Environmental Monitoring Symposium -2012
Washington, DC

Using the Trace Atmospheric Gas Analyzer (TAGA) Mobile Laboratory to Resolve Vapor Intrusion Issues – Interpretation of Multiple Lines of Evidence for Vapor Intrusion

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TAGA MOBILE LABORATORY

Trace Atmospheric Gas Analyzer (TAGA) Mobile Laboratory

Trace Atmospheric Gas Analyzer (TAGA)

Gas Chromatograph with Concentrator for Volatiles

Gas Chromatograph for Permanent Gases

VAPOR INTRUSION

Vapor Intrusion is the migration of volatile chemicals from the subsurface into overlying buildings. Volatile chemicals in buried wastes and/or contaminated groundwater can emit vapors that may migrate through subsurface soils and into indoor air spaces of overlying buildings in ways similar to that of radon gas seeping into homes.

“By 2005, EPA and its state, tribal and local partners will reduce or control the risk to human health and the environment at more than 374,000 contaminated Superfund, RCRA, underground storage tank (UST), brownfields and oil sites, and have the planning and preparedness capabilities to respond successfully to all known emergencies to reduce the risk to human health and the environment.”

WATER

Basis: 2 liters/day

Assume: TCE concentration is 5 ppb or 5 micrograms/liter (µg/L)

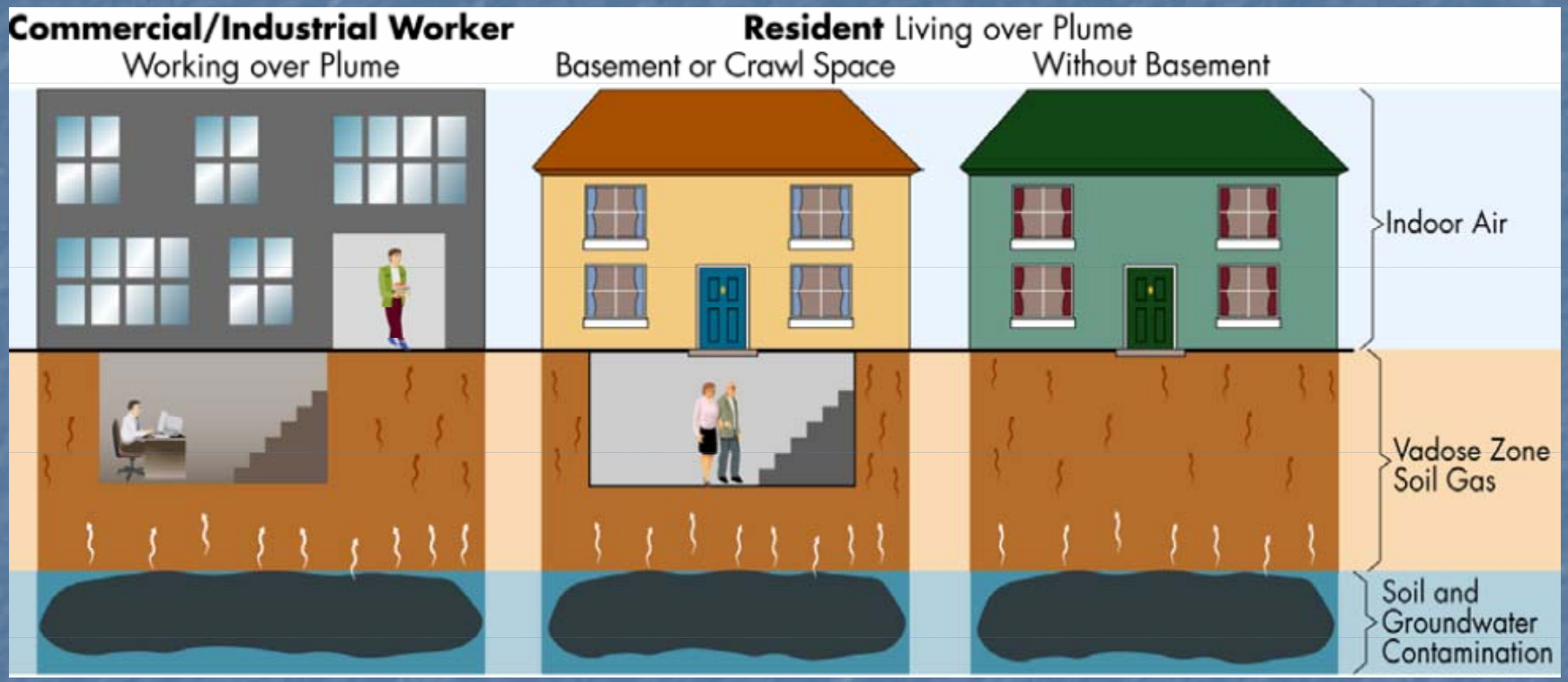
Daily impact: 2 L/day * 5 µg/L = 10 µg/day

AIR

Basis: 20 cubic meters/day

Assume: TCE concentration is 1 ppbv or 5.4 micrograms/cubic meter (µg/m^3)

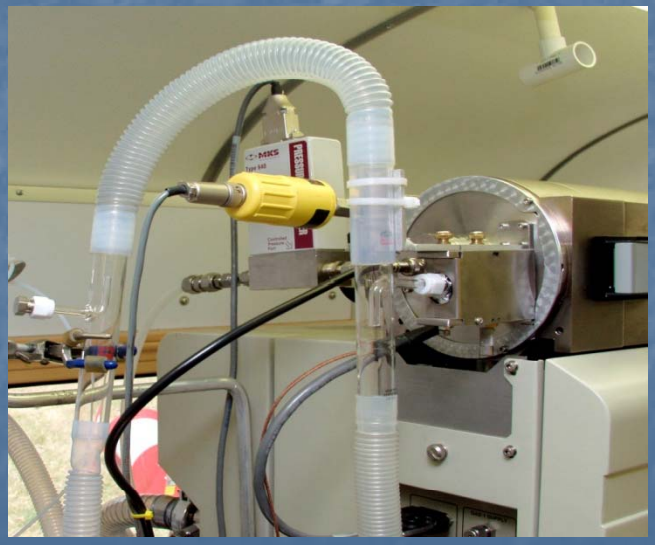
Daily impact: 20 m^3/day * 5.4 µg/m^3 = 108 ug/m^3



