Former Galena Forward Operating Location

Field Sampling Plan (FSP) Resolution and Risk Assessment Planning Meeting

Portland, OR
December 20-21, 2011

Issues for Human Health Risk Assessment

- Exposure Areas
- How to integrate the groundwater risk assessment with the site investigation results
- Use of direct push data for screening risk analysis
- Indoor Air Evaluation at ST009
- Recent Regulatory Developments for TCE

Environmental Media Data Used to Evaluate Specific Risk Pathways

Exposure Pathway	Surface Soil (0-2 ft)	Subsurface Soil (2-15 ft)	Soil Gas	Groundwater
Direct Contact by Residents	✓	✓		
Direct Contact by Workers	✓			
Direct Contact by Excavation Workers	✓	✓		✓
Domestic Use by People				✓
Indoor Inhalation by People			✓	
Direct Contact by Wildlife	✓			
Discharge to Surface Water Where Aquatic Life Resides				✓

Exposure Area Concept

- Geographic area over which a specific human or ecological receptor type is assumed to be exposed (for example contact with soil)
- Exposure is generally assumed to have equal likelihood anywhere within the exposure area
- Data within an exposure area are aggregated to identify exposure point concentrations (e.g., 95% UCLs)

Final Appendix G of the UFP QAPP: Human Health and Ecological Risk Assessment Methodology

"For the Former Galena FOL, exposure areas will generally be consistent with the areas defined by the site-specific characterizations of the nature and extent of contamination at source areas. For larger sites (i.e., those larger than Site FT001, or greater than about 7 acres) exposure areas will be subareas defined based on results of source area investigations within that site. Locations of the highest detects will be evaluated spatially to determine best placement of exposure area boundaries for the risk assessment. Attempts will be made to include contiguous locations with highest concentrations into the same exposure area."

Larger Sites at Former Galena FOL

Site	Acres
ST010 (Southeast Runway Fuel Spill)	18.97
ST005 (POL Tanks South) (Truck, MOGAS, Diesel)	14.93
ST005 (POL Tanks North)	13.45
PADS (Refueling Pads)	11.30
PARCEL D (Drum debris found Oct. 2009 site visit)	7.91
CG001 (Million Gallon Hill)	7.91
FT001 (Fire Protection Training Area)	6.29
DS1769 (Suspect drum storage area)	5.48
CG002 (Missile Storage Area)	4.74
OAP Old Pipelines (Diesel) (Old Abandoned Pipe)	4.51

Integrating Groundwater Risk Assessment with Site Investigation Results

- Site Risk Assessments to date address only soil exposure pathways (or screen GW and VI).
- For groundwater pathways, well-specific risks and hazards will be assessed across the entire base
  - Using 2010-2011 data for each well
  - Assess hypothetical residential use
  - Assess excavation worker contact when <15 ft bgs
  - Screen GW using ADEC VI target levels
  - Assign each well point to specific sites for purpose of reporting multimedia risk for each site

