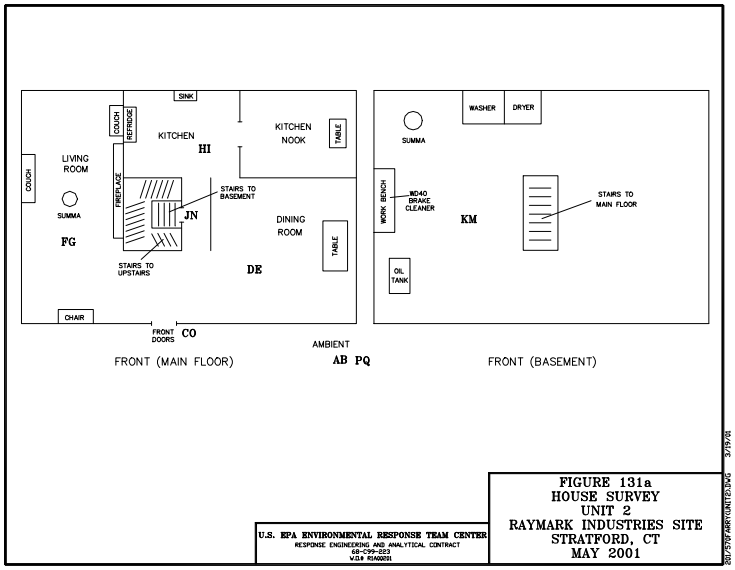


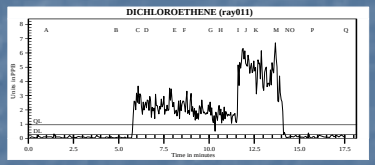


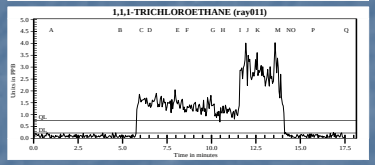


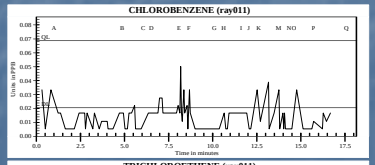


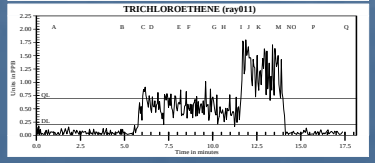
Residence Adjacent to the Gymnasium







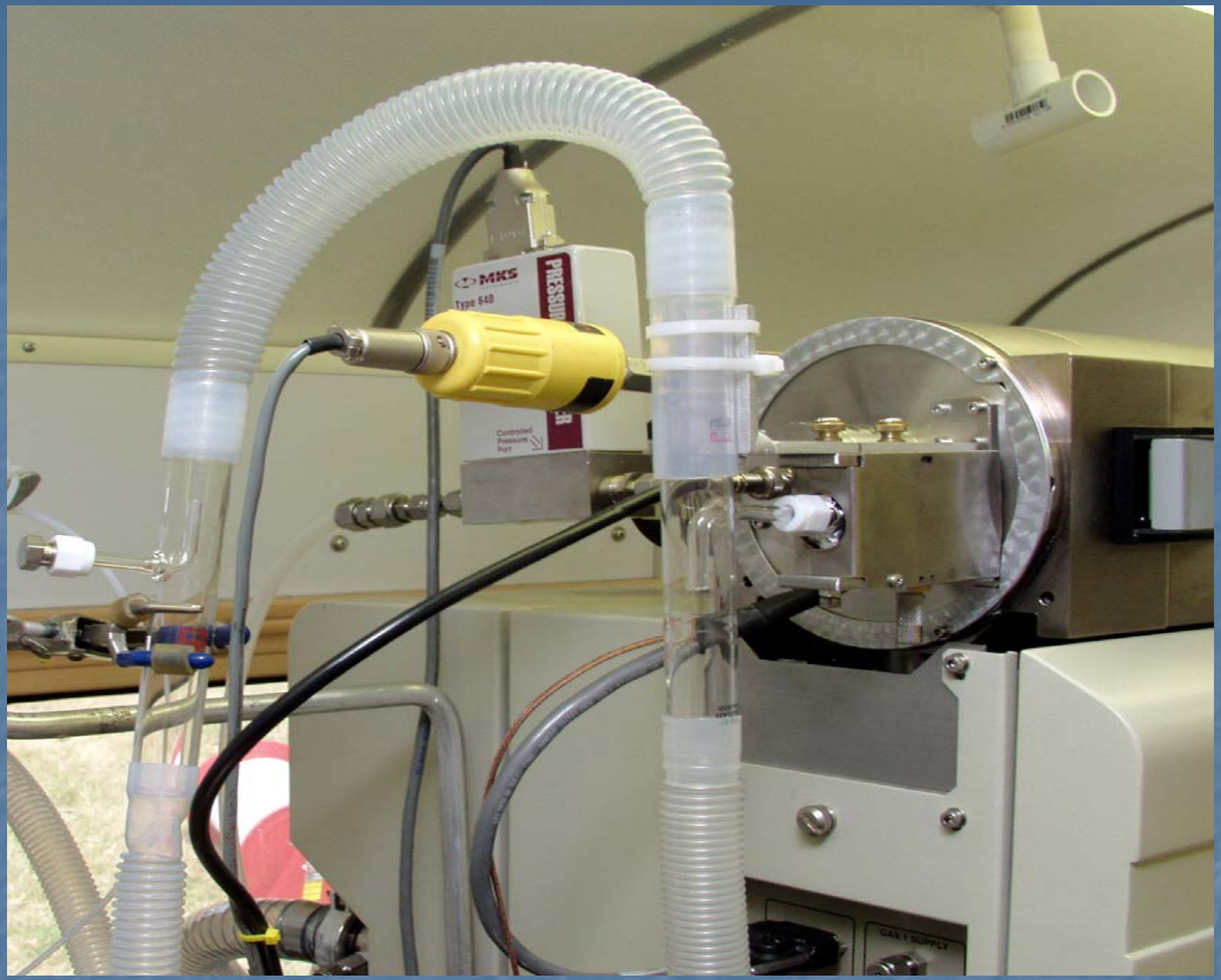




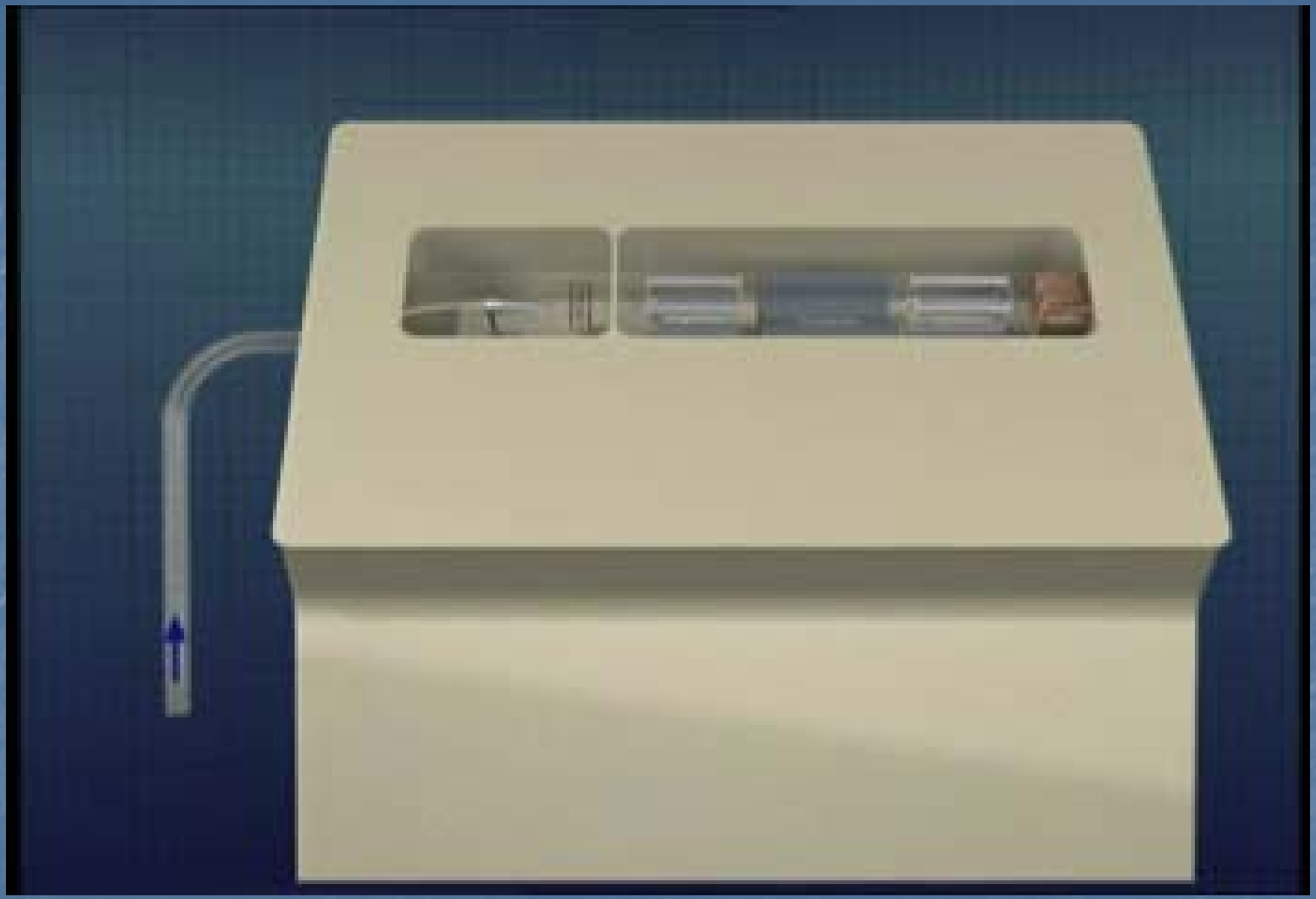
TAGA MOBILE LABORATORY

Trace Atmospheric Gas Analyzer (TAGA) Mobile Laboratory

Trace Atmospheric Gas Analyzer (TAGA)



Low Pressure Chemical Ionization (LPCI) Source



TAGA Operational Process

Gas Chromatograph with Concentrator for Volatiles

Gas Chromatograph for Permanent Gases

Driver and Passenger Seating with Monitor

INVESTIGATIVE PROCESS TO DETERMINE IF SUBSURFACE GAS IS IMPACTING

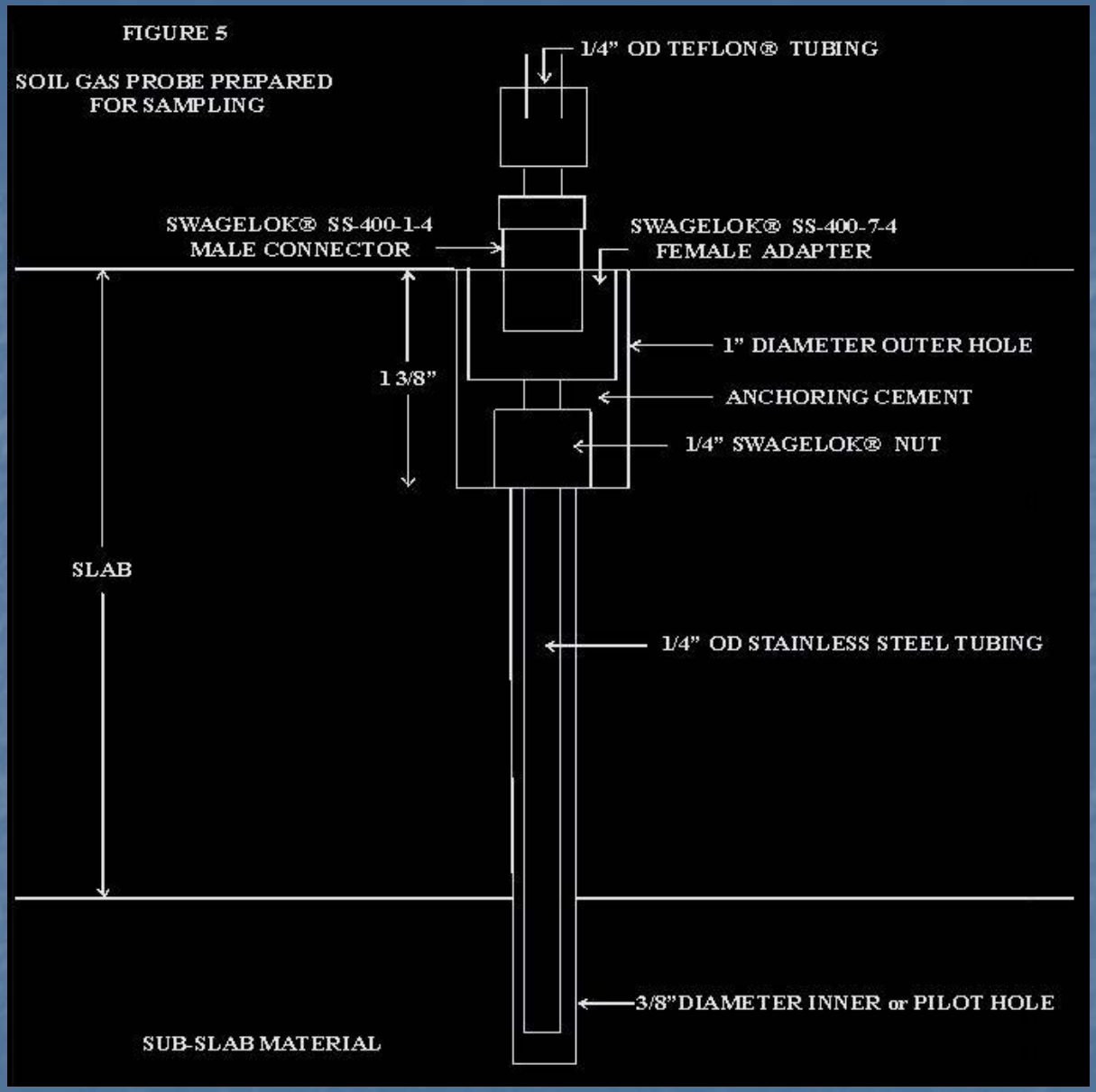
MONITORING AND SAMPLING STRATEGY

1. **INITIAL SAMPLING**
   Subslab Location

2. **INITIAL TAGA MONITORING**
   Ambient Air Investigation
   Lifestyle Source Investigation
   Subsurface Source Investigation

3. **SUBSEQUENT SUMMA CANISTER SAMPLING**
   Subslab Location
   Basement Location
   First Floor Location
   Ambient Air Location