Vapor Pathway into Buildings

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

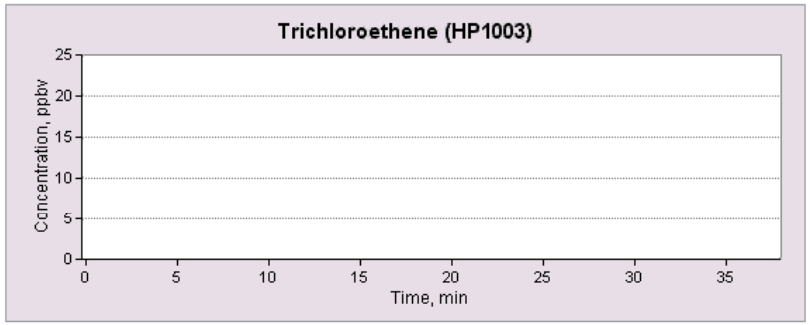


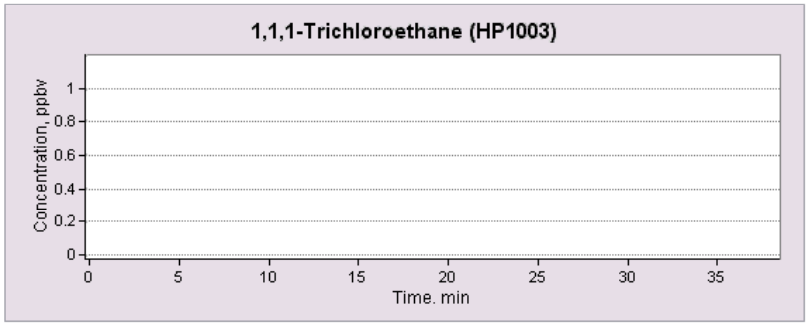
TAGA Monitoring with the Teflon Tube Using the Low Pressure Chemical Ionization (LPCI) Source

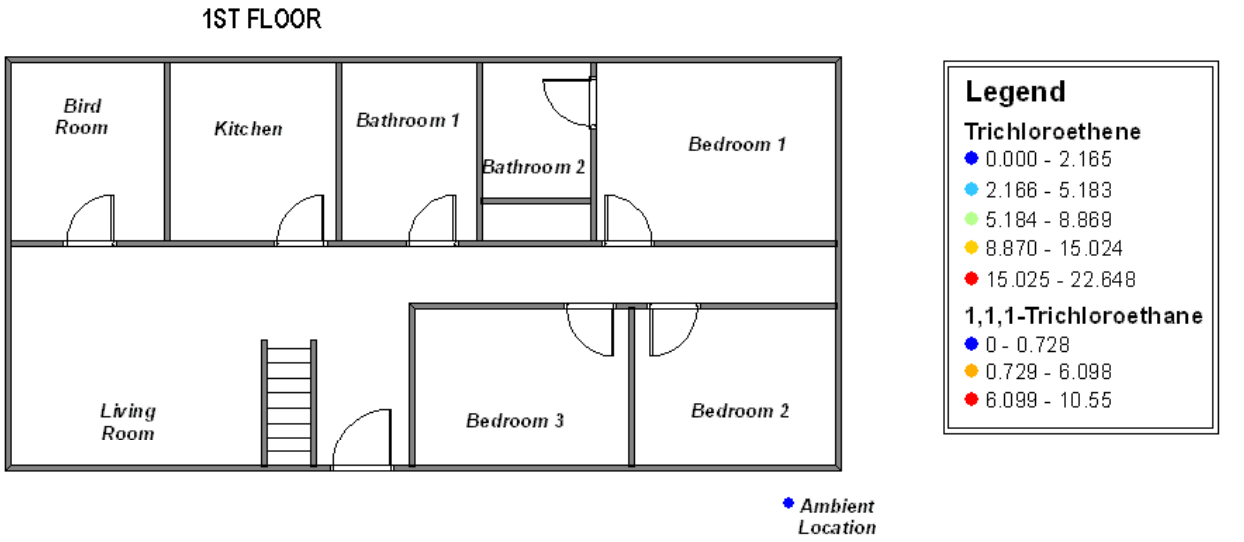
Driver and Passenger Seating with Monitor