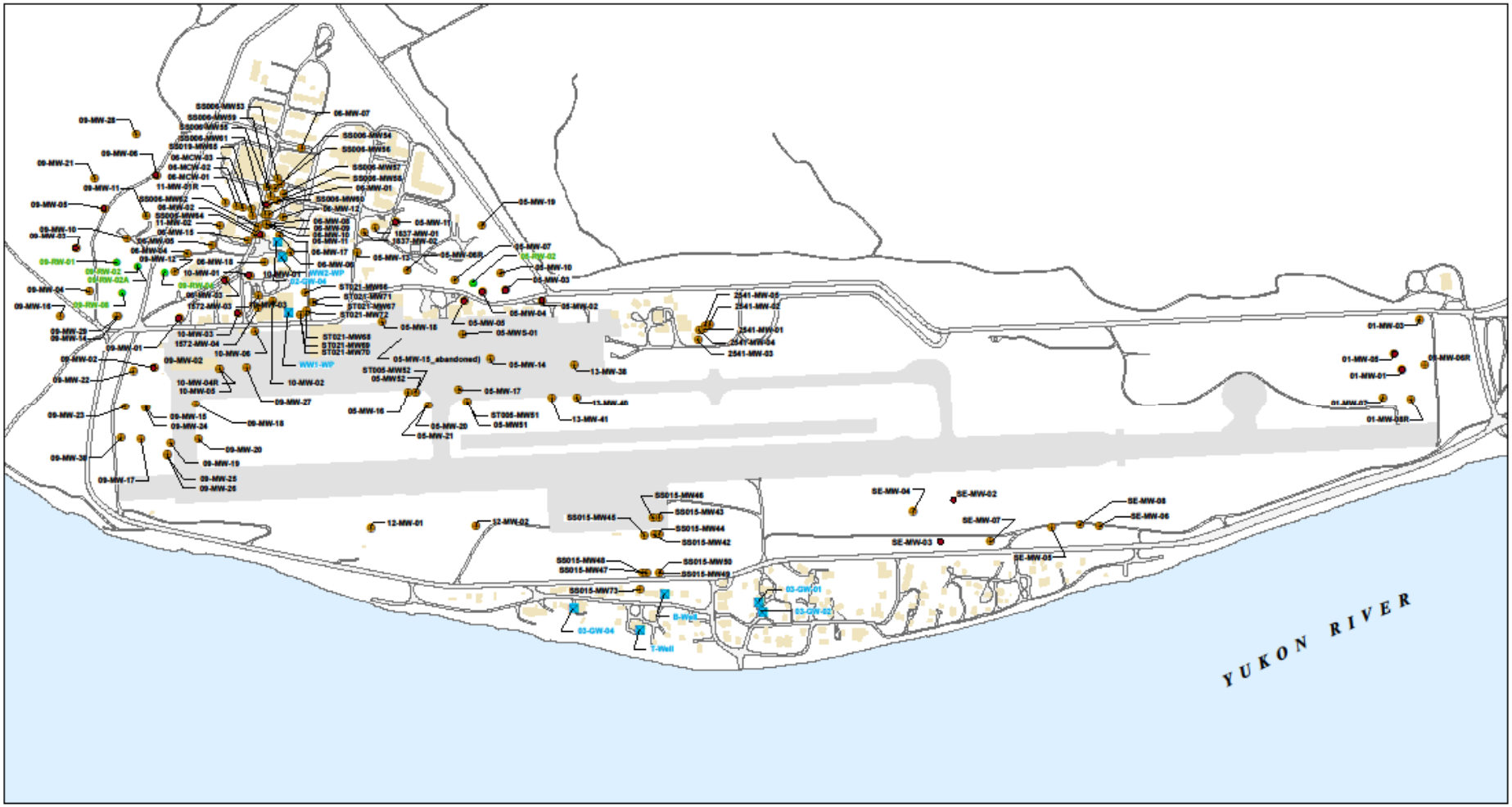
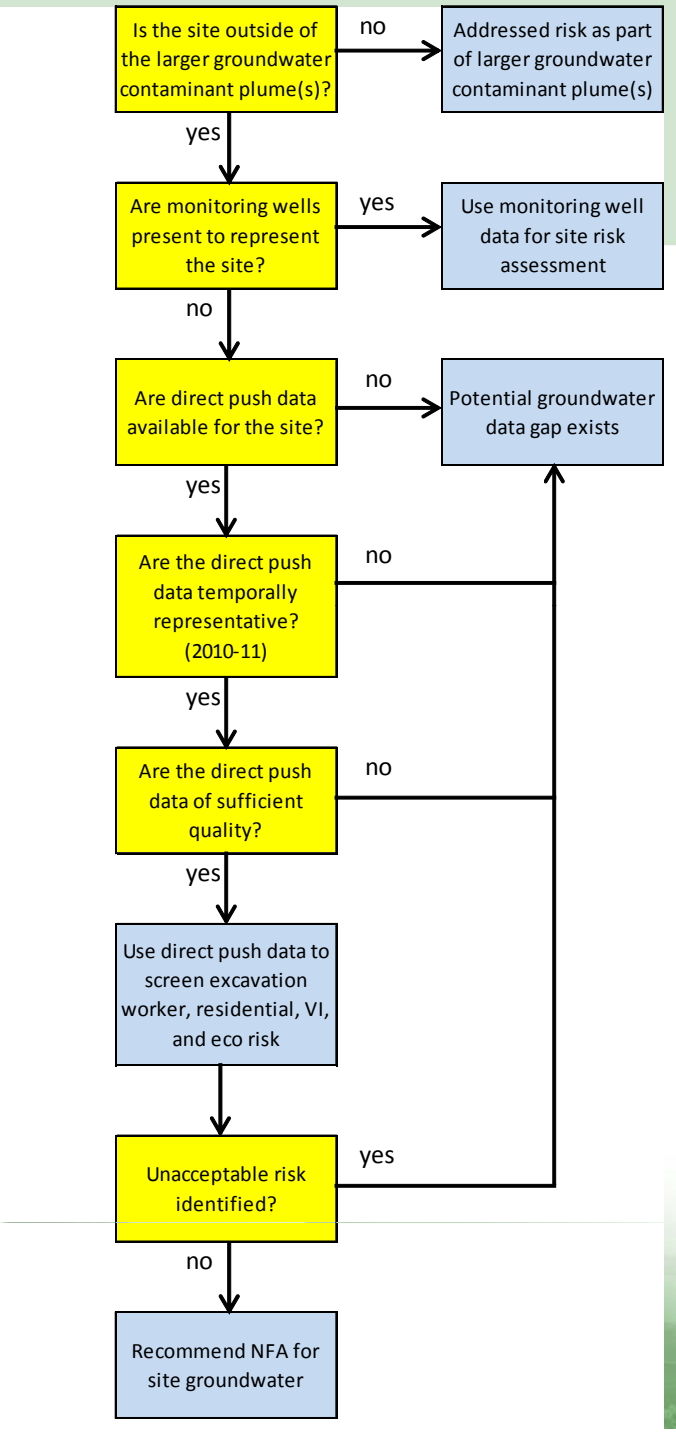