INITIAL SUBSLAB SAMPLING



Subslab Sampling Probe

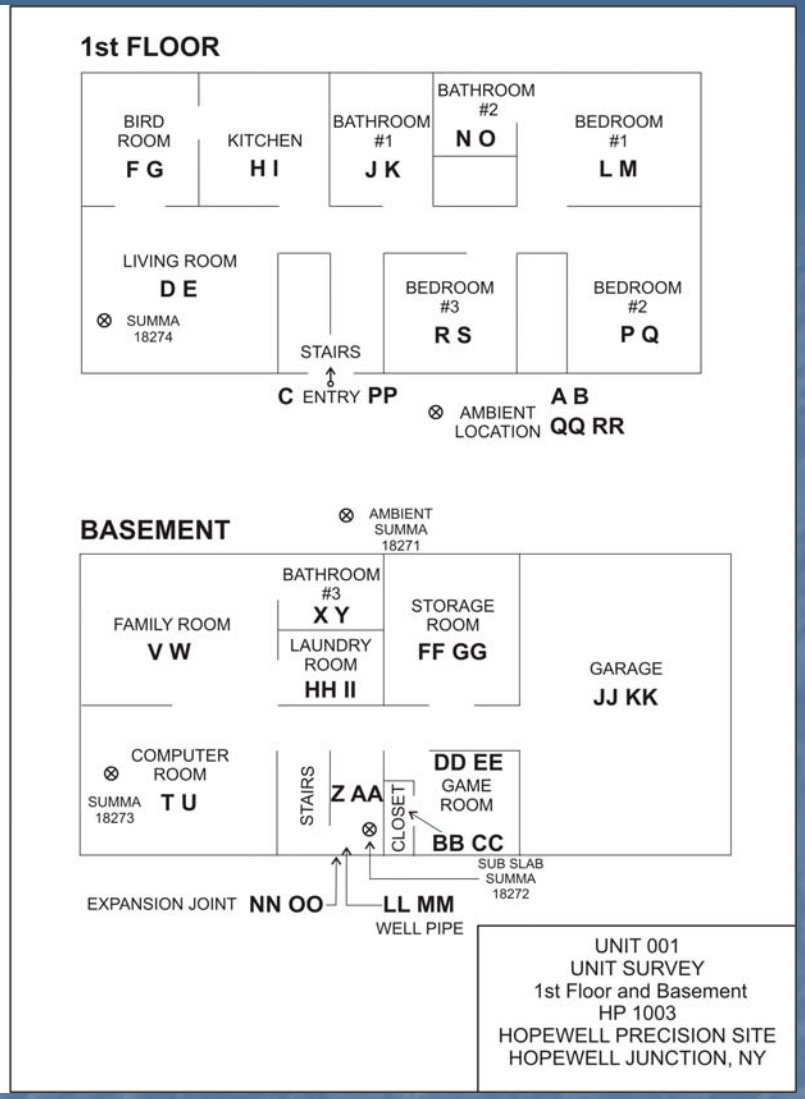
Drilling

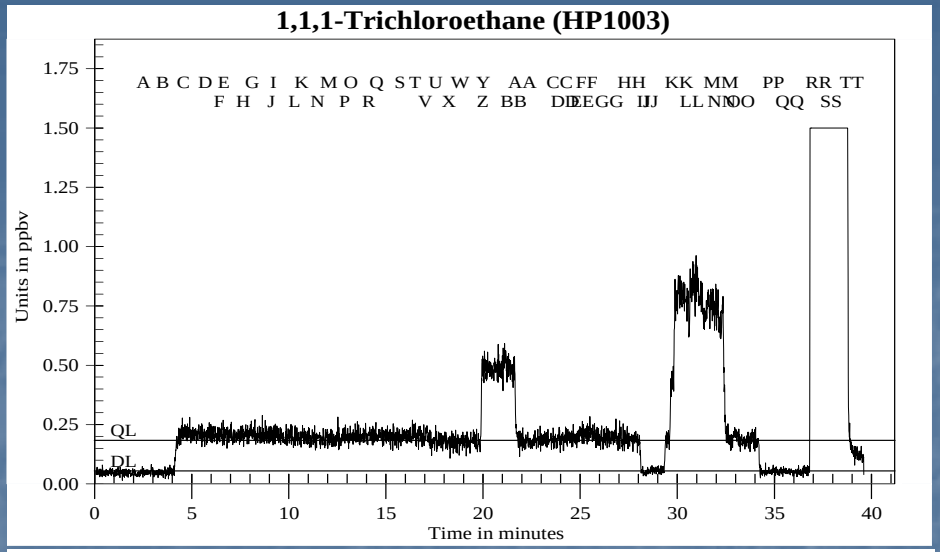
Placement and Cementing of the Probe

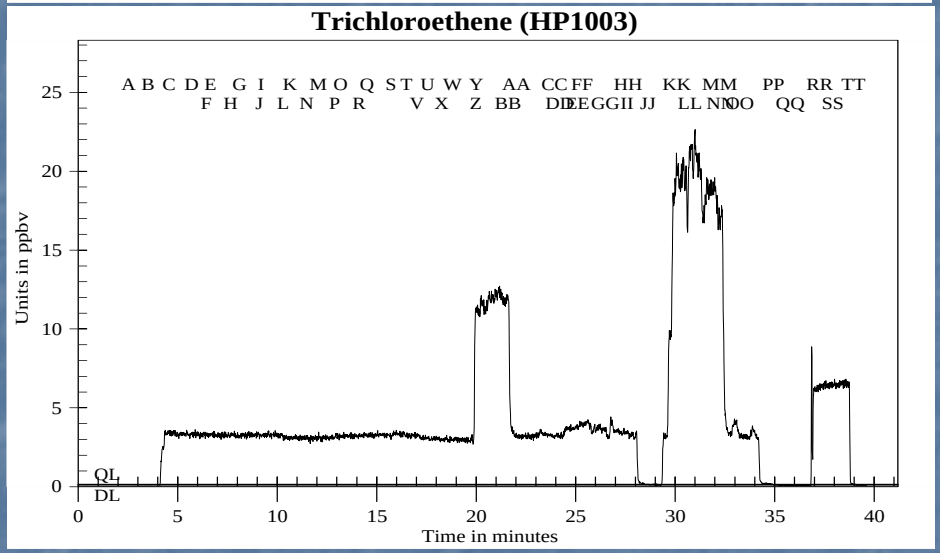
INITIAL TAGA MONITORING

MONITORING FOR SUBSURFACE INTRUSION SOURCE
TCE Site
Region 2

Region 2 - TCE Site







Residence Schematics and Compound Concentrations

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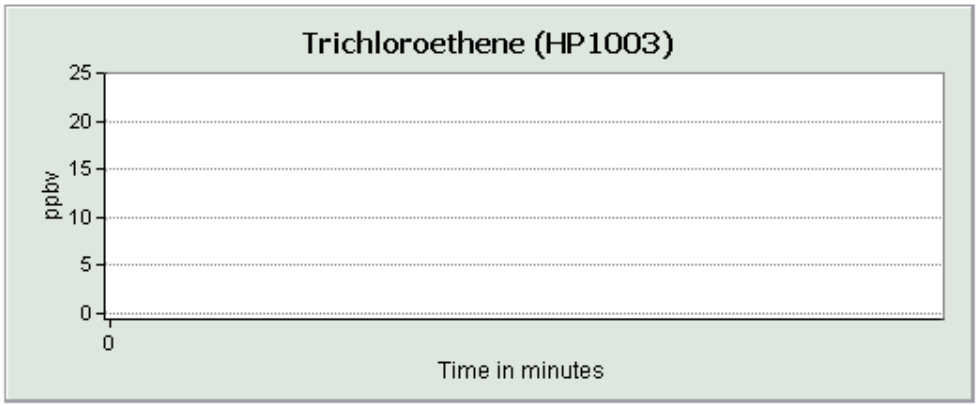
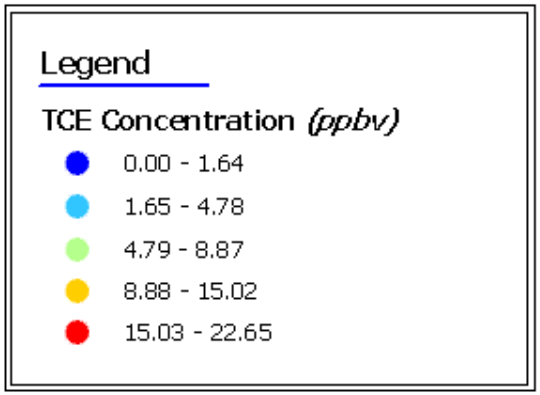




MONITORING FOR SIGNATURE COMPOUNDS TO DETERMINE SUBSURFACE GAS INTRUSION

Chlorinated Solvent Site

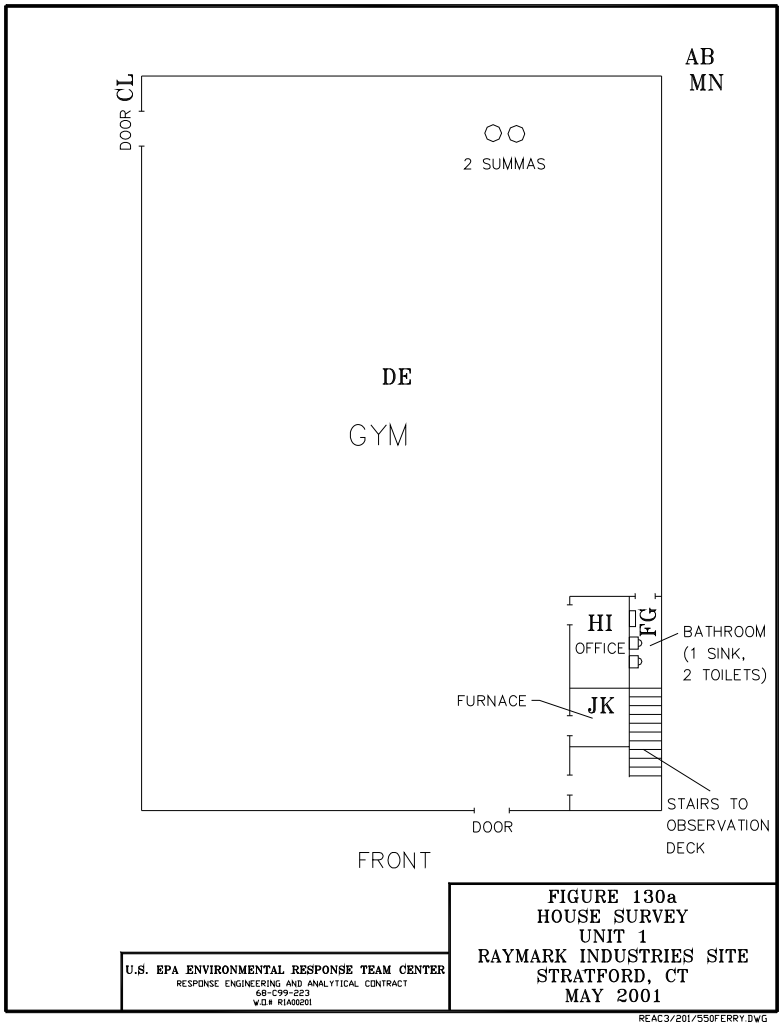
Region 1

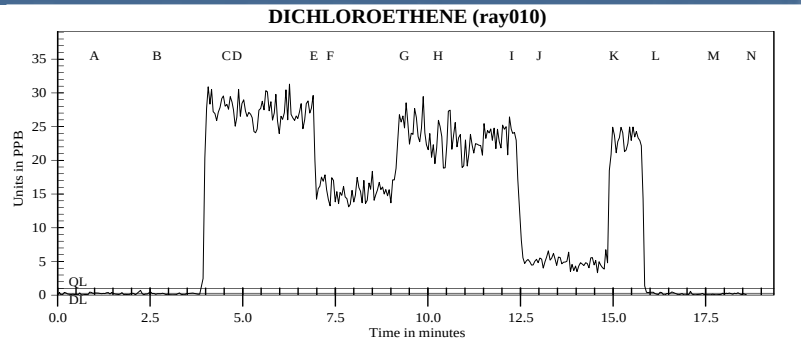
SELECTION OF PARENT/DAUGHTER IONS

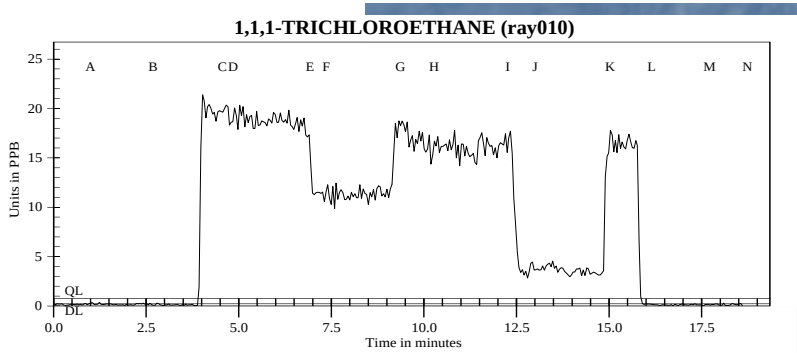
Compounds	Parent/Daughter Masses
Vinyl Chloride	62/27
Vinyl Chloride	64/27
Benzene	78/39
Benzene	78/52
Toluene	92/39
Toluene	92/51
1,1-Dichloroethene	96/61
1,1-Dichloroethene	98/61
1,1-Dichloroethene	98/63
1,1,1-Trichloroethane	97/61
1,1,1-Trichloroethane	99/61
1,1,1-Trichloroethane	99/63
Chlorobenzene	112/77
Chlorobenzene	114/77
Trichloroethene	130/95
Trichloroethene	132/95
Trichloroethene	132/97