MONITORING FOR SUBSURFACE INTRUSION SOURCE
TCE Site
Region 2

Region 2 - TCE Site





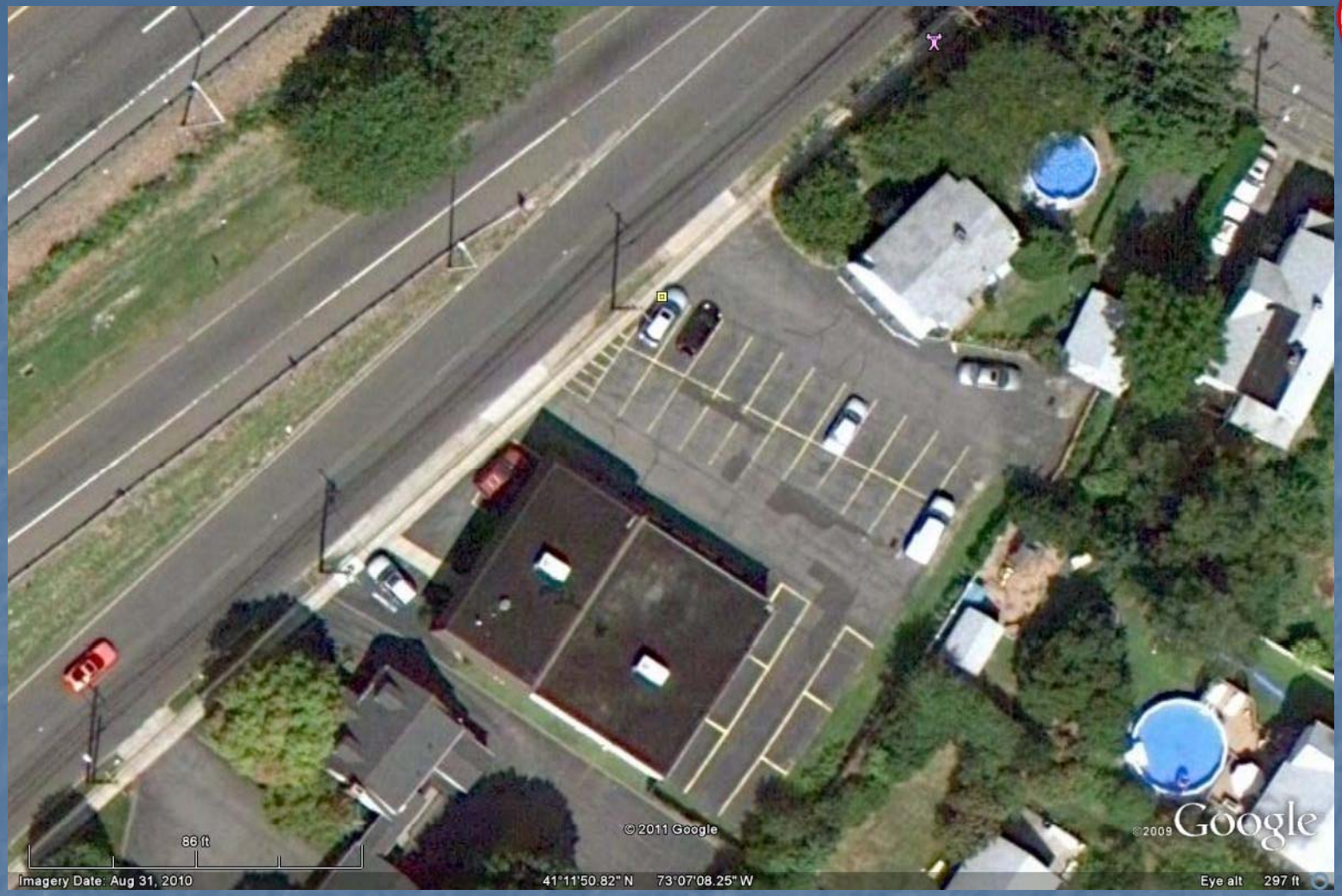


Region 2 TCE Site

MONITORING FOR SIGNATURE COMPOUNDS TO DETERMINE SUBSURFACE GAS INTRUSION

Chlorinated Solvent Site

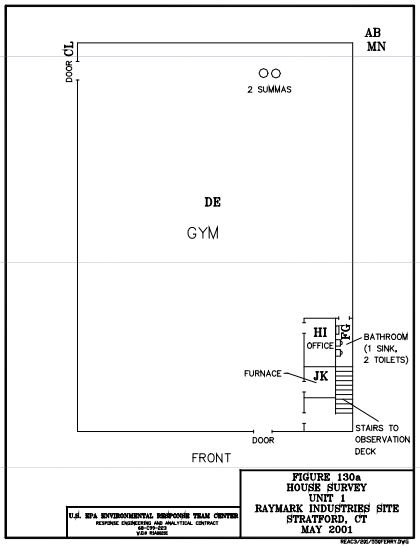
Region 1

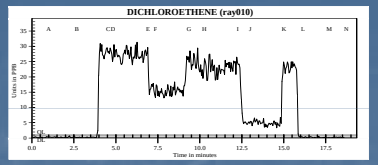


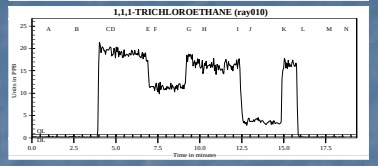
Region 1 – TCE Site

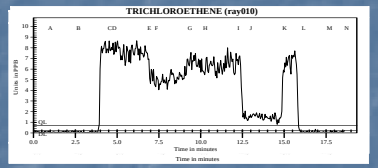
Constituent Ratios

Children's Gymnasium

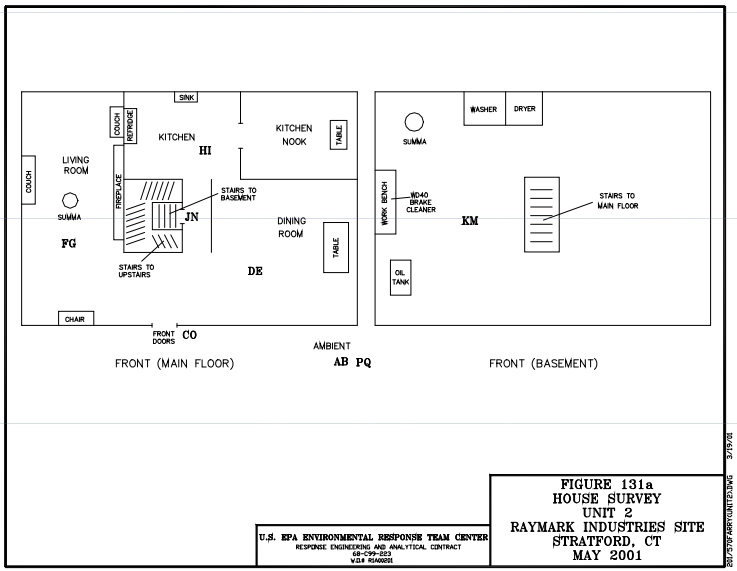


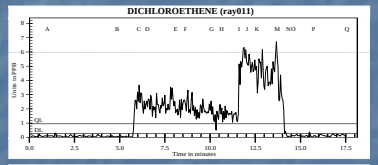


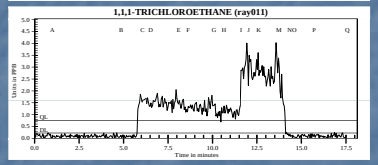


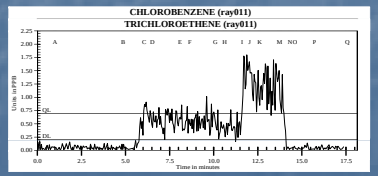


Residence Adjacent to the Gymnasium



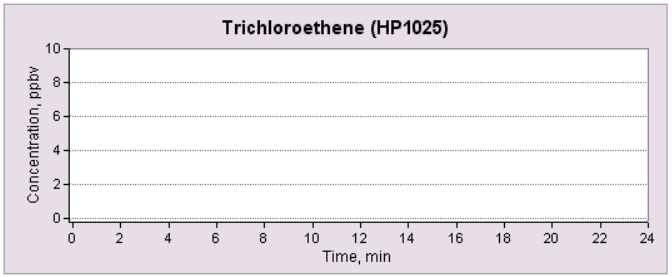


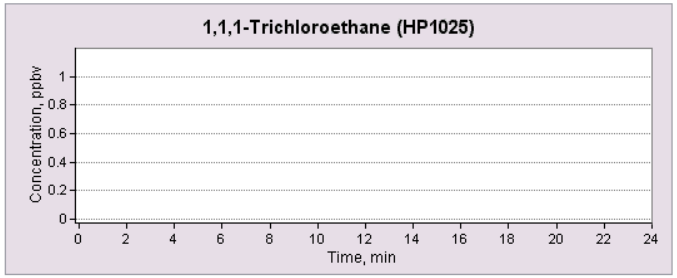


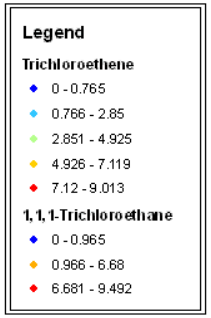


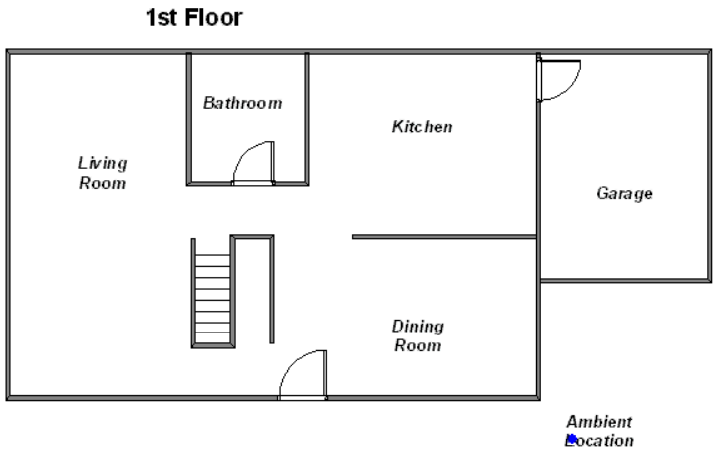
MONITORING FOR LIFESTYLE SOURCES
TCE Site
Region 2