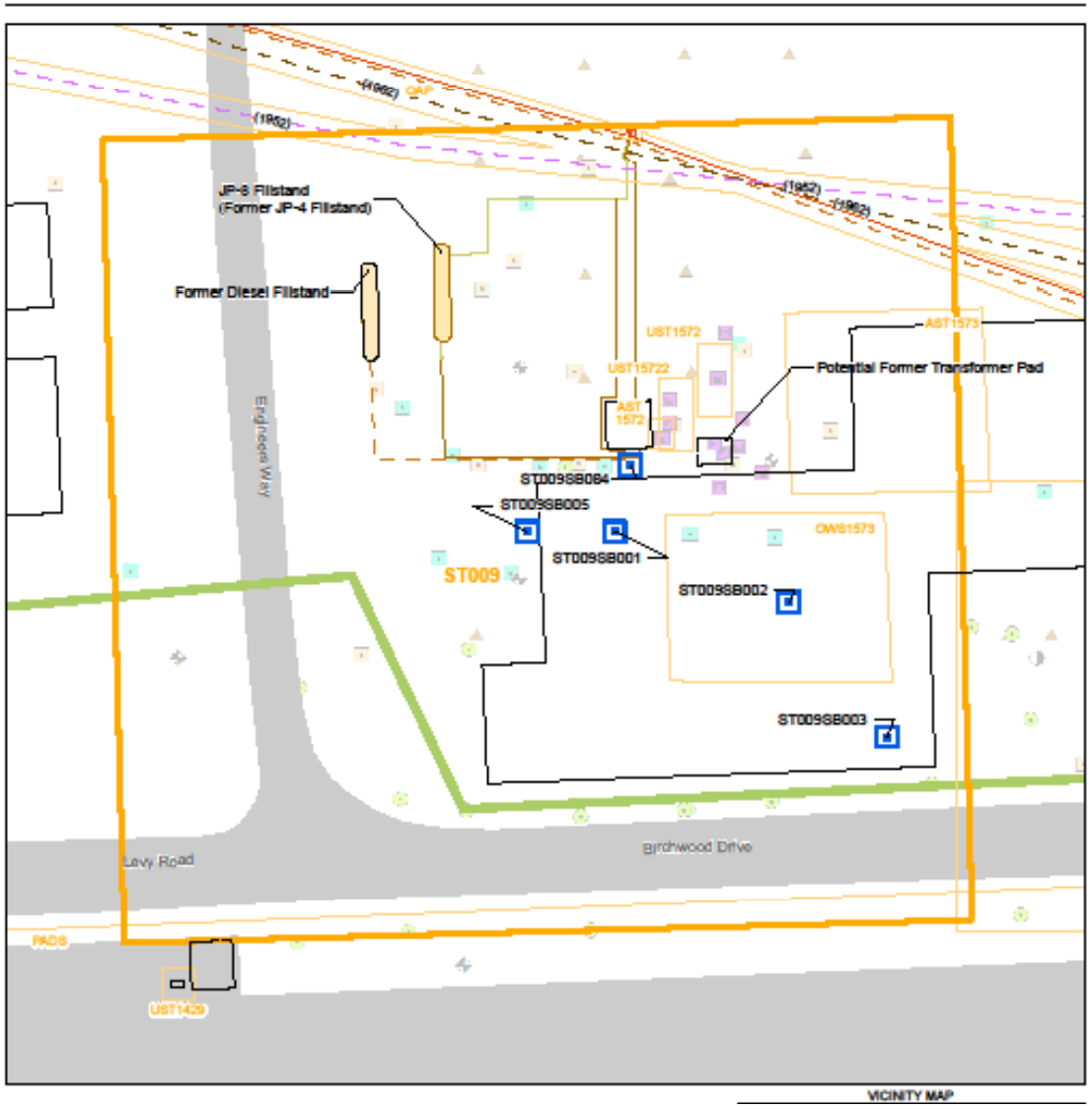
FIGURE 3-5
Existing Well Network
Site Characterization Report
Former Galena Forward Operating Location, Alaska