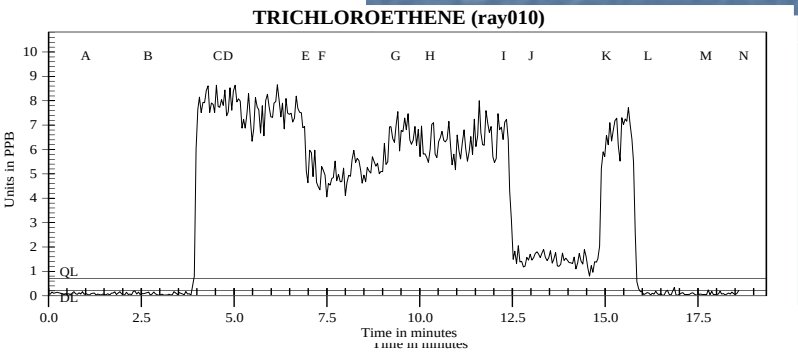
Unit 1

Gymnastic Facility For Children





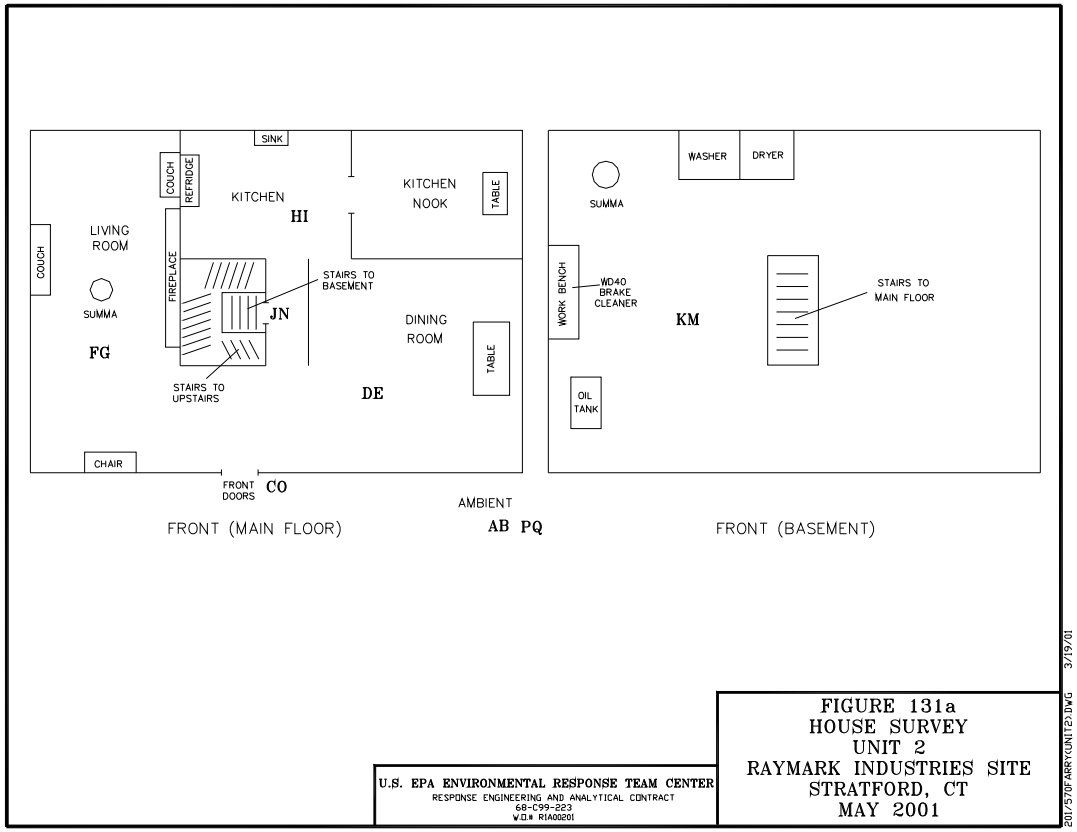


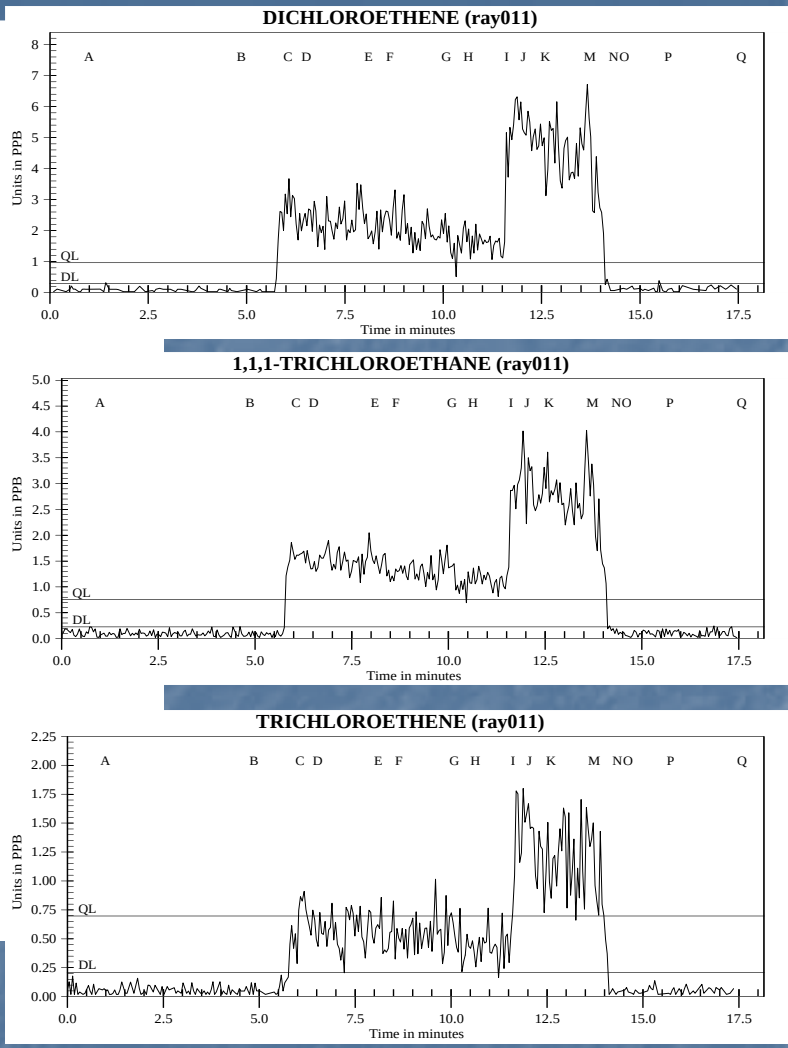


Building Schematic and Compound Concentrations

Unit 2

Residence Adjacent to the Gymnastic Facility

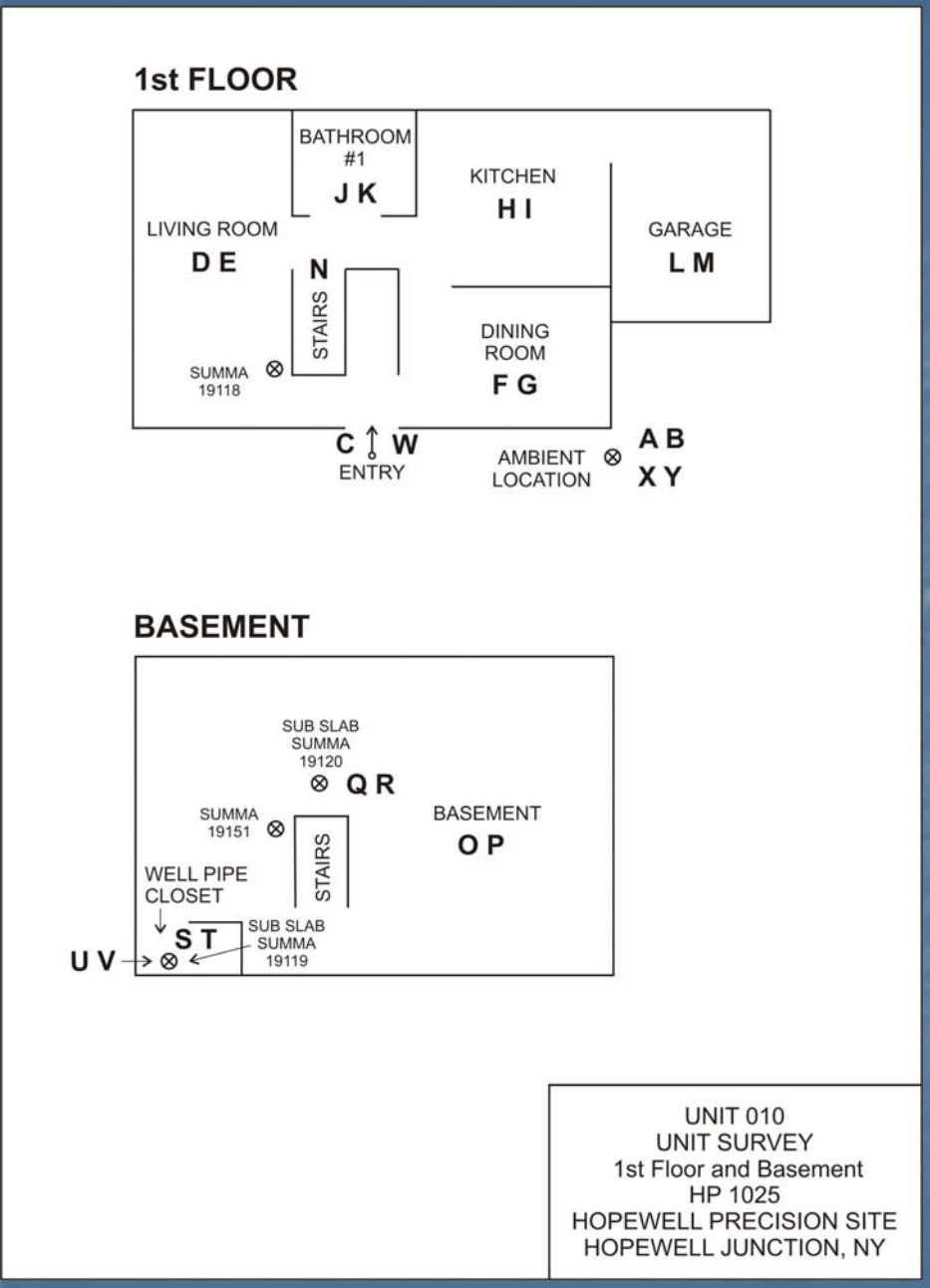


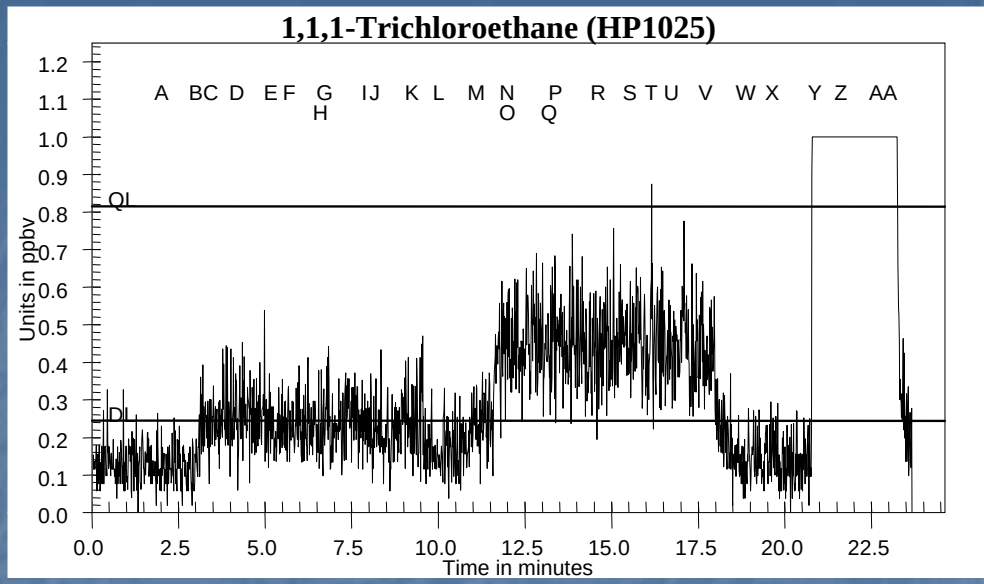


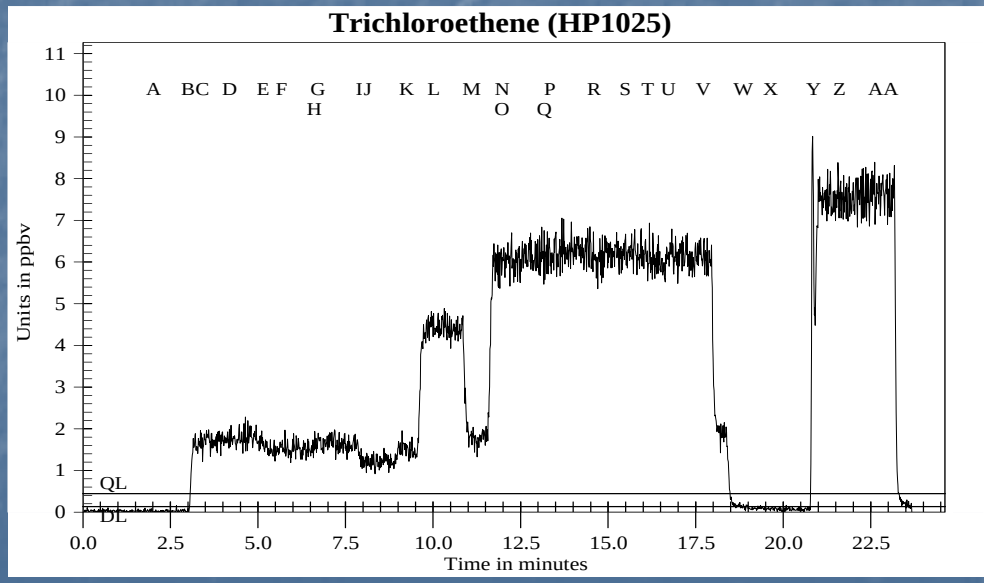
Residence Schematic and Compound Concentrations