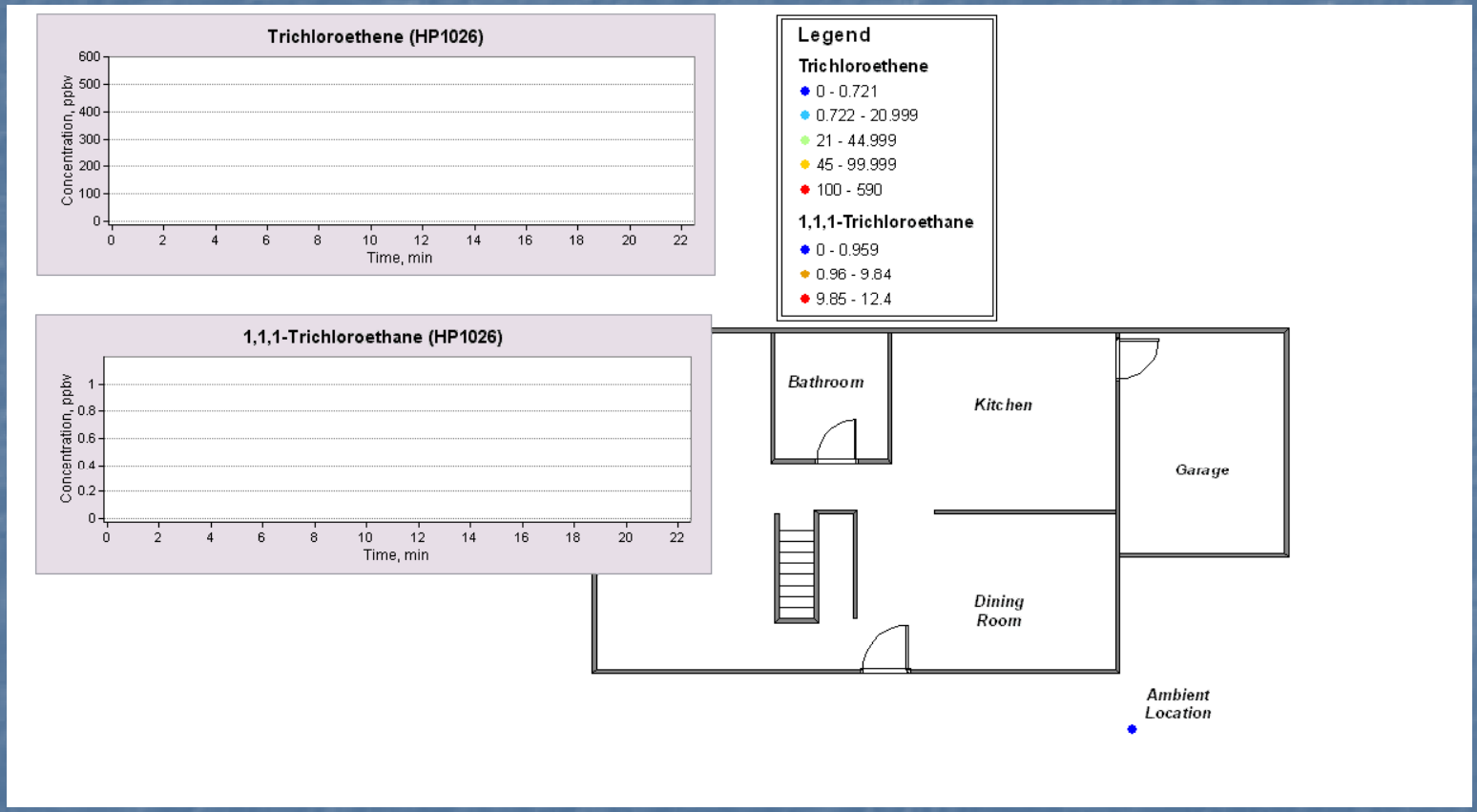
Region 2 - TCE Site


Trichloroethene (HP1025)
Concentration, ppbv
Time, min


1,1,1-Trichloroethane (HP1025)
Concentration, ppbv
Time, min


Legend
Trichloroethene
0 - 0.765
0.766 - 2.85
2.851 - 4.925
4.926 - 7.119
7.12 - 9.013
1,1,1-Trichloroethane
0 - 0.965
0.966 - 6.68
6.681 - 9.492