CH2MHILL

Decision Process for Use of Direct Push Groundwater Data for Screening Risk Analyses

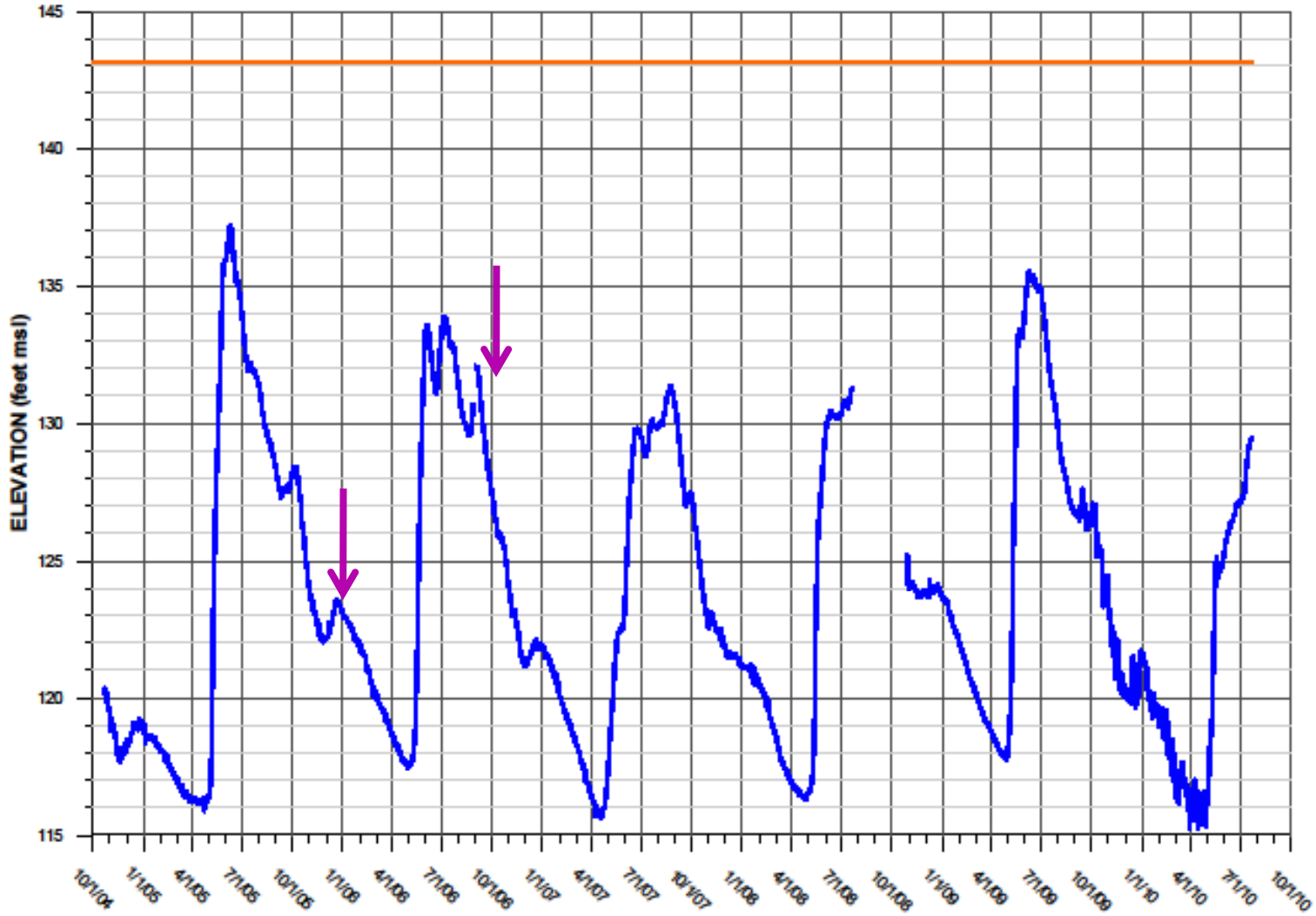


Soil Gas Sample Locations ST009



Site ST009 Soil Gas Sampling

- Samples collected in both winter (Jan-Feb 2011) and fall (Oct 2011) during opposite GW conditions
- Two soil gas samples at collected from immediately outside the VMF to provide vertical profiling of near-slab soil gas and to characterize the oxidative conditions of the soil near the building (0-2, 5-6, and 10-11 feet bgs)
- Three subslab samples to determine the concentrations of VOCs in vapors immediately beneath the building slab
- Samples analyzed by Method TO-15, with naphthalene added



LEGEND

Groundwater Elevation

Ground Surface Elevation

FIGURE D2-VIST009
Hydrograph of Groundwater Elevation versus Time; BRWELL
Work Plan for Site Inspection, Remedial Investigation, and Site Characterization
Former Galena Forward Operating Location, Alaska

CH2MHILL

\\cdlm\pro\alfceet\394439\Galena\285-Assessment_Reports\RDD_Sites\Figures\Grapher\Figure_D2-VIST009.grf

Analytical Results

During Jan-Feb 2011

- 13 of 51 target analytes were detected in the exterior soil gas sample
- 27 of 51 target analytes were detected in at least one subslab sample

During Oct 2011

- 13 of 51 target analytes were detected in the exterior soil gas sample
- 12 of 51 target analytes were detected in at least one subslab sample

Summary of Chemicals Detected in Subslab Soil Gas: Site ST009 Jan 2011

	ST009_SV001		ST009_SV002	ST009_SV003		
	ST009SV001-012511	ST009SV901-012511	ST009SV002-012511	ST009SV003-012511	ADEC Target	Maximum
	0.5	0.5	0.5	0.5	Level for Soil	Factor of