MONITORING FOR LIFESTYLE SOURCES
TCE Site
Region 2

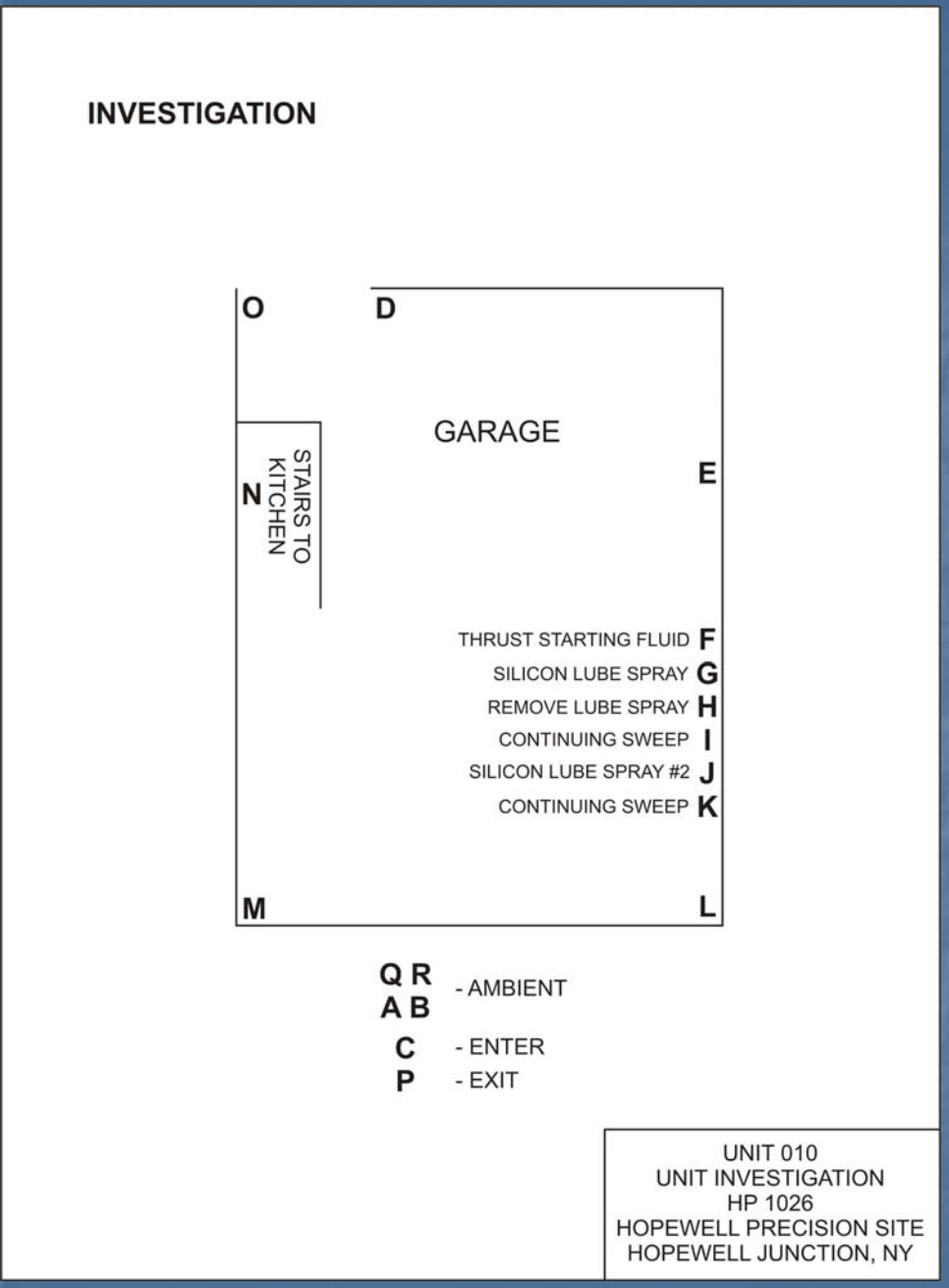
Region 2 - TCE Site

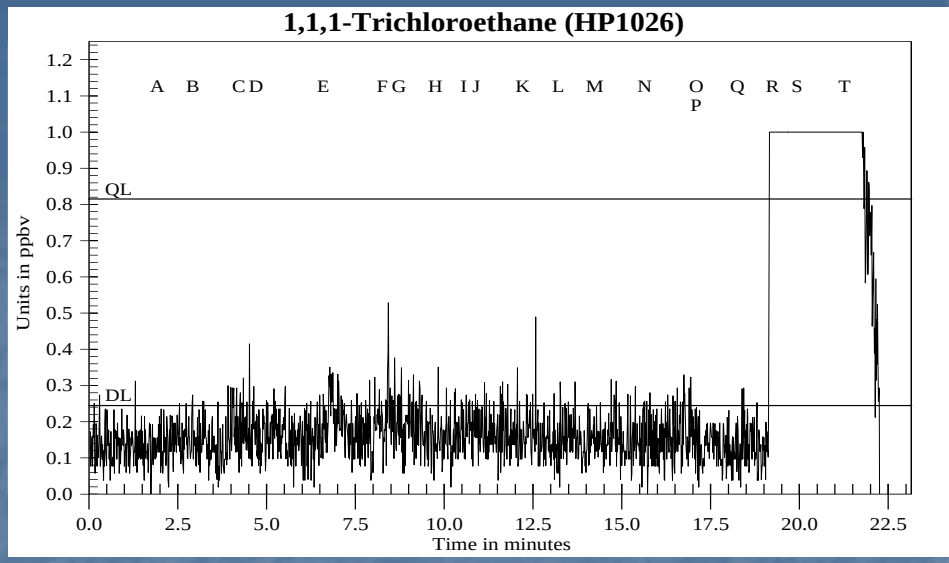


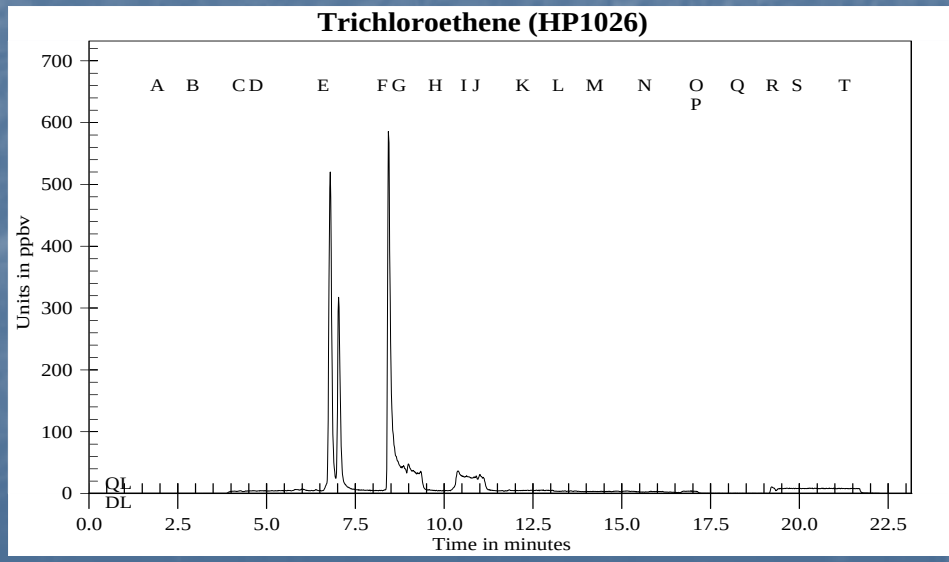




Residence Schematic and Compound Concentrations







Garage Schematic and Compound Concentrations

MONITORING FOR ACCIDENTAL OR INTENTIONAL RELEASES

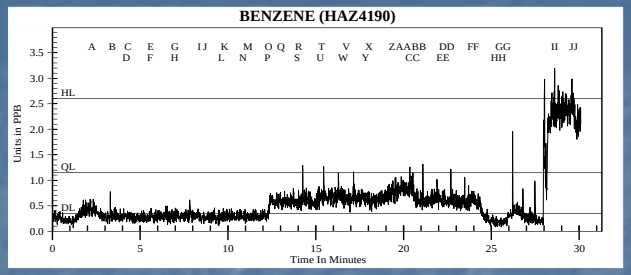
Gasoline Spill Site

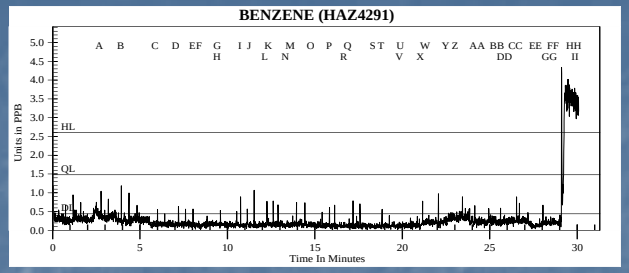
Region 3

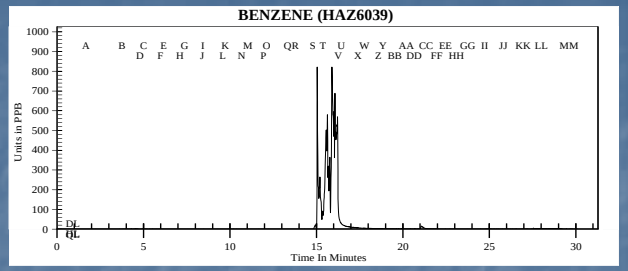
1st

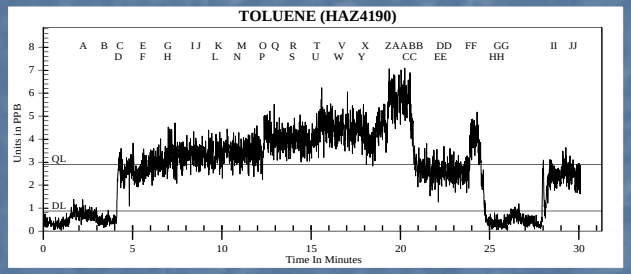
2nd

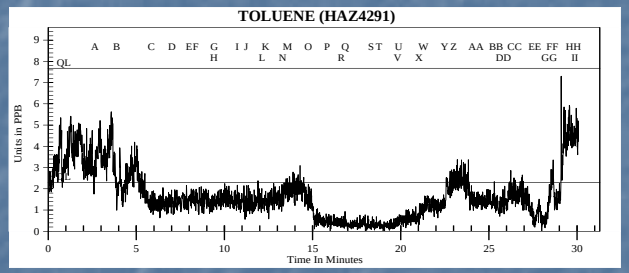
3rd

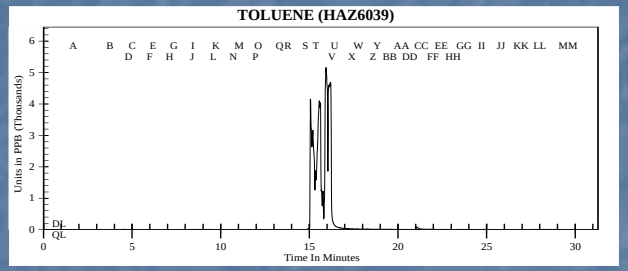


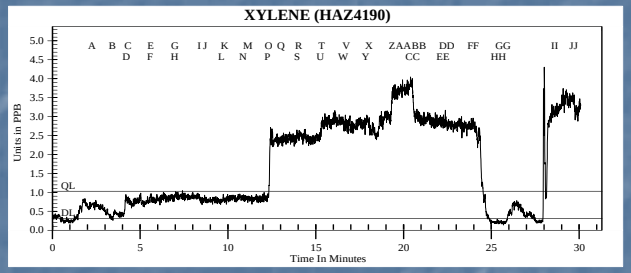


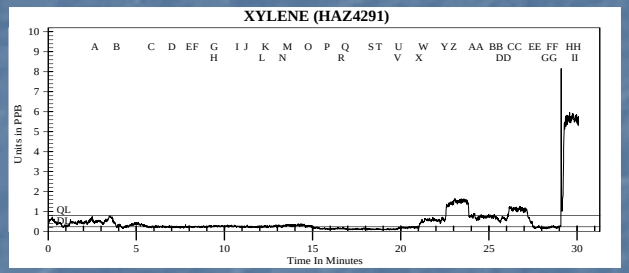


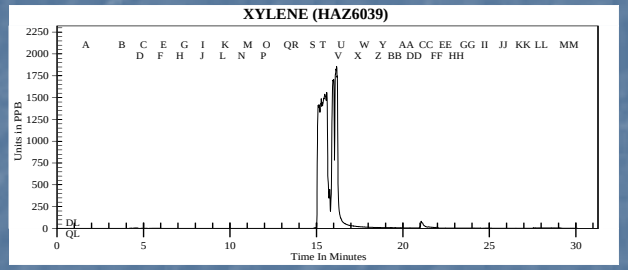












Benzene < 1.0 PPBV

Benzene < 1.0 PPBV

Benzene > 900 PPBV

Benzene, Toluene and Xylene Concentrations

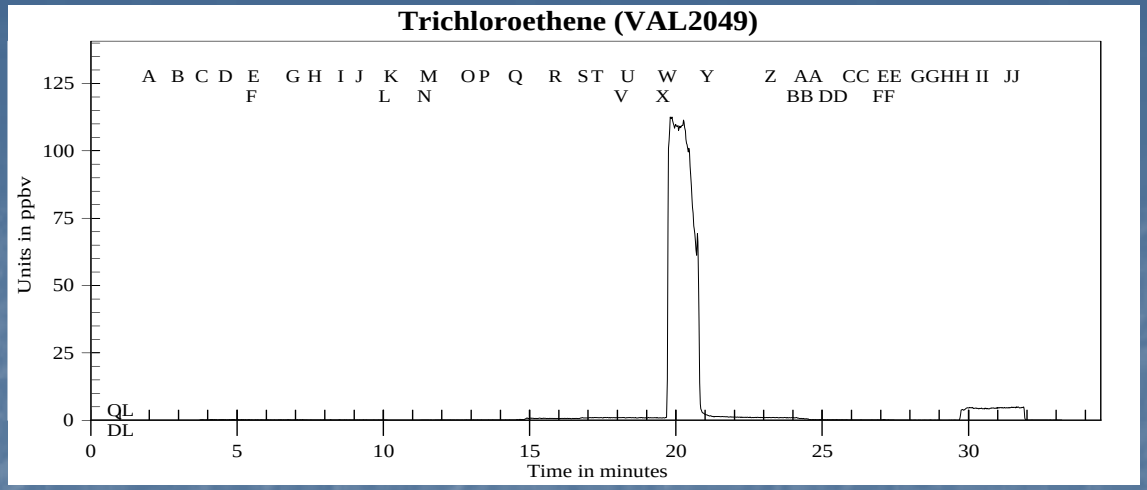
MONITORING FOR METEOROLOGICAL EFFECTS
TCE Site
Region 3