1st Floor
Bathroom
Kitchen
Living Room
Garage
Dining Room
Ambient Location

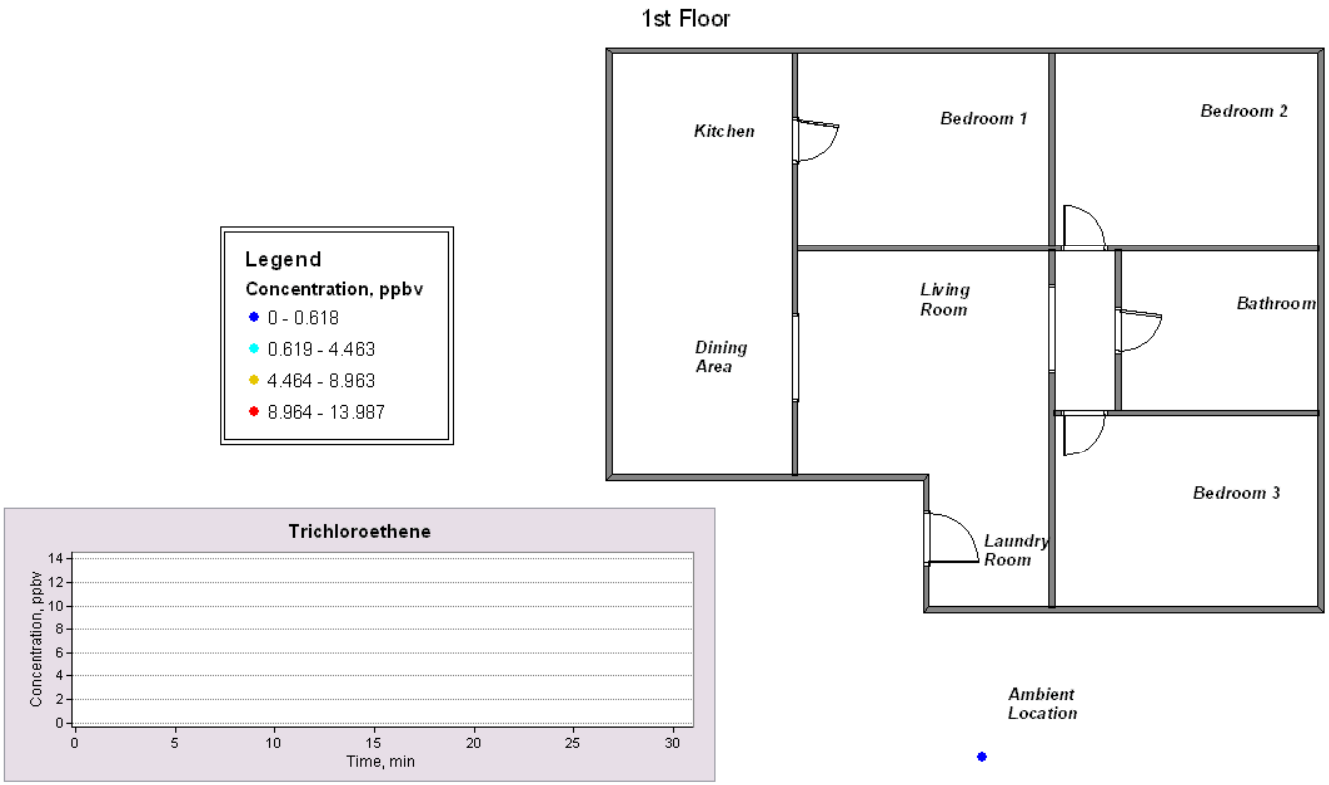

Trichloroethene (HP1026)
Concentration, ppbv
600
500
400
300
200
100
0
0 2 4 6 8 10 12 14 16 18 20 22
Time, min
1,1,1-Trichloroethane (HP1026)
Concentration, ppbv
1
0.8
0.6
0.4
0.2
0
0 2 4 6 8 10 12 14 16 18 20 22
Time, min
Legend
Trichloroethene
0 - 0.721
0.722 - 20.999
21 - 44.999
45 - 99.999
100 - 590
1,1,1-Trichloroethane
0 - 0.959
0.96 - 9.84
9.85 - 12.4
Bathroom
Kitchen
Garage
Dining Room
Ambient Location

MONITORING FOR CONTRIBUTIONS FROM CRAWLSPACE AREAS

PCE Site

Region 4

TCE Site Region 6

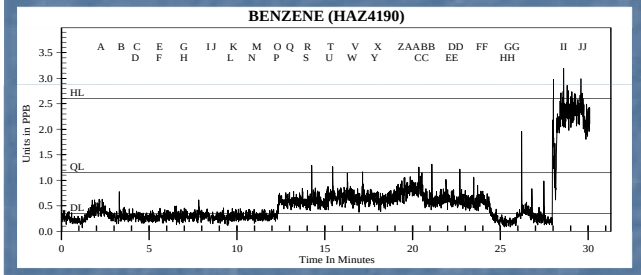
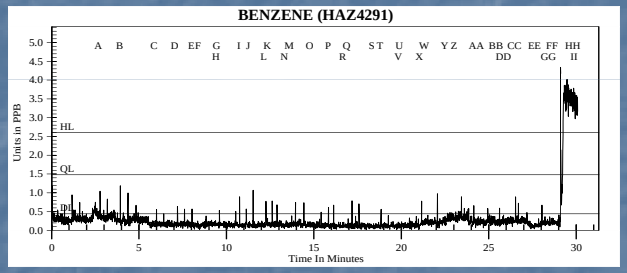
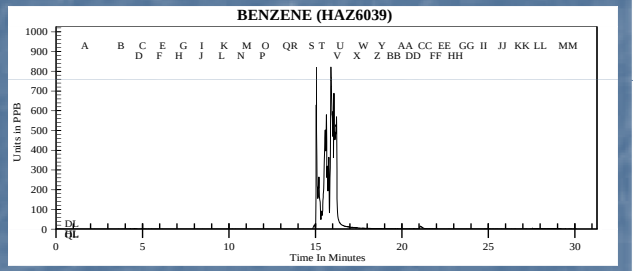
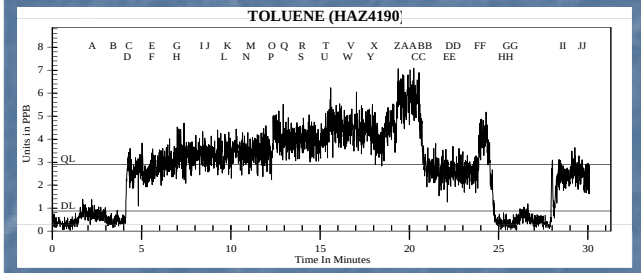
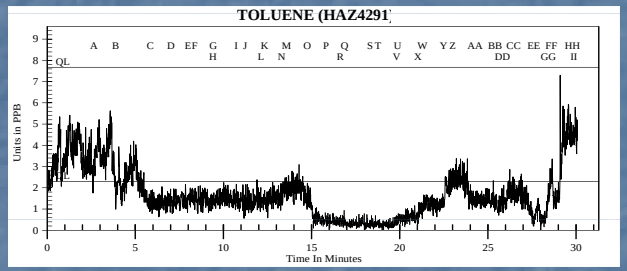
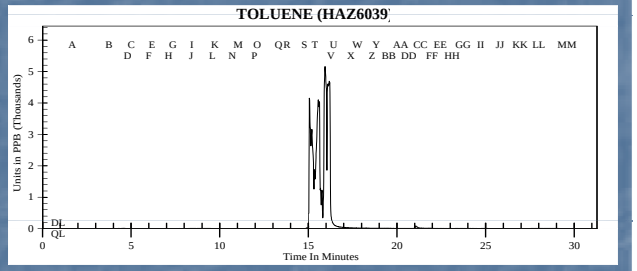
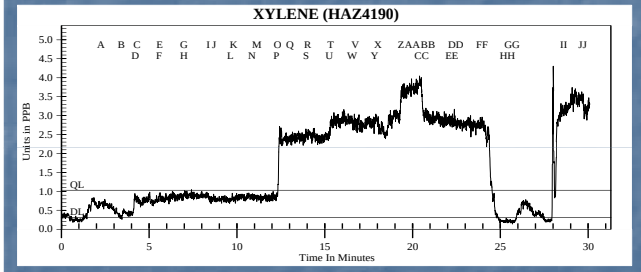
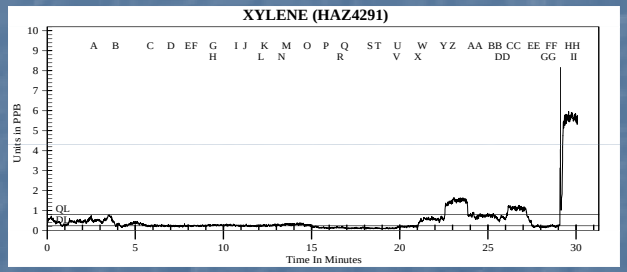
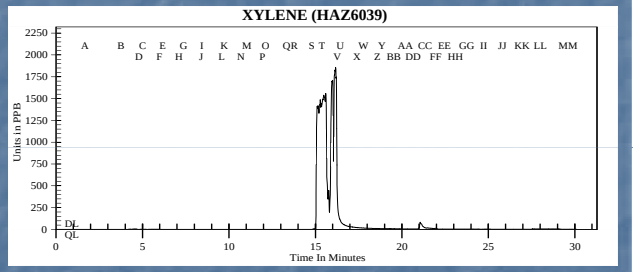