Analyte	1/25/2011	1/25/2011	1/25/2011	1/25/2011	Gas	Exceedance
Chloroform	0.22 U	0.04 U	**8**	**0.34**	11	0.73
Tetrachloroethene (PCE)	0.16 U	1.8 B	**9.5**	**4.5**	41	0.23
Naphthalene	21 U	3.7 U	**1.3 J**	0.93 U	7.2	0.18
1,2-Dichloropropane	2.6 U	0.47 U	0.12 U	**1.8**	13	0.14
1,1-Dichloroethene	0.23 U	0.041 U	0.011 U	**0.57**	4.9	0.12
Carbon Tetrachloride	0.23 U	0.042 U	**0.098 J**	**0.69**	16	0.04
Trichlorofluoromethane	1.7 U	**1.7 J**	**16**	**220**	7,300	0.03
1,2,4-Trichlorobenzene	22 U	4 U	**1.1 J**	1 U	42	0.03
1,2,4-Trimethylbenzene	3 U	**1.4 J**	**0.37 J**	**0.68**	73	0.02
Benzene	0.45 U	**0.41 B**	**0.38**	**0.58**	31	0.02
1,1,2,2-Tetrachloroethane	0.28 U	0.051 U	**0.07 J**	0.013 U	4.2	0.02
1,2-Dichloroethane	0.12 U	0.02 U	0.0054 U	**0.14**	9.4	0.01
1,1,2-Trichloroethane	0.18 U	0.033 U	0.0086 U	**0.13 J**	15	0.009
1,3,5-Trimethylbenzene	3 U	0.54 U	0.14 U	**0.33 J**	73	0.005
Total Xylenes	- -	**1.36**	**0.95**	**2.6**	1,000	0.003
Ethylbenzene	0.092 U	**0.29 J**	**0.21**	**0.52**	220	0.002
Bromobenzene	14 U	2.5 U	0.65 U	**0.88 J**	630	0.001
Chlorobenzene	1.2 U	0.21 U	0.056 U	**0.38 J**	520	0.0007
Methyl tert-Butyl Ether (MTBE)	1 U	0.18 U	**0.33 J**	0.046 U	470	0.0007
1,1,1-Trichloroethane	0.28 U	0.05 U	**8.5**	**12**	22,900	0.0005
Acetone	5.1 U	**12**	**15**	**15**	32,900	0.0005
Carbon Disulfide	3.5 U	0.63 U	**1.1 J**	**0.62 J**	7,300	0.0002
2-Butanone (MEK)	2.4 U	**1.7**	**2.4**	**4.5**	52,100	0.00009
Toluene	0.1 U	**1.2**	**1.1**	**2.4**	52,100	0.00005
1,1-Dichloroethane	0.28 U	0.049 U	0.013 U	**0.22**	5,200	0.00004
4-Methyl-2-Pentanone (MIBK)	5 U	0.9 U	**0.3 J**	**0.3 J**	31,300	0.00001
2-Hexanone	6.3 U	1.1 U	**0.31 J**	**0.45 J**	NA	NA