Region 3 - TCE Site

1ST

Rainfall - 0.9 inch
11/06 1500 – 2300
Wind ~ 5 mph
11/07 0000 – 1200

Wet Sumps

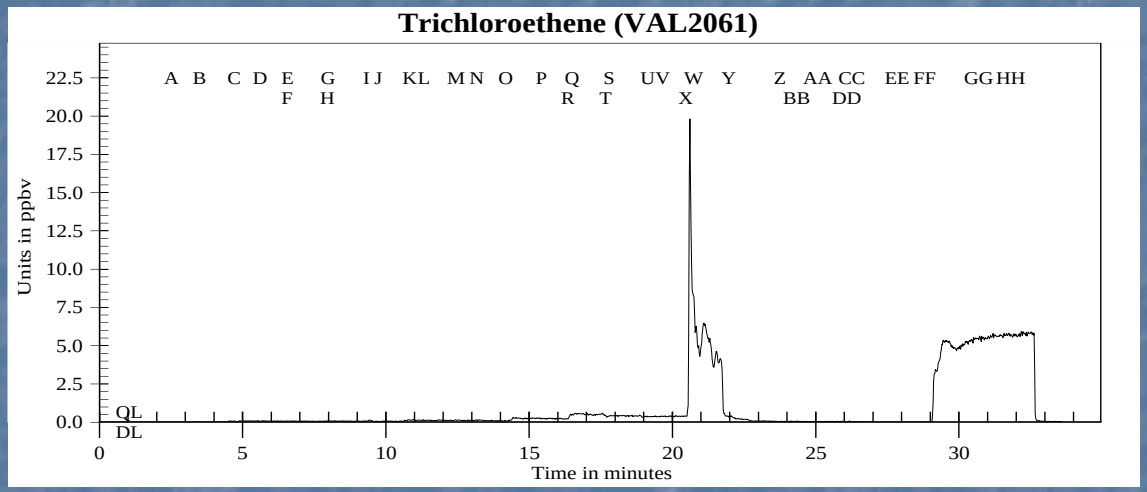


~ 120 PPBV

2ND

Rainfall - 1.9 inch
11/12 0500 – 2300
Wind ~ 25 mph
11/13 0000 – 1100

Dry Sumps



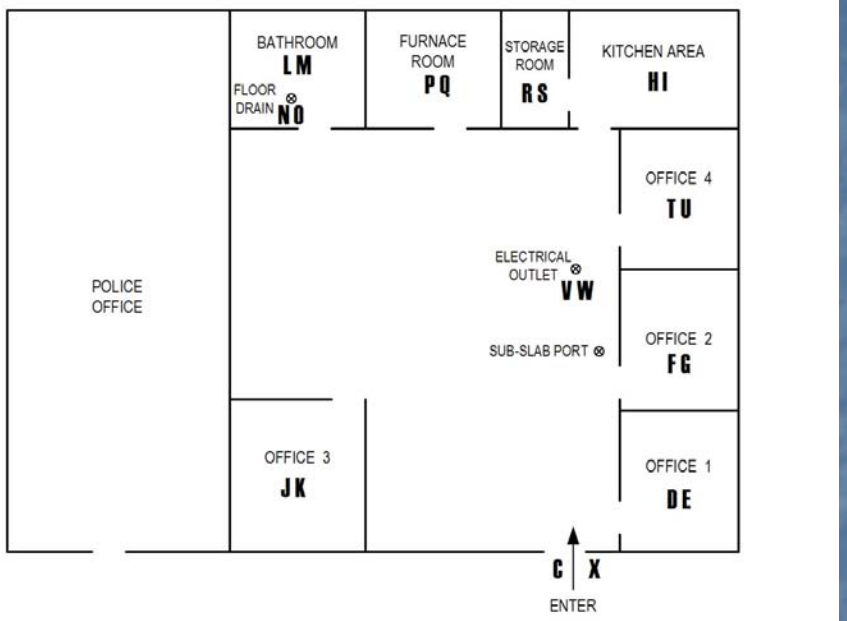
~21 PPBV

Trichloroethene Concentrations in the Sump Area

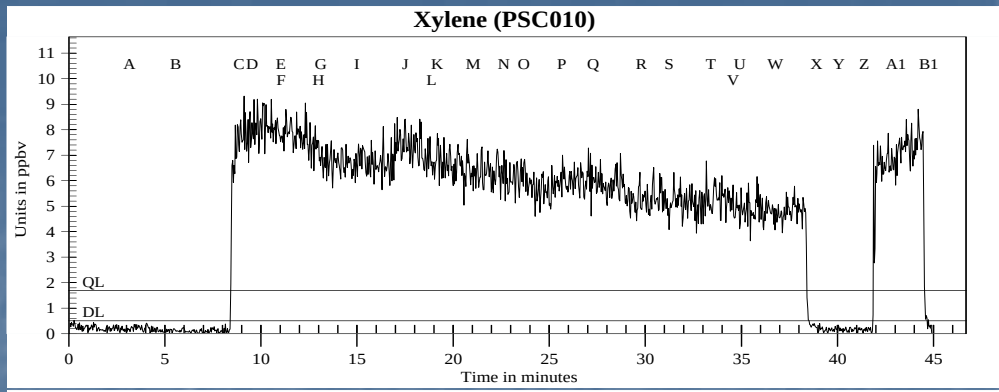
MONITORING FOR CONTRIBUTIONS FROM ATTACHED FACILITIES

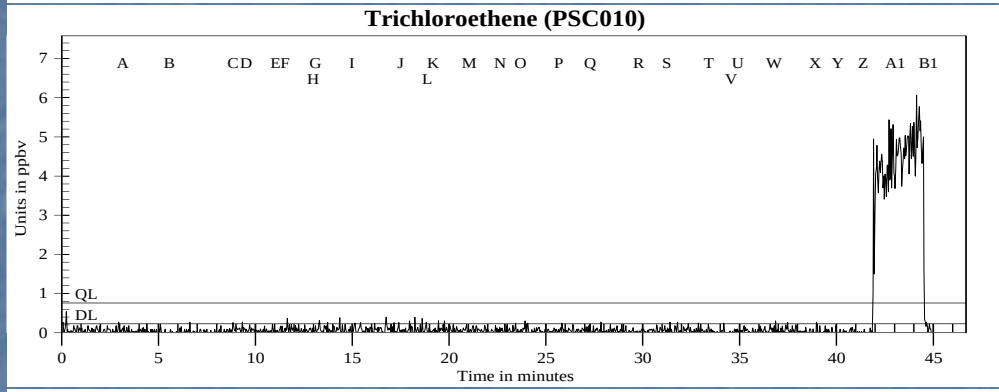
Solvent Site

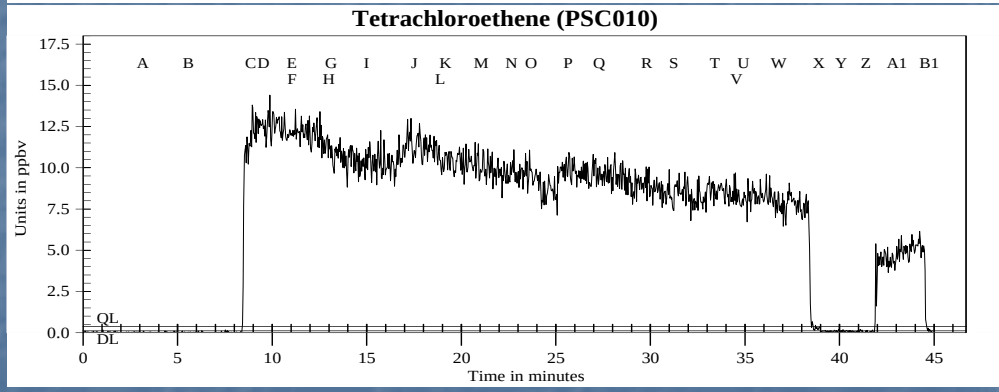
Region 6



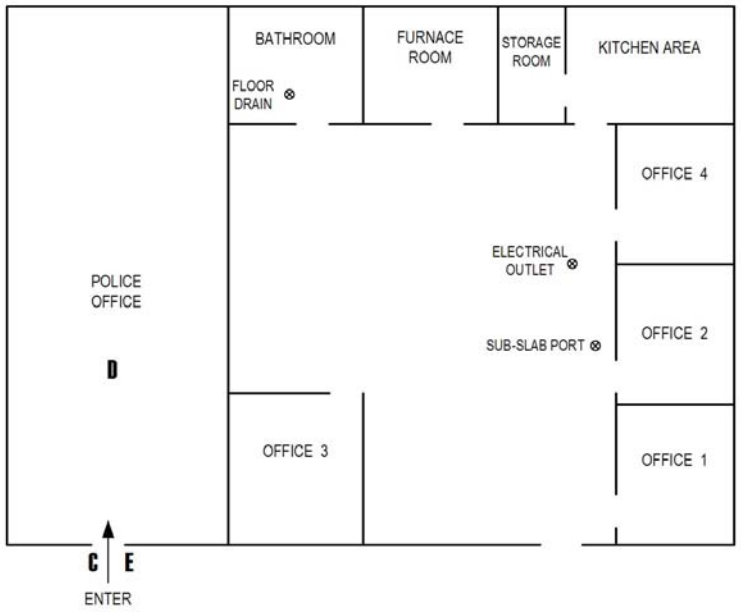
UNIT 004 SURVEY ONE
PSC010
PARKER SOLVENTS COMPANY SITE
LITTLE ROCK, ARKANSAS



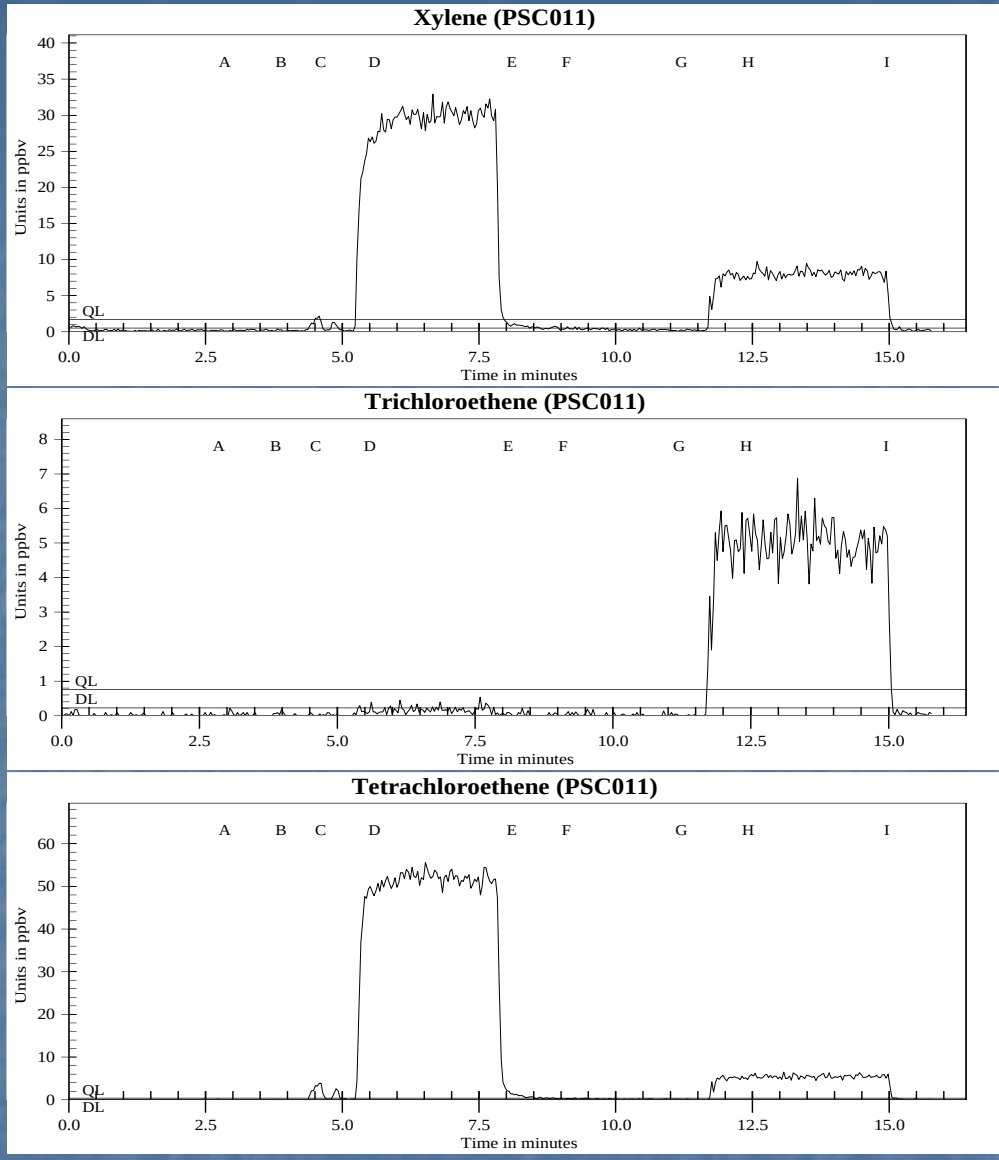




Building Schematics and Compound Concentrations

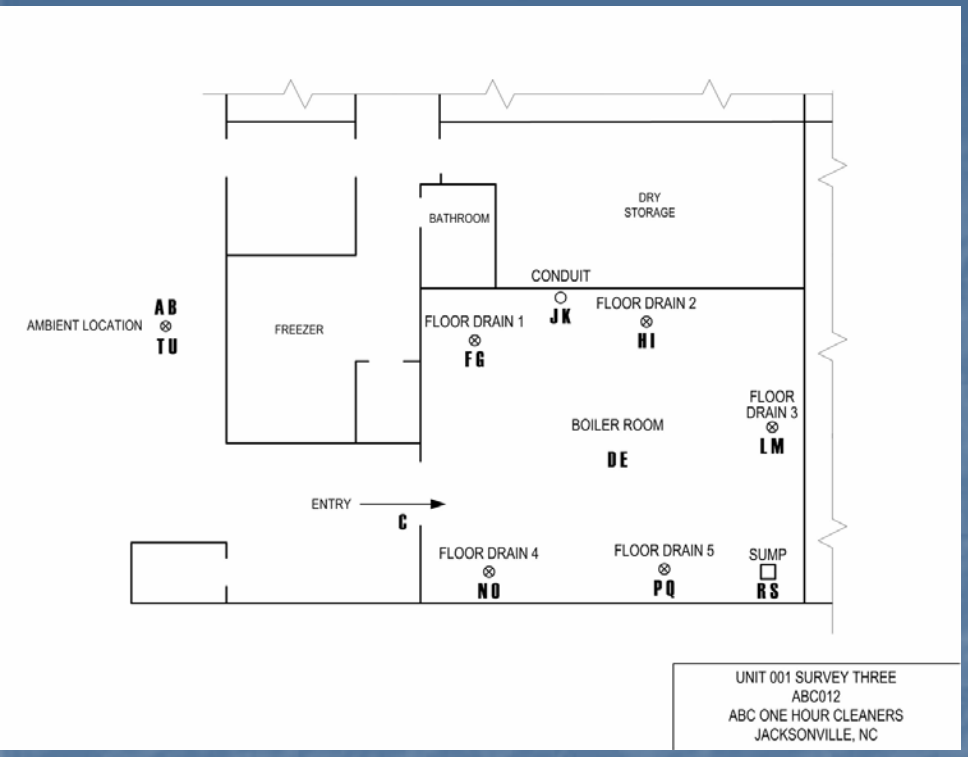


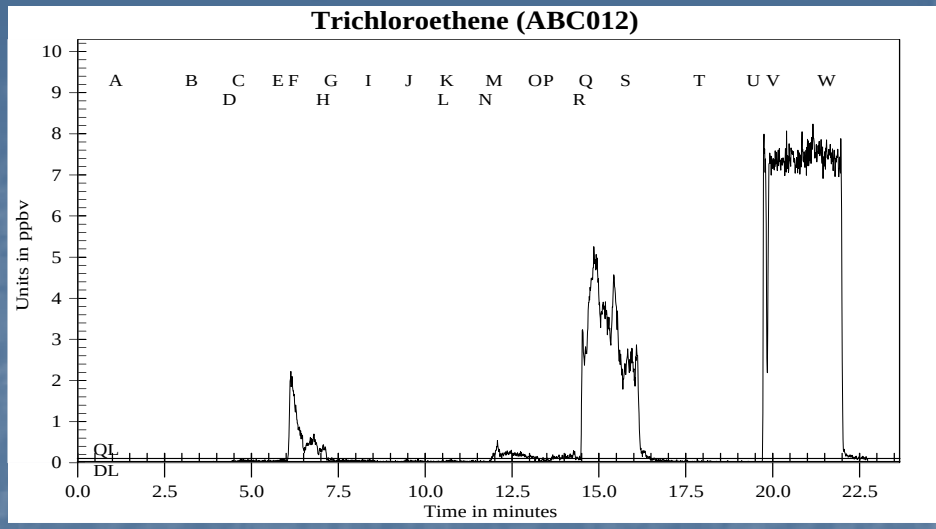
UNIT 004 SURVEY TWO
PSC011
PARKER SOLVENTS COMPANY SITE
LITTLE ROCK, ARKANSAS

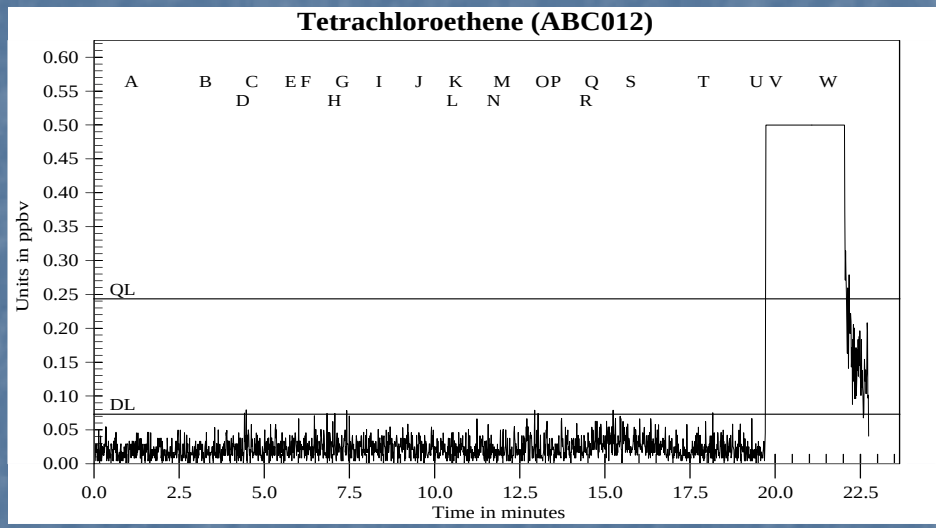


Building Schematic and Compound Concentrations

MONITORING FOR CONTRIBUTIONS FROM SELF-POLLUTING OPERATIONS AT THE MARINE CORPS BASE CAMP LEJEUNE, NC

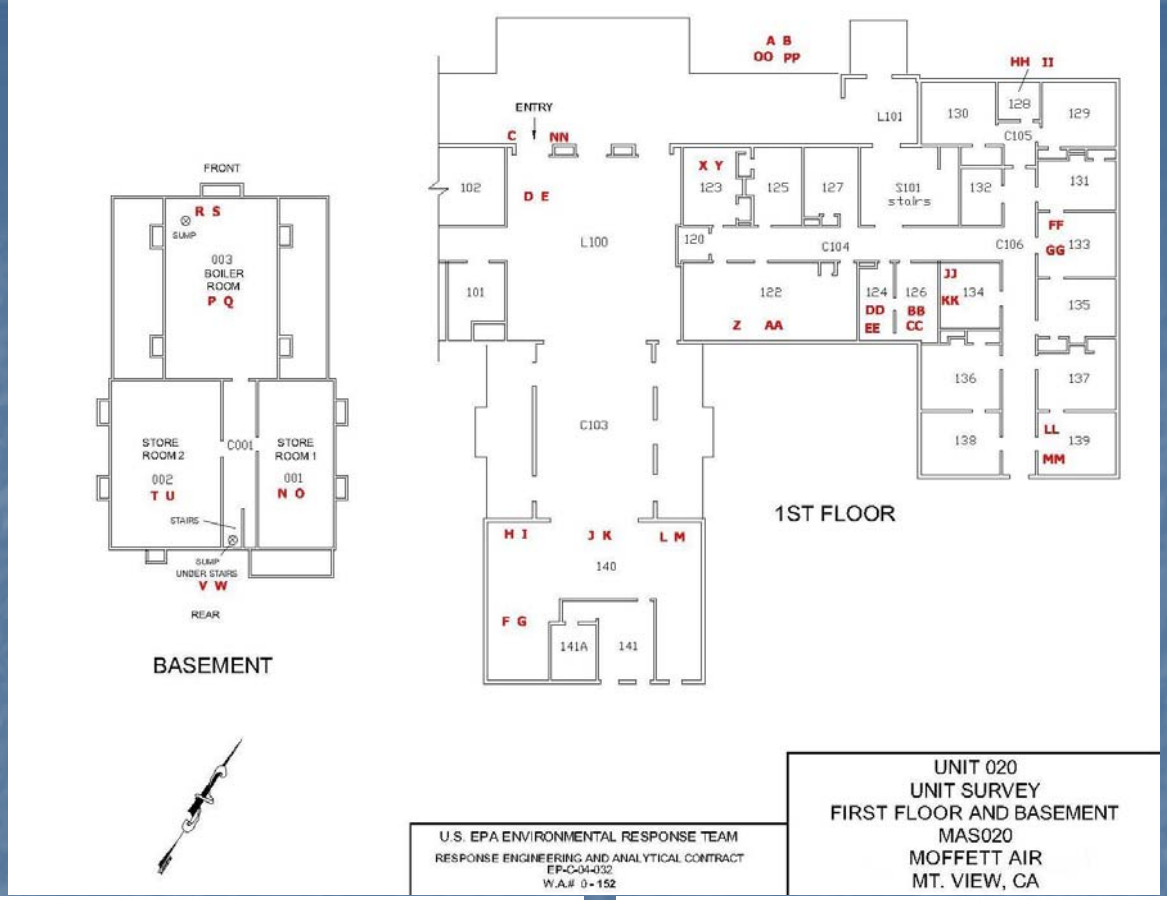


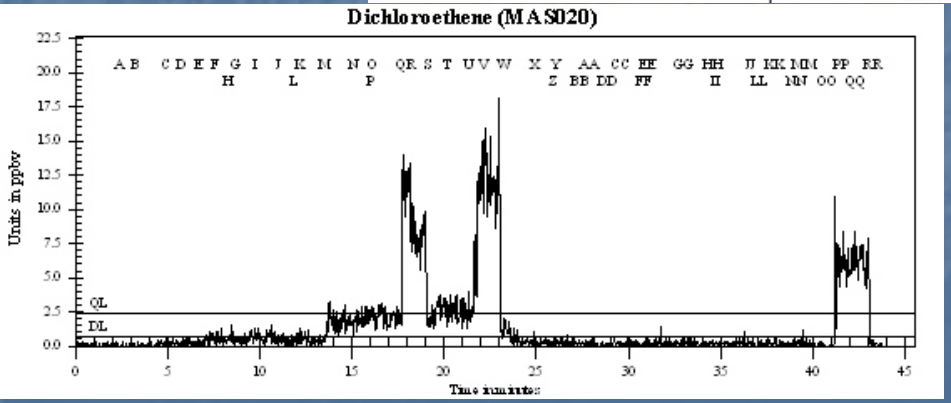


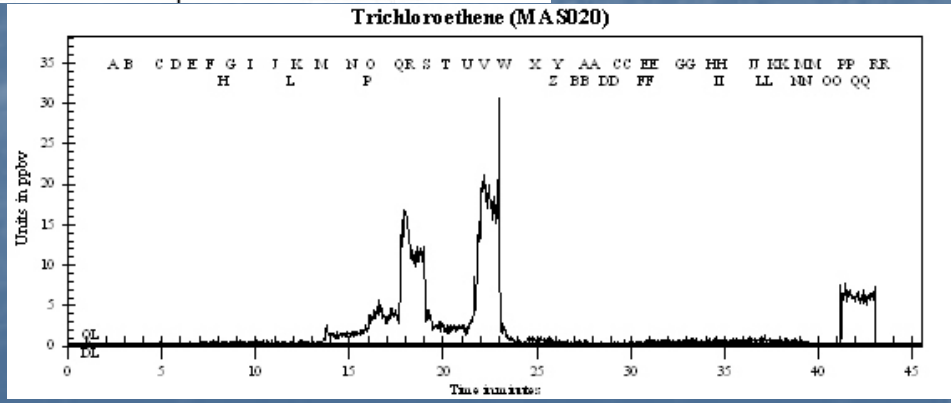


Tarawa Terrace School - Marine Corps Base Camp Lejeune, NC

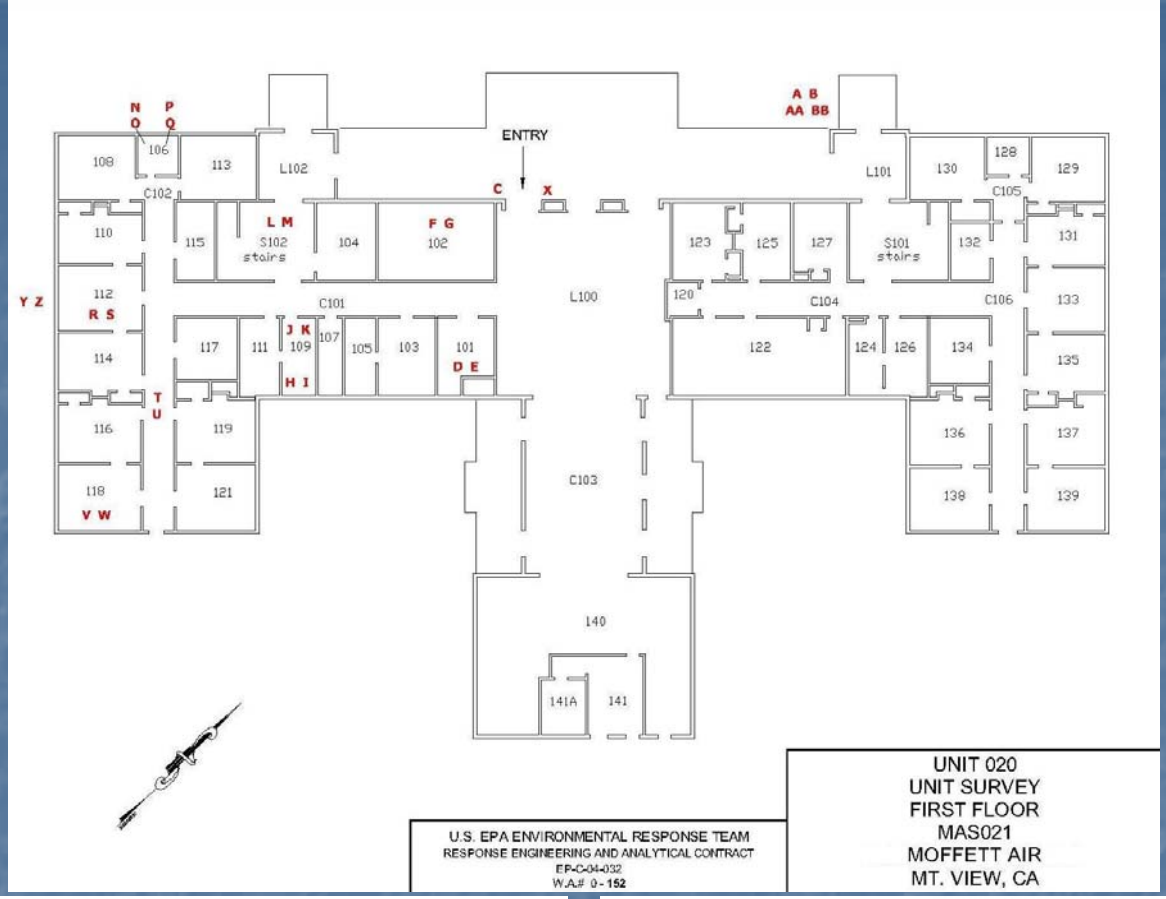
MONITORING FOR CONTRIBUTIONS FROM VAPOR INTRUSION AT THE FORMER NAVAL AIR STATION MOFFETT FIELD, CA