1st Floor
Kitchen
Bedroom 1
Bedroom 2
Living Room
Bathroom
Dining Area
Bedroom 3
Laundry Room
Ambient Location
Legend
Concentration, ppbv
0 - 0.618
0.619 - 4.463
4.464 - 8.963
8.964 - 13.987
Trichloroethene
Concentration, ppbv
0
2
4
6
8
10
12
14
0
5
10
15
20
25
30
Time, min

MONITORING FOR ACCIDENTAL OR INTENTIONAL RELEASES

Gasoline Spill Site

Region 3

Region 3 – BTX Site

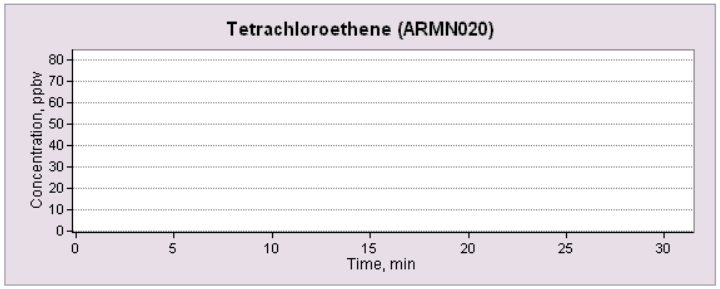
1st	2nd	3rd
		
		
		
Benzene < 1.0 PPBV	**Benzene < 1.0 PPBV**	**Benzene > 900 PPBV**

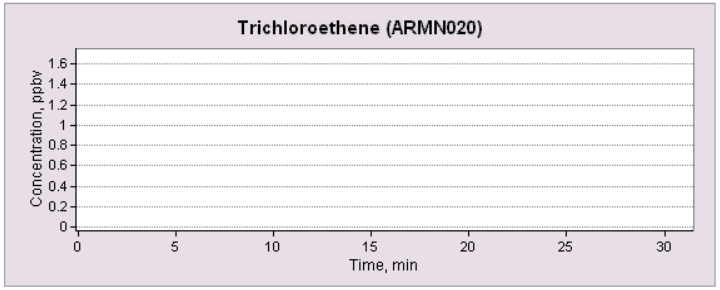
Benzene, Toluene and Xylene Concentrations