Summary of Chemicals Detected in Subslab Soil Gas: Site ST009 Oct 2011

	ST009_SV001		ST009_SV002		ST009_SV003		ADEC	
	ST009SV001-1011		ST009SV002-1011		ST009SV003-1011		Target	Maximum
	0.5		0.5		0.5		Level for	Factor of
Analyte	10/8/2011		10/8/2011		10/8/2011		Soil Gas	Exceedance
Trichloroethene (TCE)	0.32	U	**3.2**		0.67	U	2.2	1.45
Tetrachloroethene (PCE)	**1.7**		**6.9**		**4.5**		41	0.17
Carbon Tetrachloride	0.33	U	0.35	U	**1.5**	**J**	16	0.09
Chloroform	0.13	U	**0.54**	**J**	0.27	U	11	0.05
Trichlorofluoromethane	**1.6**		**37**		**160**		7,300	0.02
Benzene	0.16	U	**0.21**	**J**	0.33	U	31	0.01
Methylene Chloride	**0.51**	**J**	**0.37**	**J**	**2.3**		520	0.004
1,1,1-Trichloroethane	5.3	U	**0.74**	**J**	**24**		22,900	0.0010
Bromomethane	**0.41**	**J**	0.4	U	0.78	U	520	0.001
Acetone	**10**		**3.1**		**2.6**	**J**	32,900	0.0003
2-Butanone (MEK)	**1.6**	**J**	**0.41**	**J**	0.58	U	52,100	0.00003
Toluene	**0.29**	**J**	**0.28**	**J**	**0.45**	**J**	52,100	0.00001

BTEX Concentration with Depth at Site ST009

February 2011

Analyte	10 - 11 ft bgs	5 - 6 ft bgs	0 - 2 ft bgs	Subslab (Max)
Benzene	50,000	0.068 B	0.09 B	0.58
Toluene	1,300 U	0.13	0.11	2.4
Ethylbenzene	1,300 U	0.0038 U	0.028 J	0.52
Total Xylenes	12,900	0.13	0.089	2.6

October 2011

Analyte	10 - 11 ft bgs	5 - 6 ft bgs	0 - 2 ft bgs	Subslab (Max)
Benzene	16,000	0.15 U	0.15 U	0.21 J
Toluene	920 J	0.13 U	0.13 U	0.45 J
Ethylbenzene	490 U	0.1 U	0.1 U	0.23 U
Total Xylenes	2,000	0.21 U	0.2 U	0.43 U

Soil gas oxygen at Site ST009 generally >9%
Maximum benzene in GW at Site ST009 = 11,400 ug/L (8/2007)
ADEC GW VI Target Level = 14 ug/L

Recent Regulatory Developments for TCE

- EPA officially updated their slope factors for TCE in September 2011
- RSLs were updated November 2011
- Residential Soil RSL (@10-5) = 9.1 mg/kg versus ADEC Method 2 CUL = 0.57 mg/kg
- Since Extent Sl based on GW migration, no impact on step-out decisions
- Updated slope factors will be used for all soil and GW risk assessments