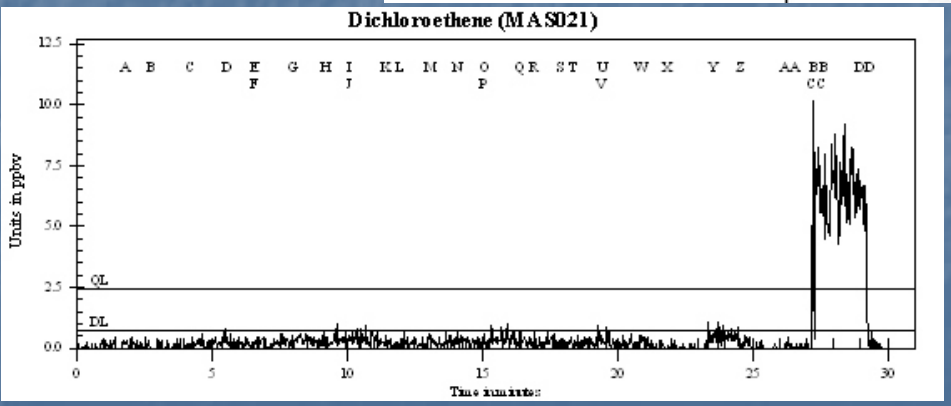


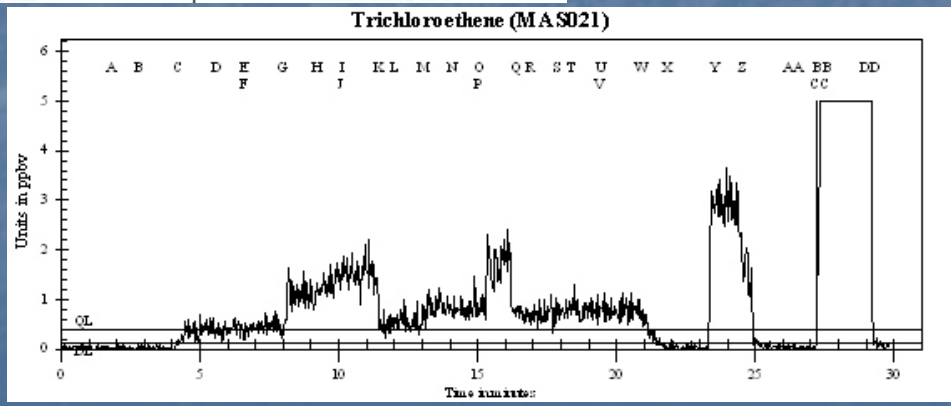




Building 20 - Former Naval Air Station Moffett Field







Building 20 - Former Naval Air Station Moffett Field

MONITORING FOR CONTRIBUTIONS FROM VAPOR INTRUSION AT THE FORMER RARITAN ARSENAL, NJ

0124-DFA-111805

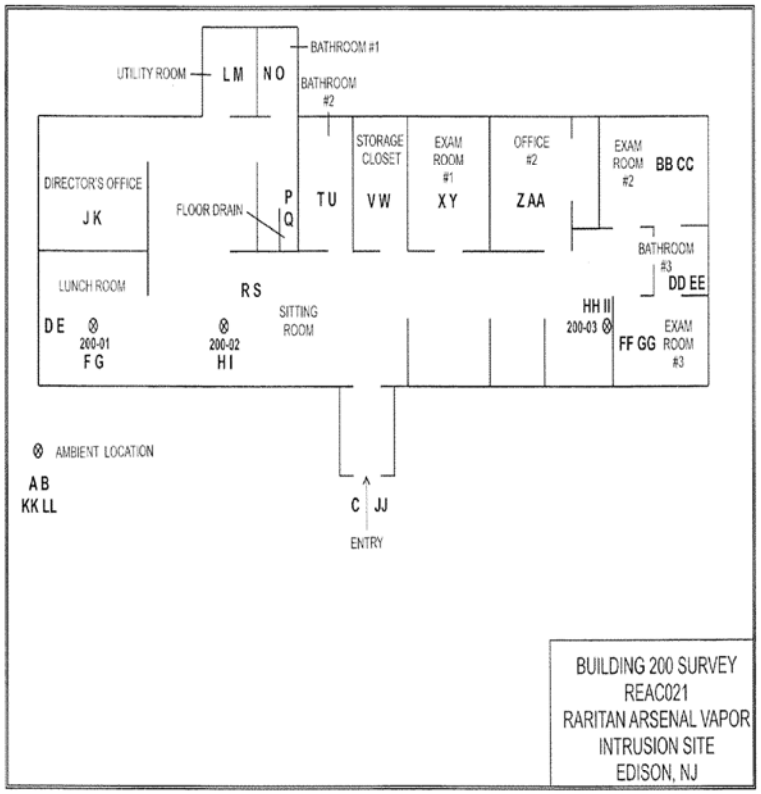


Figure 5a Building 200 Survey Floor Plan, REAC021

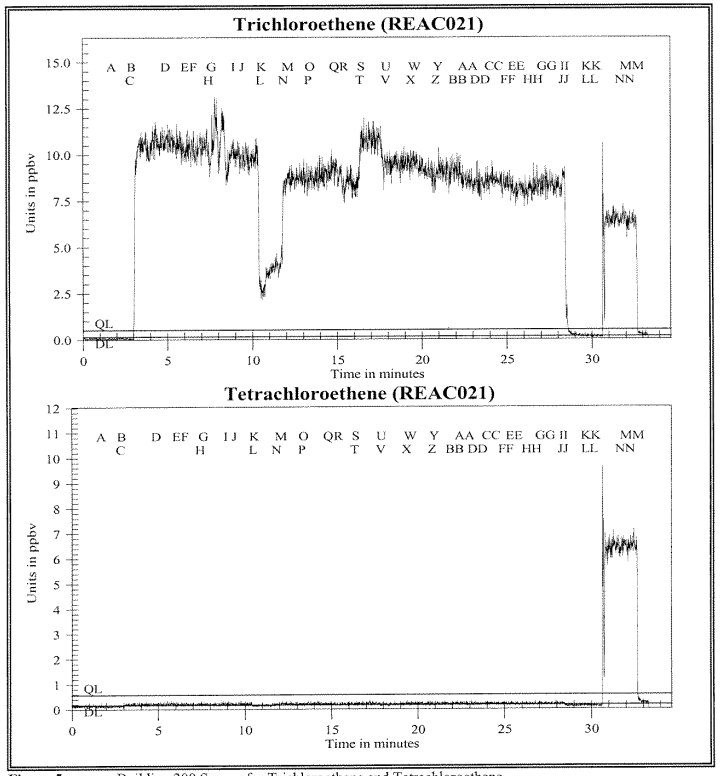


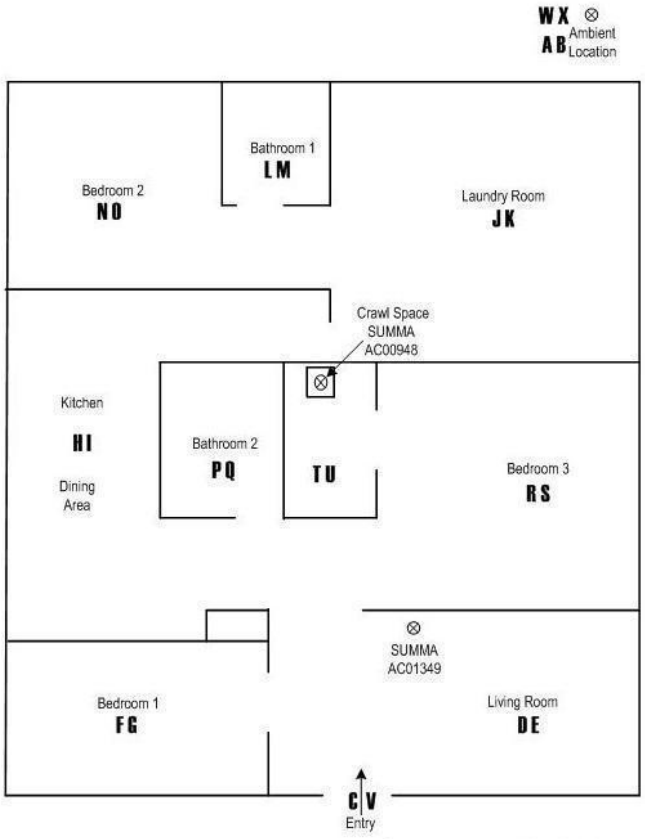
Figure 5c Building 200 Survey for Trichloroethene and Tetrachloroethene

0124-DFA-111805

Building 200 – Former Raritan Arsenal

MONITORING FOR CONTRIBUTIONS FROM CRAWLSPACE AREAS
TCE Site
Region 6

TCE Site Region 6



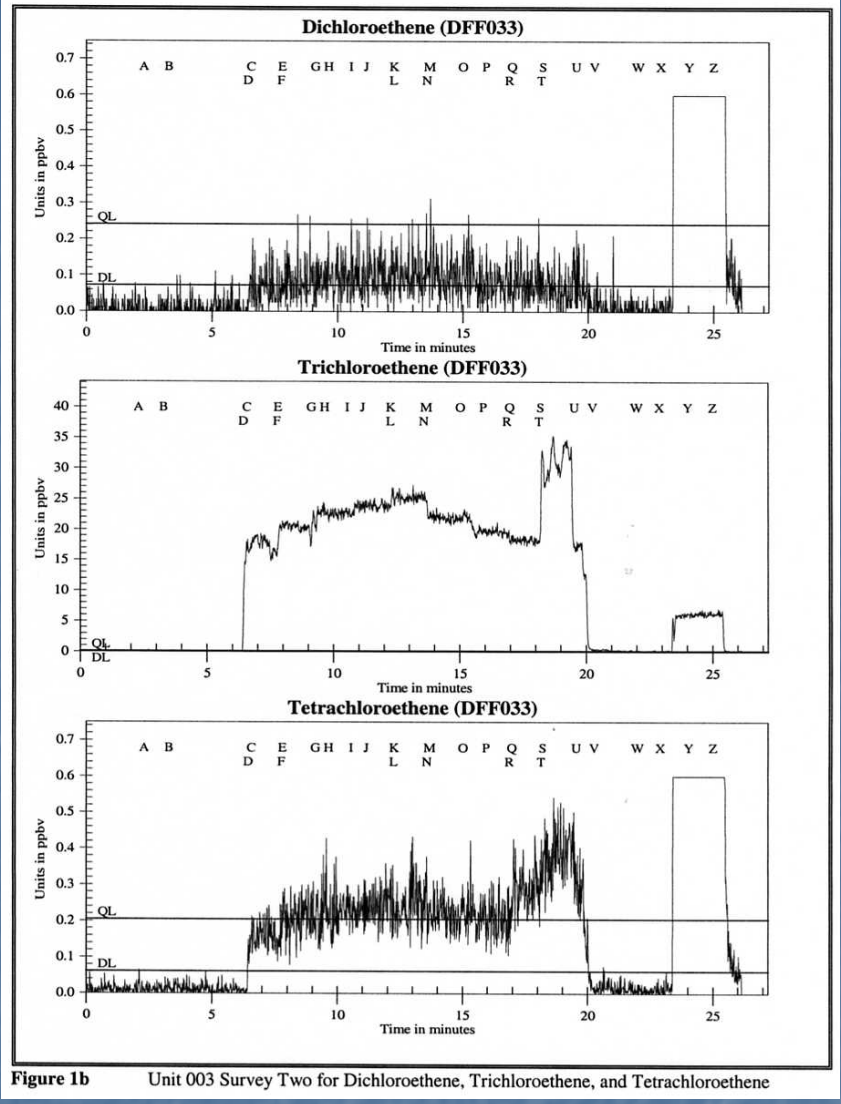


Figure 1b Unit 003 Survey Two for Dichloroethene, Trichloroethene, and Tetrachloroethene

Residence Schematics and Compound Concentrations

MONITORING FOR CONTRIBUTIONS FROM ACTIVITIES IN ADJACENT STRUCTURES
Region 5

Region 5 – PCE Site

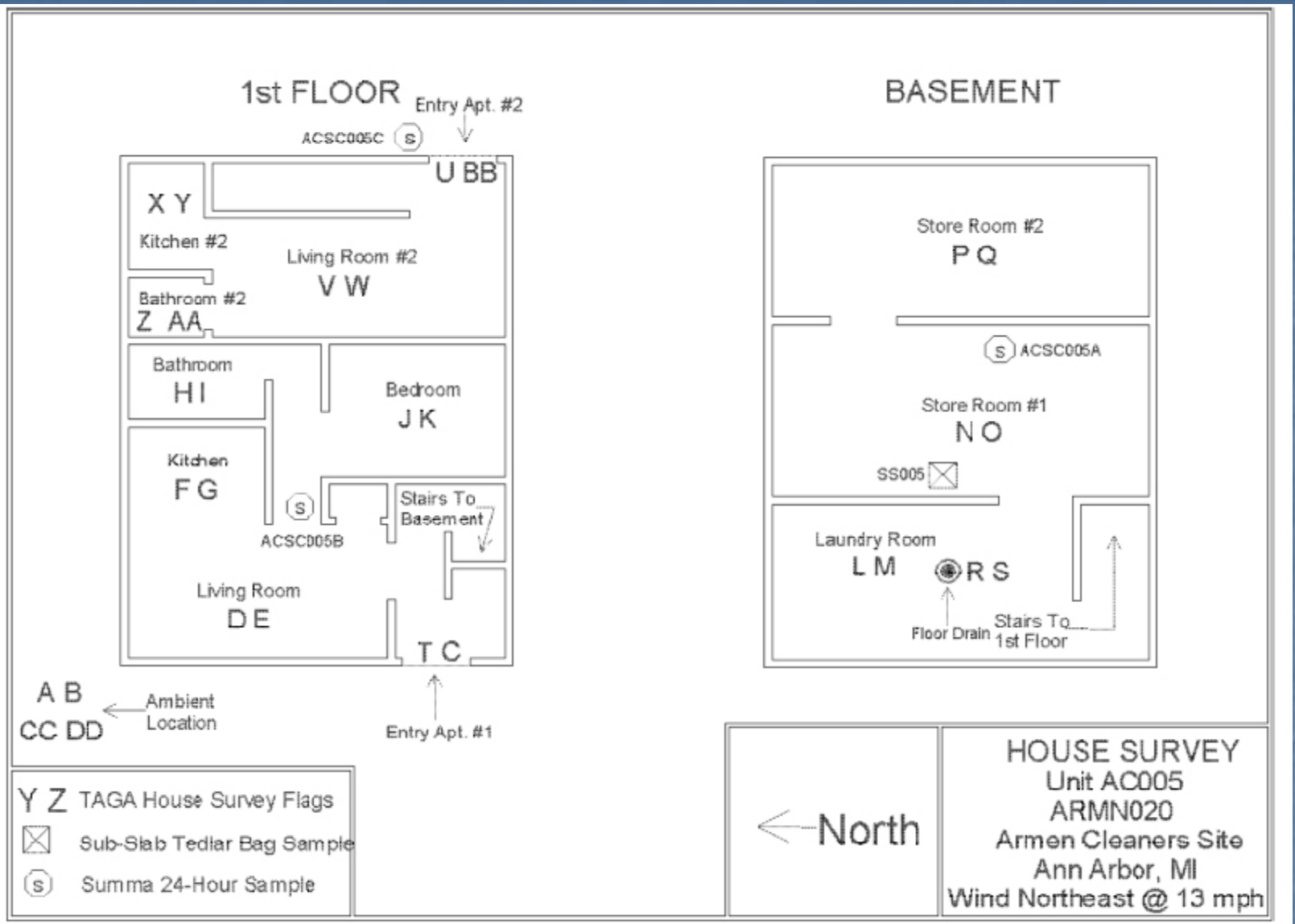
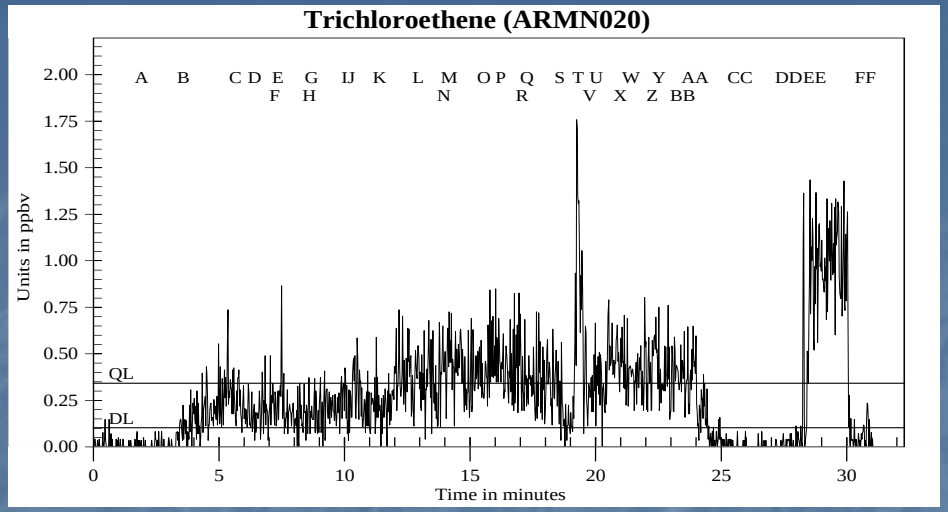
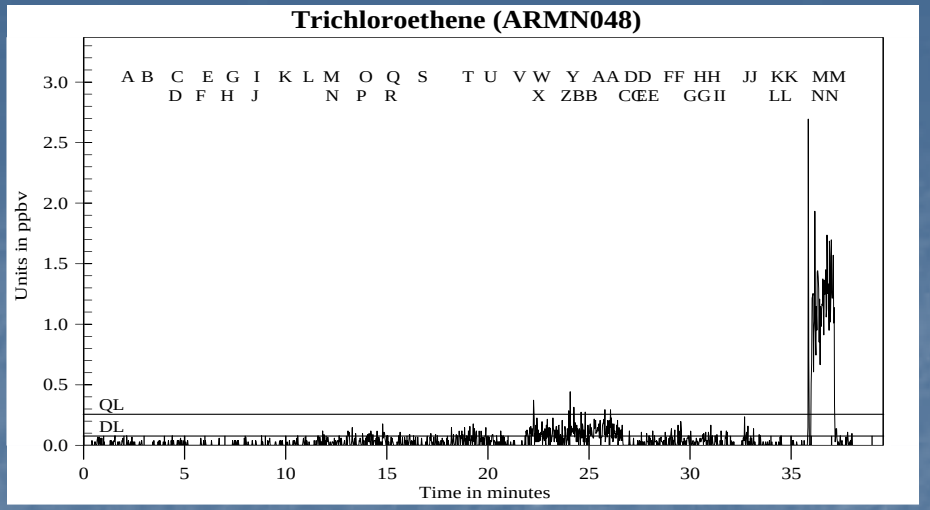
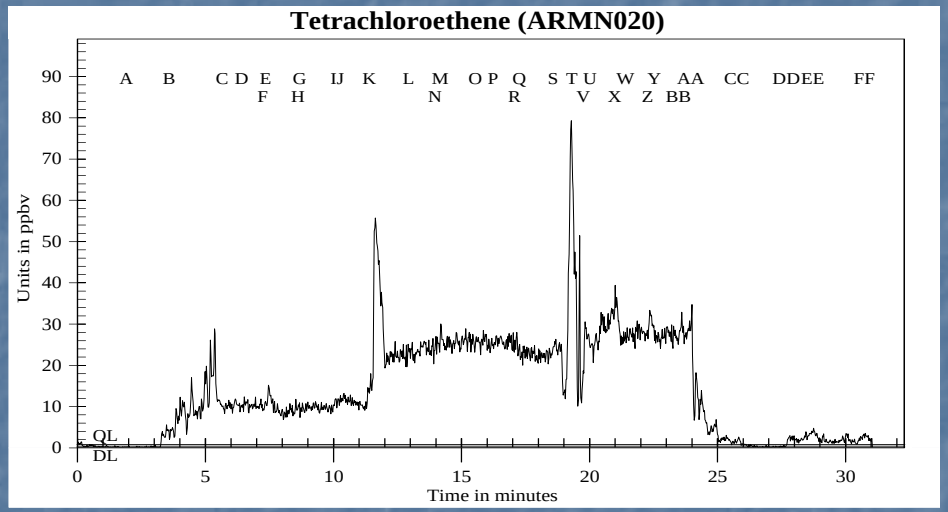


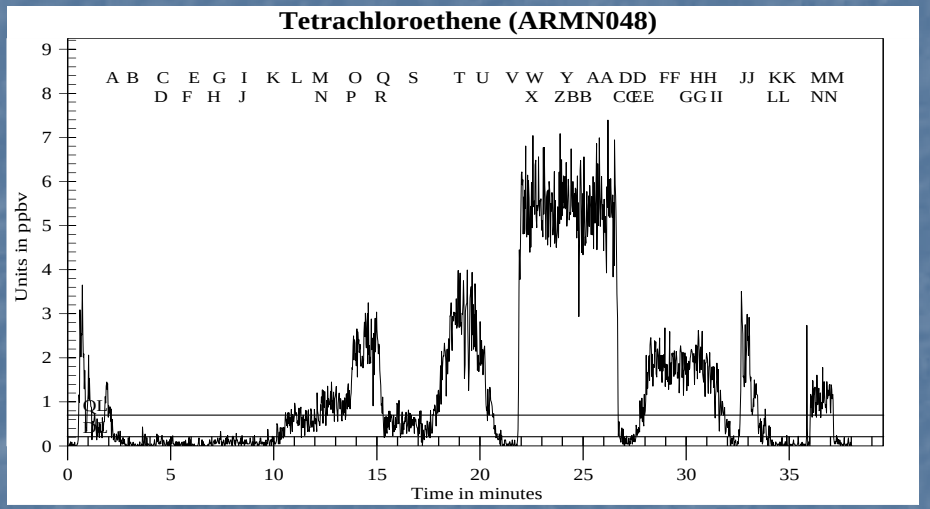
Figure 7a House Survey in Unit AC-005, ARMN020