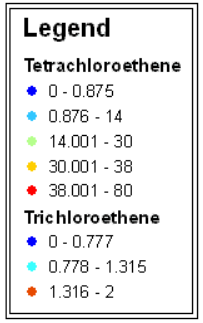
MONITORING FOR CONTRIBUTIONS FROM ACTIVITIES IN ADJACENT STRUCTURES

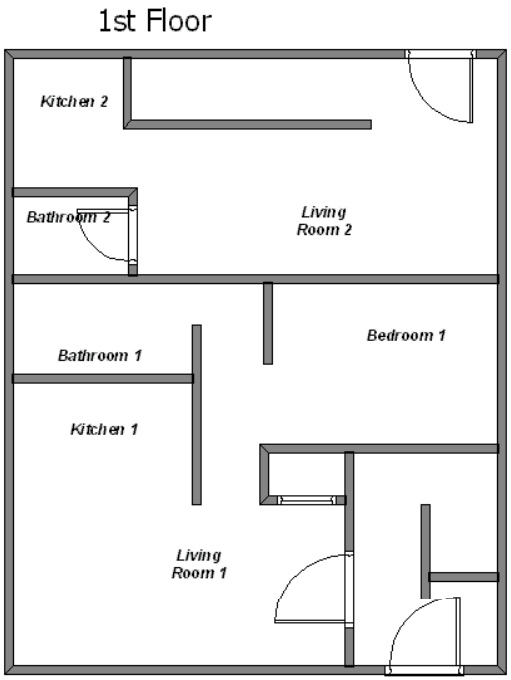
Region 5

Region 5 – PCE Site

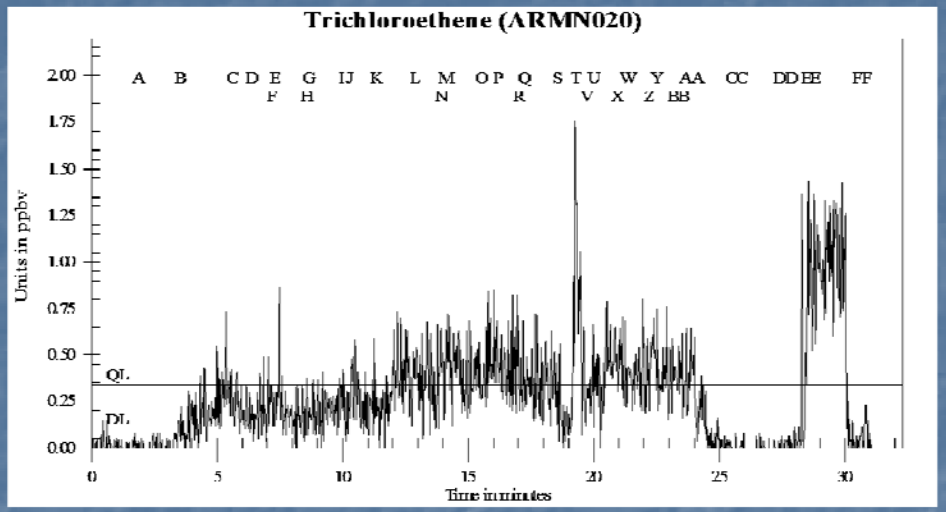


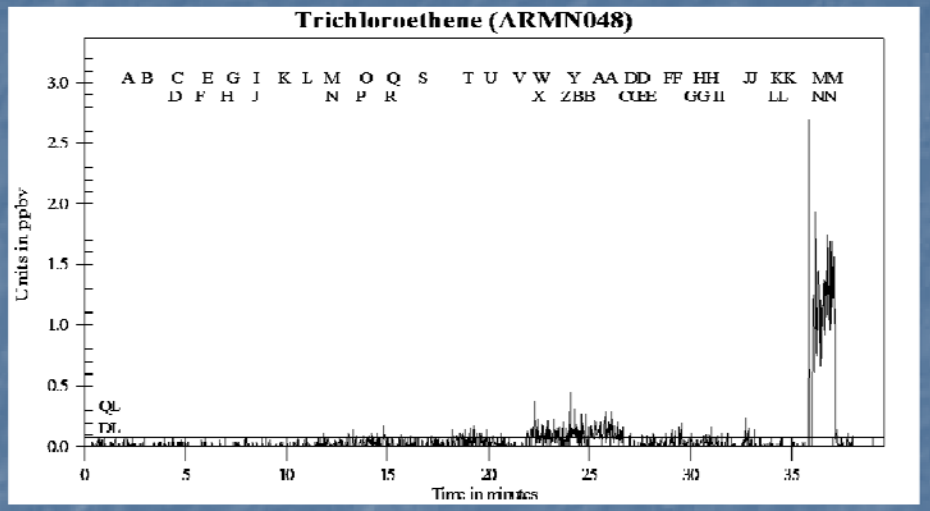


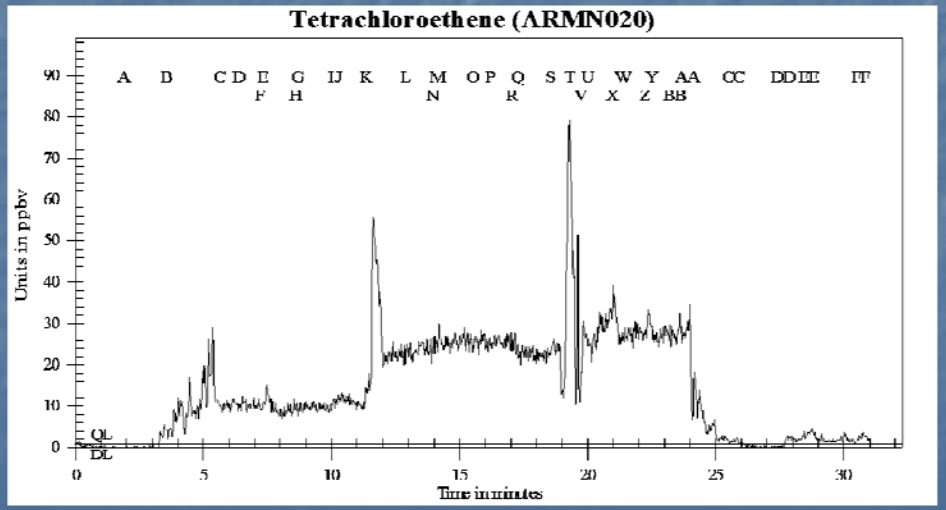


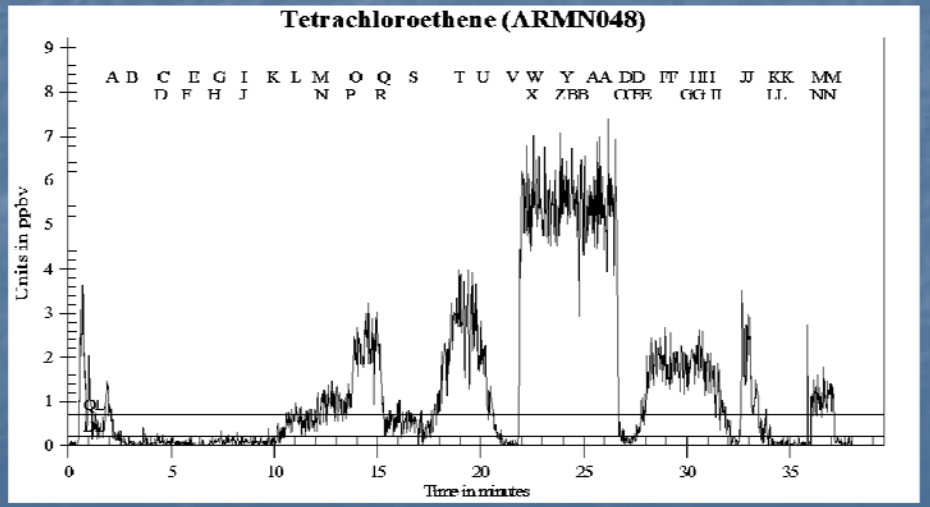


Ambient Location



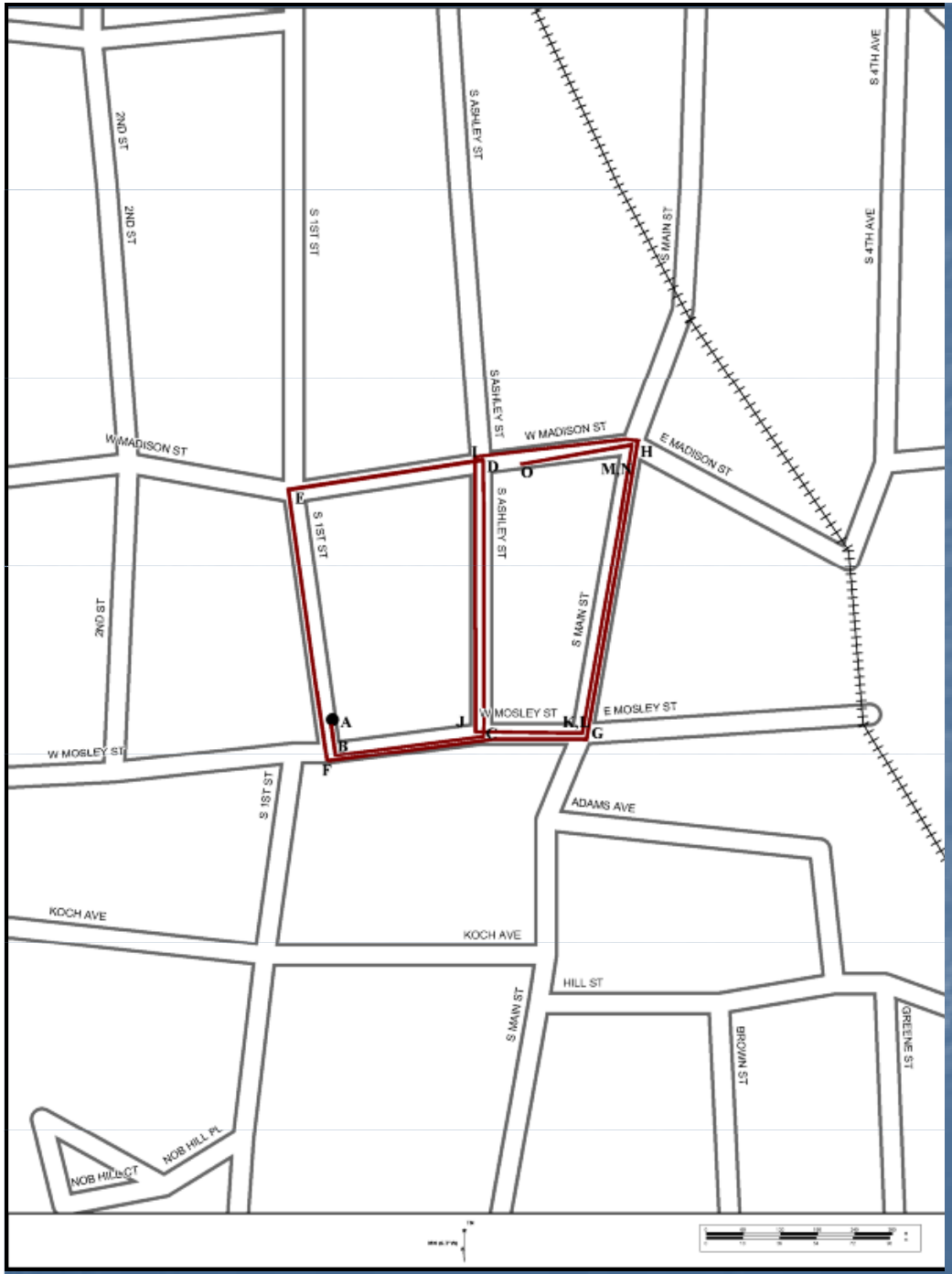


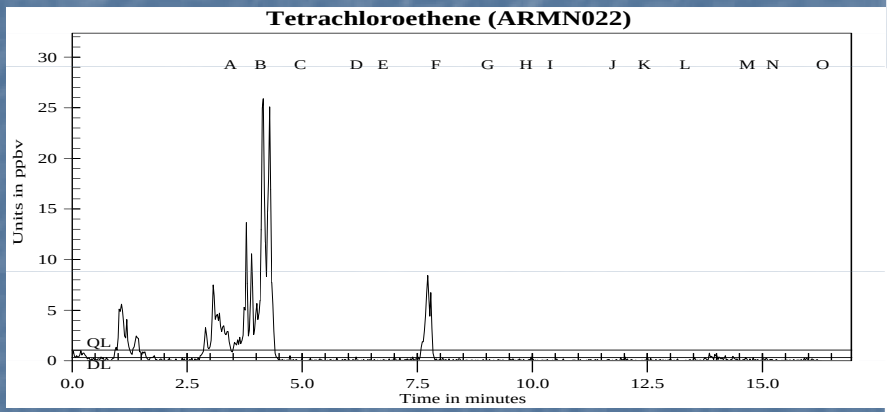




Northeast – 13 mph

North – 12 mph



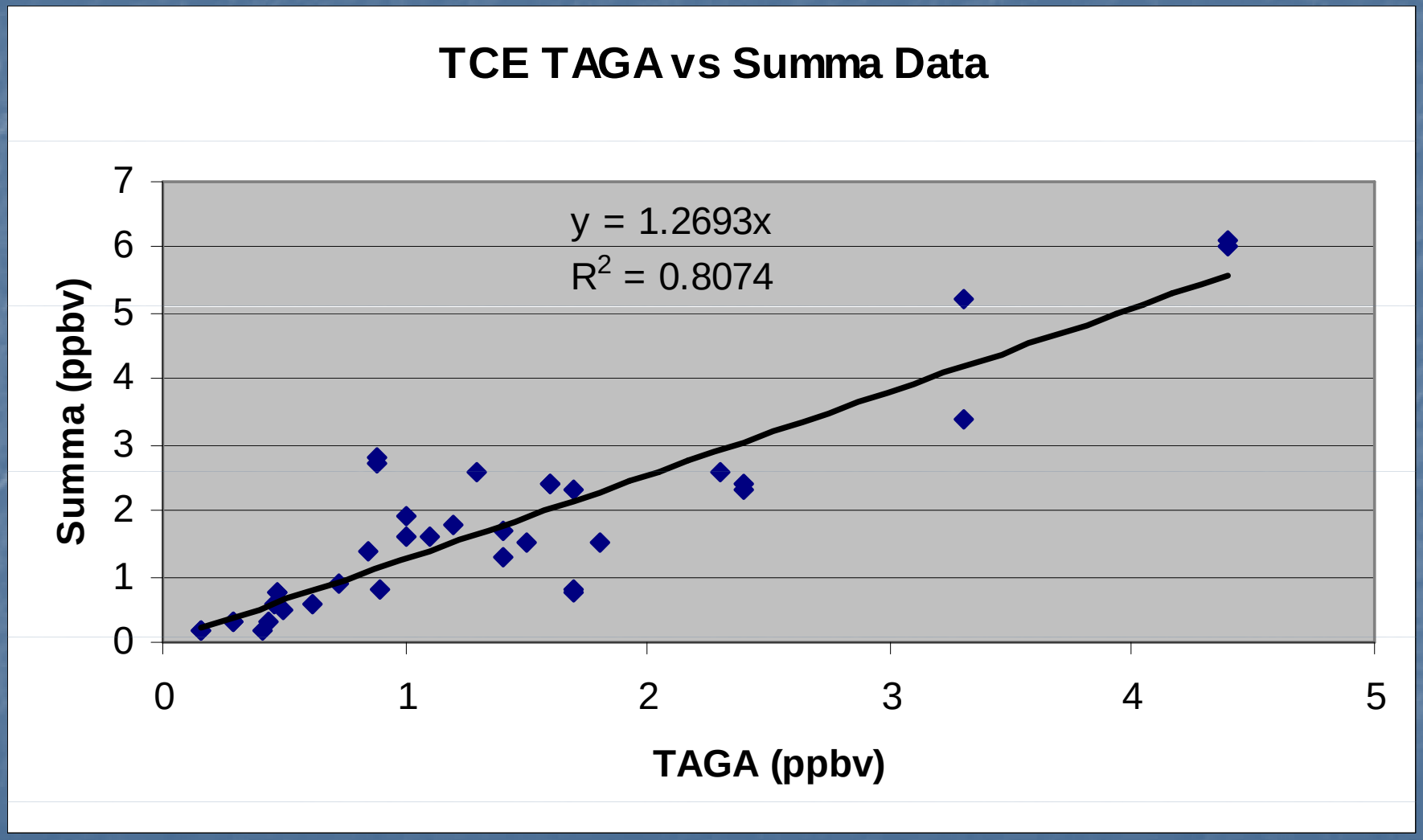


Wind: 10 mph/050°

Figure 18a Mobile Monitoring Path Two, ARMN022

INDOOR ANALYSIS

Comparison of the TAGA Triple Quadrupole Mass Spectrometer Real-time Monitoring **1- Minute Average** Results to the Off-site GC/MS Results of 6-Liter **24-Hour** Time-weighted-averaged Summa Canister Samples



Hopewell Junction Site – Hopewell, NY

37 INDOOR LOCATIONS

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

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.

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

What does your data tell you???

For additional information concerning the capabilities and applications of the TAGA, call or e-mail me at 919 541 4191 or Mickunas.Dave@epa.gov.