Schematic of the Residence



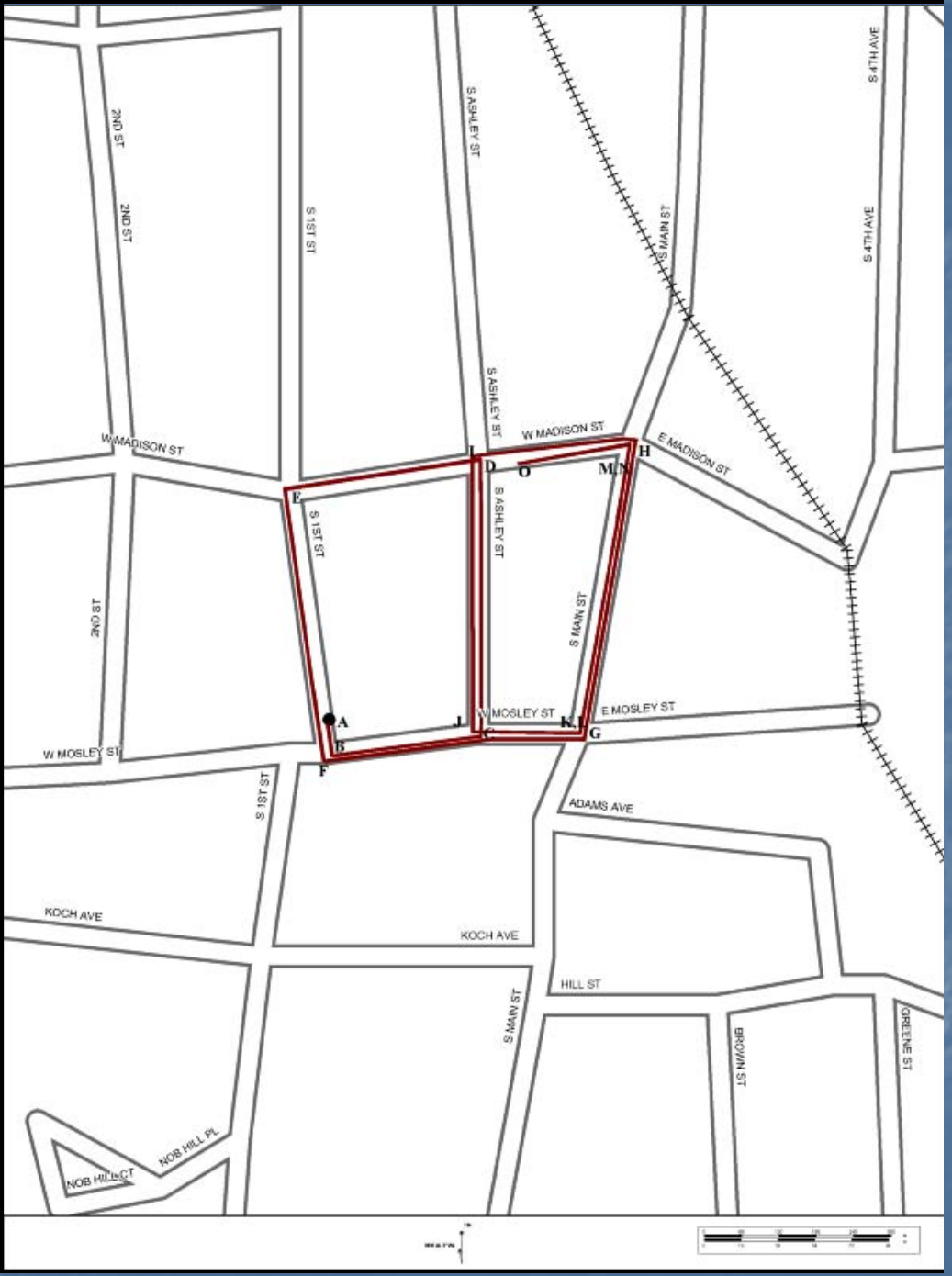


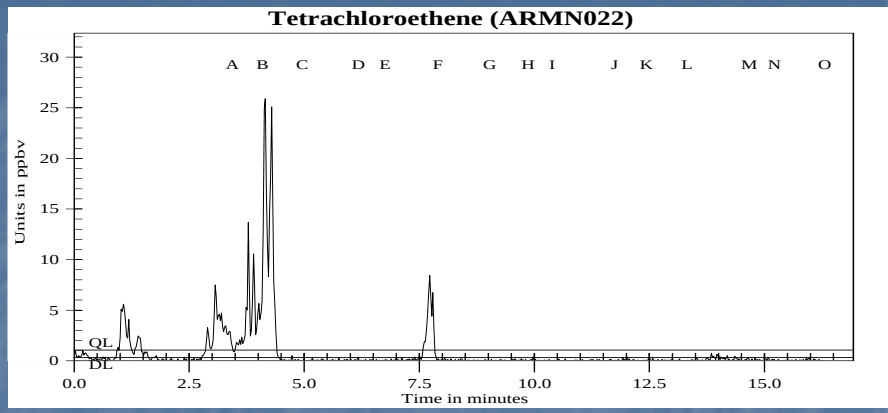




Northeast – 13 mph **North – 12 mph**

Indoor Air Compound Concentrations At the Same Residence On Two Different Days When The Wind Directions Varied





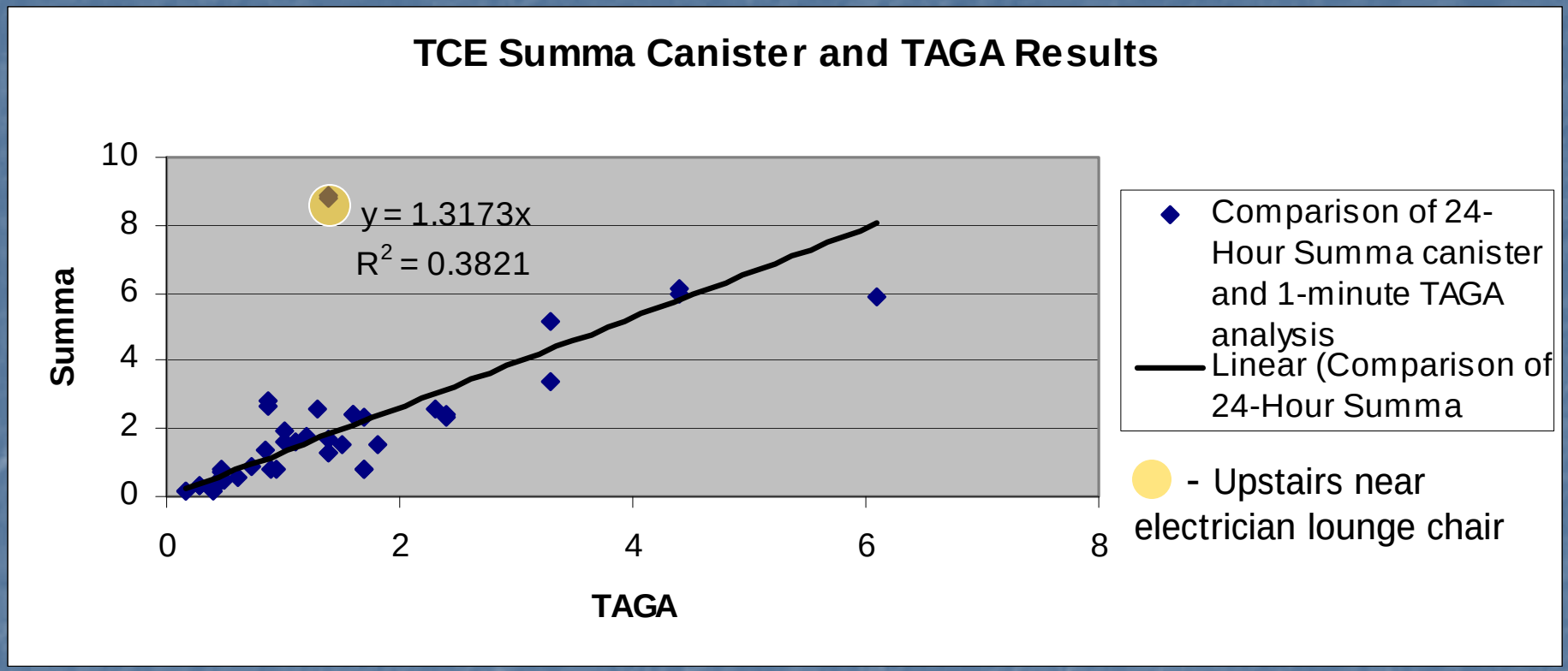
Wind: 10 mph/050°

Isolation Of The Source Using The TAGA in the Mobile Monitoring Mode

Figure 18a Mobile Monitoring Path Two, ARMN022

INDOOR ANALYSIS

Comparison of the TAGA Triple Quadrupole Mass Spectrometer Real-time Monitoring Results to the Off-site GC/MS Results of 6-Liter 24-Hour Time-weighted-averaged Summa Canister Samples



Hopewell Junction Site – Hopewell, NY

42 INDOOR LOCATIONS

May 14, 2008

24-HOUR SUMMA SAMPLES TO 1-MINUTE TAGA RESULTS

DATA POINTS: 152
RANGE OF DELTA (SUMMA – TAGA): -0.93 – 1.92 ppbv
RANGE OF % DIFFERENCE (SUMMA – TAGA)/SUMMA
-48.3 to +84.2%

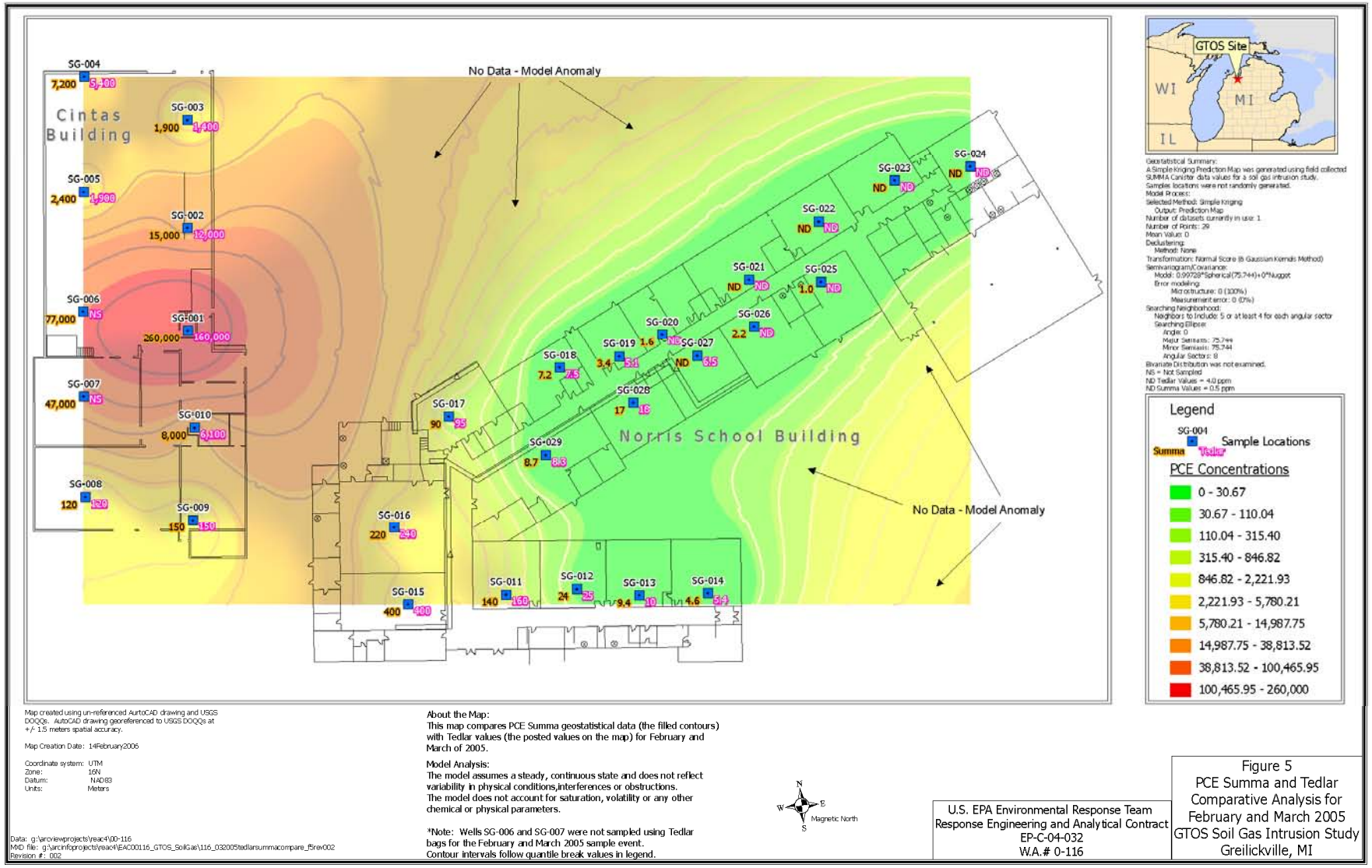
NOT DETECTED: 110
100% AGREEMENT BETWEEN SUMMA AND TAGA

GRAND TRAVERSE OVERALL SITE

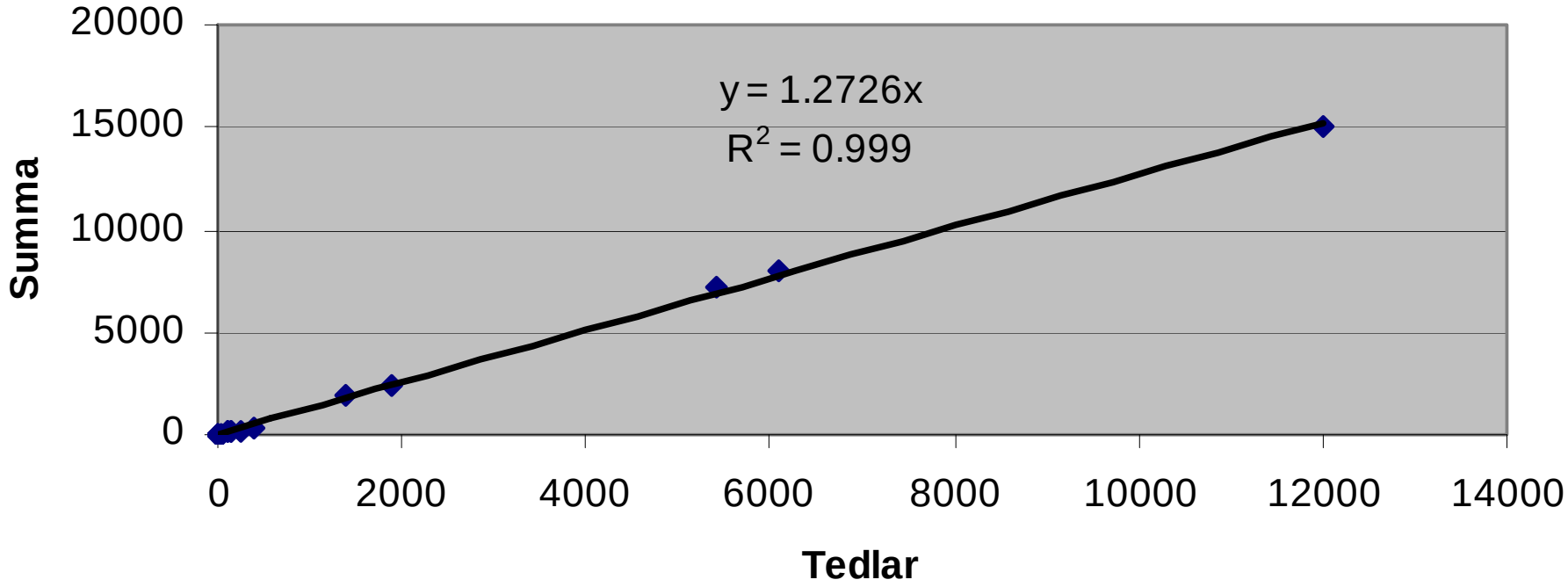
TEDLAR BAG GRAB SAMPLES ANALYZED ON SITE (using a sample concentrator – **45 minute run time** – 1 ppbv detection limit) vs SUMMA CANISTER 24-HOUR SAMPLES ANALYZED OFF SITE

30 SUBSLAB LOCATIONS

MARCH 2005



GTOS Facility and Norris Elementary School
February & March 2005
Comparison Summa and Tedlar Bag Sampling



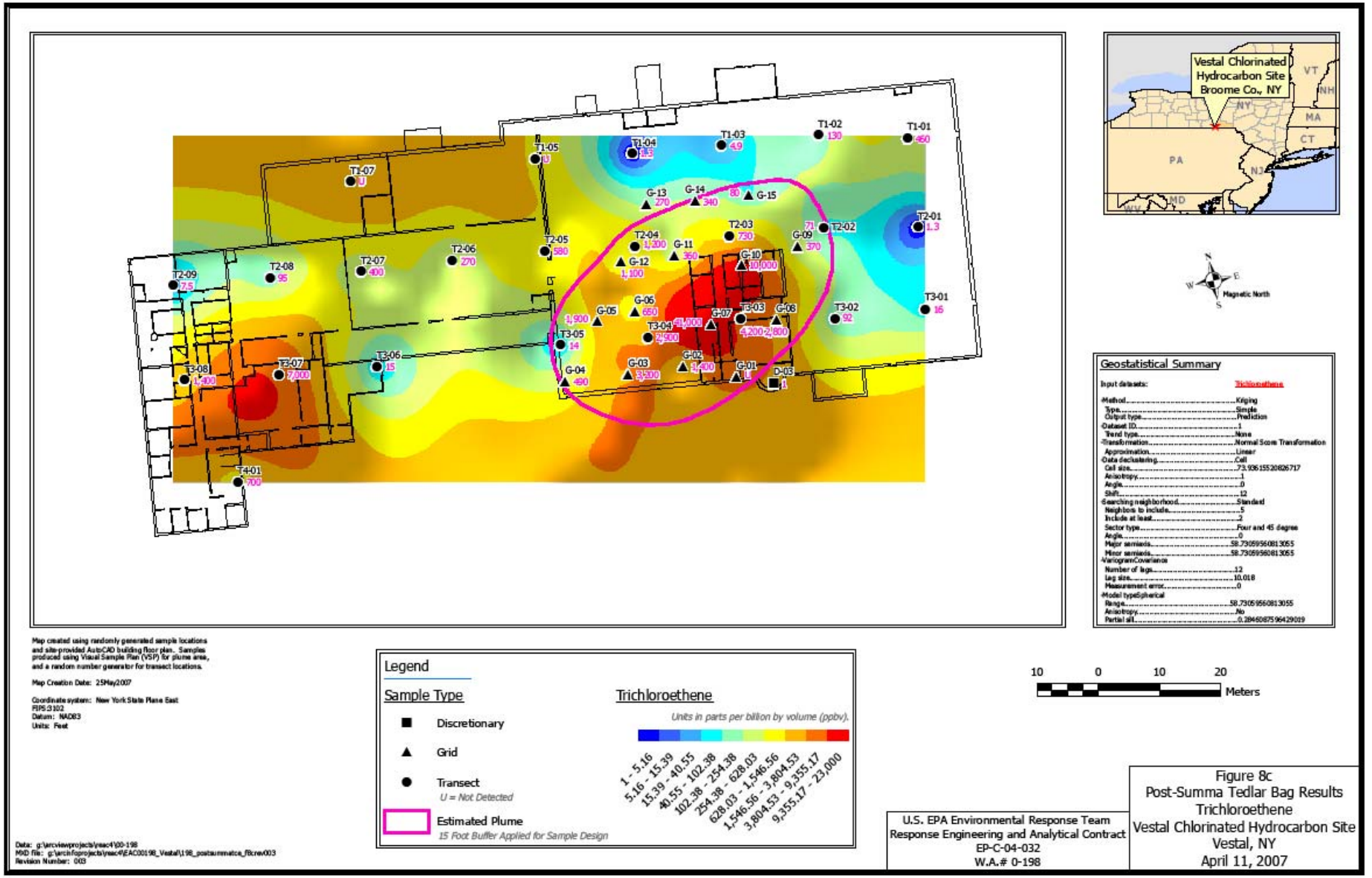
Grand Traverse Overall Supply Site – Traverse City, MI

30 SUBSLAB LOCATIONS

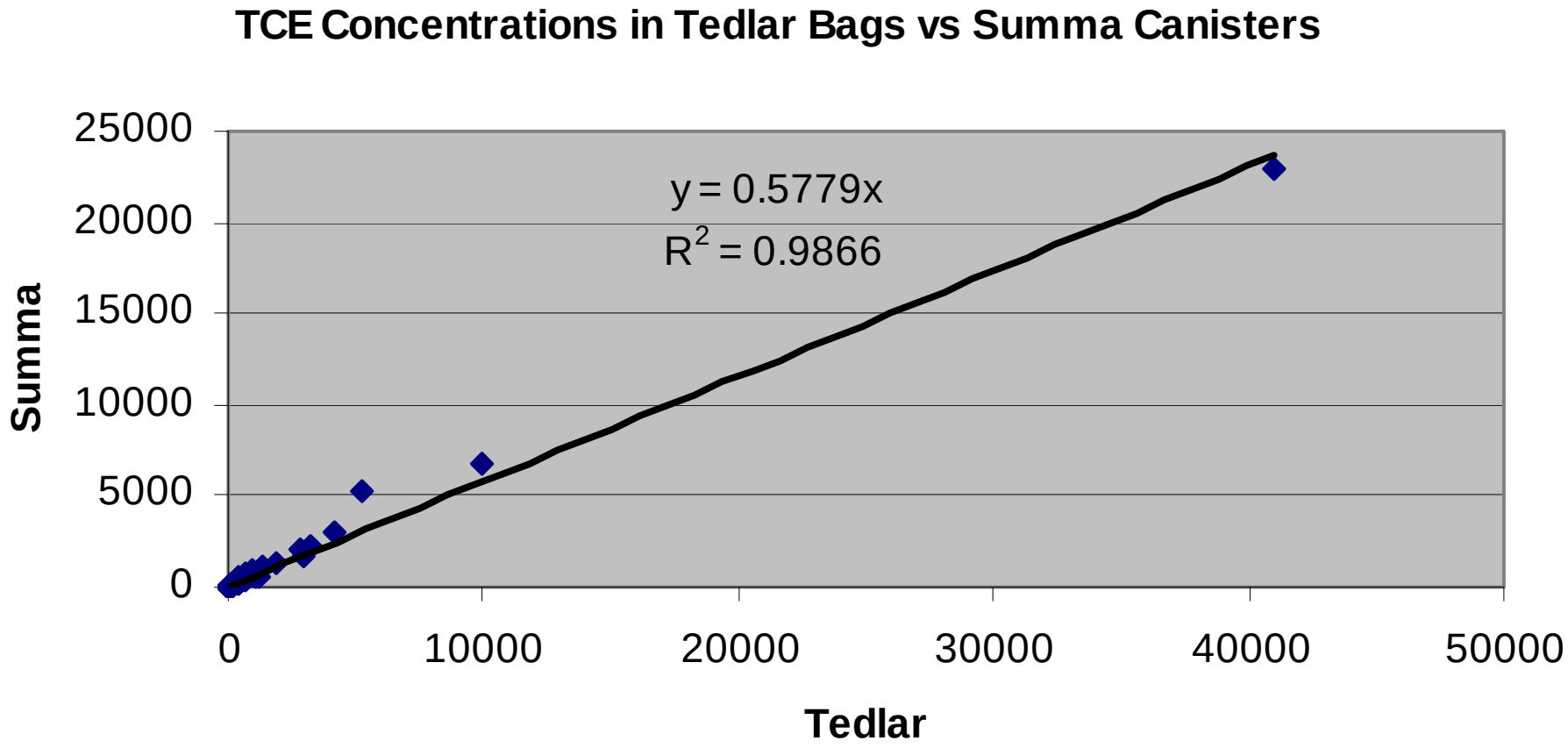
MARCH 2005

Loop Injection Method

TEDLAR BAG GRAB SAMPLES ANALYZED ON SITE (using a loop injection – **6 minute run time** – 1 ppbv detection limit) vs SUMMA CANISTER 24-HOUR SAMPLES ANALYZED OFF SITE



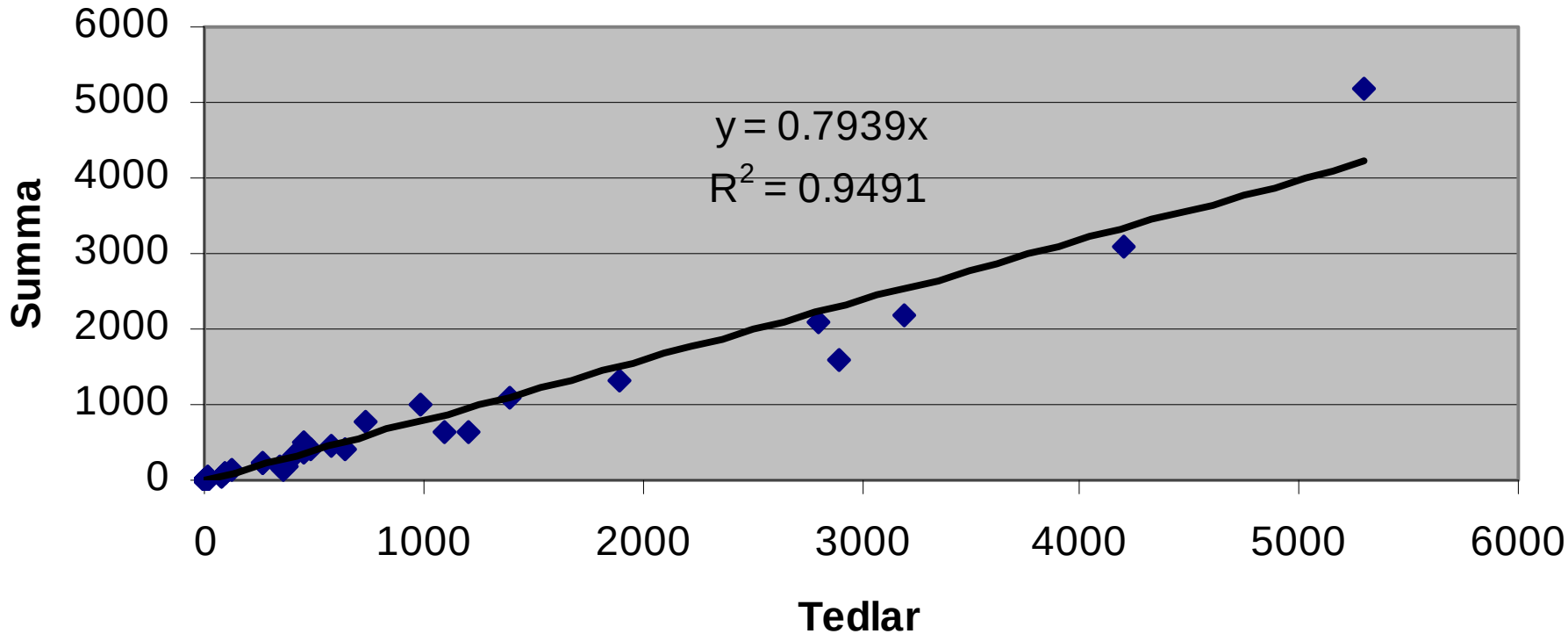
Region 2 – TCE Site



Vestal Chlorinated Hydrocarbon Site – Vestal, NY

42 SUBSLAB LOCATIONS

APRIL 2007

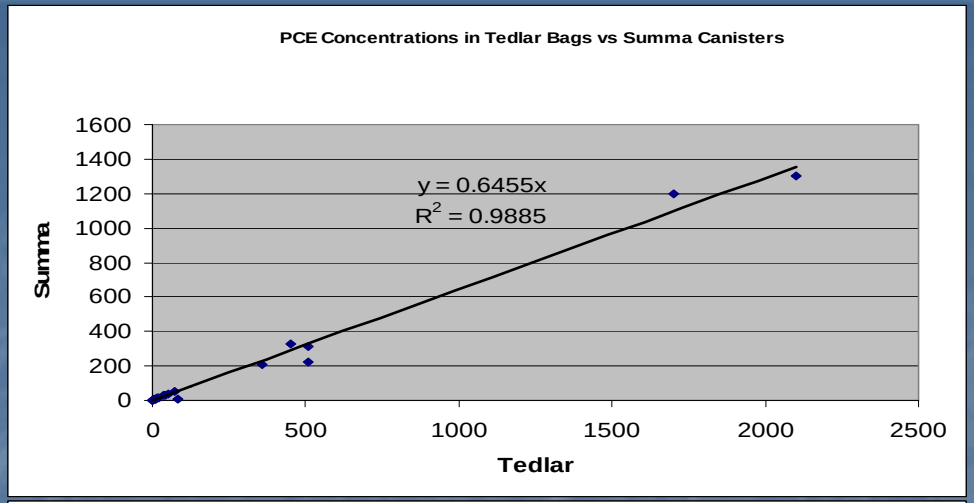


Vestal Chlorinated Hydrocarbon Site – Vestal, NY

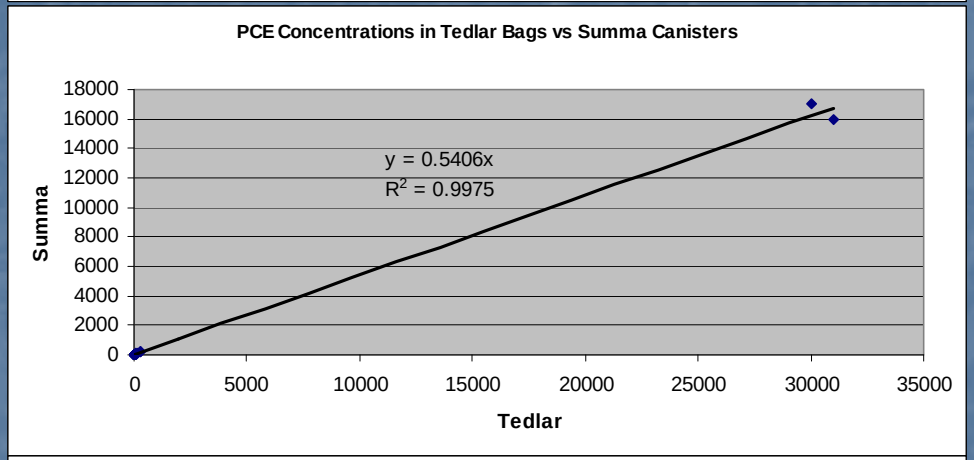
42 SUBSLAB LOCATIONS – (less the two high points)

APRIL 2007

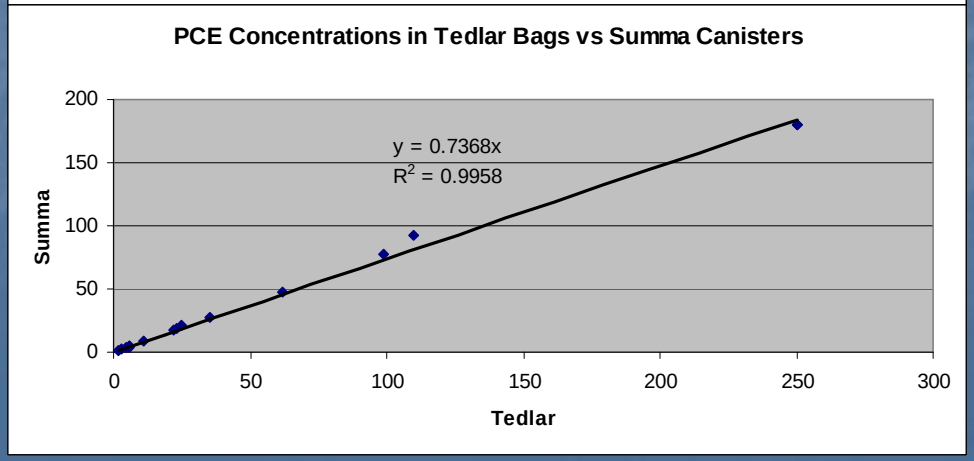
White Swan Site – Sea Girl, NJ
18 SUBSLAB LOCATIONS
January 8, 2008



White Swan Site – Sea Girl, NJ
17 SUBSLAB LOCATIONS
January11, 2008



White Swan Site – Sea Girl, NJ
17 SUBSLAB LOCATIONS
(less the two high points)
January11, 2008



TAKE-AWAY POINTS

•UTILIZATION OF THE TAGA TRIPLE QUADRUPOLE MASS SPECTROMETER REAL-TIME MONITORING TO RESOLVE VARIOUS VAPOR INTRUSION ISSUES – Demonstrated that this technology can provide quantitative and qualitative information to isolate confounding factors involved in vapor intrusion studies. The interfering sources may be related to lifestyle products/operations, ambient air impacts, accidental/intentional releases, geological anomalies, etc. The TAGA is by far the best technology to resolve the problems associated with the vapor intrusion matrices.

•INDOOR AIR ANALYSIS ON SITE (using the Trace Atmospheric Gas Analyzer [TAGA]) – Demonstrated that a one-minute monitoring within each room of a structure gave similar results as 24-hour time-weighted-averaged Summa canister samples – however, the disruption to the residents is limited to a single entry with the TAGA as compared to two entries with 24-hour time-weighted-averaged Summa canister samples. This provides information in the field for decision making and again, further reduces overall expenses.

•TOXICOLOGY OR POLICY – These groups set the action limits for vapor intrusion.

TAKE-AWAY POINTS (Cont'd)

•SUBSLAB AIR ANALYSIS ON SITE (using the GC/MS analysis with the Concentrator) – Demonstrated that a one-minute grab Tedlar bag sample gave similar results as 24-hour time-weighted-averaged Summa canister samples – limited the disruption to the residents is limited to a single entry with the Tedlar bag sampling as compared to two entries with 24-hour time-weighted-averaged Summa canister samples. The analysis required 45 minutes per sample. This provides information in the field for decision making and again, further reduces overall expenses.

•SUBSLAB AIR ANALYSIS ON SITE (using the GC/MS analysis with the Loop Injector) – Demonstrated that a one-minute grab Tedlar bag sample gave similar results as 24-hour time-weighted-averaged Summa canister samples – limited the disruption to the residents is limited to a single entry with the Tedlar bag sampling as compared to two entries with 24-hour time-weighted-averaged Summa canister samples. The analysis required 6 minutes per sample. This provides information in the field for decision making and again, further reduces overall expenses.

Hey, did you want all of the sources removed???

What does your data tell you???

For additional information concerning the scheduling, capabilities, and applications of the TAGA mobile laboratories, contact:

David Mickunas
US EPA/ERT-Research Triangle Park, NC
Telephone - (919) 541 4191
E-mail - Mickunas.Dave@epa.gov.