EA Engineering, P.C. and
Its Affiliate EA Science
and Technology

Remedial Investigation Report for the Armed Forces Reserve Center Albany Site 4, O'Donovan Armed Forces Reserve Center (Facility ID NY001), Albany, NY

Prepared for:
99th Regional Support Command and
U.S. Army Environmental Command

12 October 2016

Agenda

- Introductions/Project Team
- Schedule
- Site Background
- Remedial Investigation Approach
- Remedial Investigation Results
- Groundwater and Vapor Intrusion Investigation Summaries
- Conclusions
- Recommendations
- Questions

Schedule

- Work Plan Approval: September 2015
- Field Work: November 2015 and April 2016
- Draft RI Report: June 2016
- Draft Final RI Report: August 2016
- Final RI Report: Awaiting comments
- Feasibility Study: Winter 2016
- Proposed Plan: Spring 2016
- Record of Decision: Summer 2017

Site Background

- O'Donovan AFRC:U. S. Army Reserve center (O'Donovan Building, annex, O&M building) and U.S. Naval Reserve/Marine Corps Reserve centers (former NOSC, storage garage, drill hall)
- AFRC Albany Site 4: former vehicle Wash Rack and OWS northeast of the O&M building and former trench drain within the southernmost maintenance bay garage of the O&M building that drained to the OWS

Initial Investigations

- 1998 Initial investigation: Oil sheen on groundwater, DRO and GRO in site soil.
- 1999 Subsurface investigation: VOCs and SVOCs in site soil and groundwater. Closure activities for the former Wash Rack and OWS. OWS was cleaned and the interior of the concrete chamber was inspected for damage; no damage was found. Wash Rack basin was closed and paved over, and OWS was filled with crushed stone and closed in place.
- 2003 Preliminary Assessment indicated O'Donovan AFRC was eligible for inclusion on the NPL
- 2004 Supplemental Site Investigation: petroleum-related VOCs, SVOCs, and metals in subsurface soil and groundwater in former OWS area. Recommended limited soil excavation.

2005 Limited Soil Excavation

- OWS exposed and sheen was observed draining from the OWS.
- Top of the OWS was removed, crushed stone from within the interior was excavated, and ~630 gallons of water were removed.
- Bottom portion of the OWS was filled with a concrete slurry mix to seal it in place.
- North, south, and west sidewalls of the OWS were excavated to a depth of 14 ft bgs (buried high voltage electrical conduit along eastern sidewall).
- Total 75 tons of soil removed. Post-excavation soil sampling: VOCs and SVOCs below EPA residential soil RSLs.
- Excavation backfilled with clean sand fill.

Previous Investigations

- 2011 Site Inspection
- 2013 Site Investigation Addendum
- February 2013 Vapor Intrusion Testing at Albany High School
- 2013 Site Investigation
- May 2013 Vapor Intrusion Testing at Offsite Properties

Initial Summary of Risk from SI

- PCE in groundwater above EPA MCL of 5 µg/L and/or the EPA Tapwater RSL of 4.1 µg/L
- PCE and TCE in sub-slab soil gas beneath the O'Donovan building exceeding EPA industrial target sub-slab soil gas screening levels from the VISL calculator (580 µg/m^3 for PCE and 29 µg/m^3 for TCE) and in indoor air of the O'Donovan building exceeding EPA industrial air RSLs (18 µg/m^3 for PCE and 0.88 µg/m^3 for TCE)
- TCE in indoor air of the former NOSC building at concentrations above the EPA industrial air RSLs.

Analytical Results - SI

Monitoring Well	Analyte	July 2012 (µg/L)	August 2012 (µg/L)	April 2013 (µg/L)	EPA Tapwater RSL[a,b] (µg/L)	EPA MCL[c] (µg/L)
MW-1	PCE	120	80	1.3	4.1	5
MW-2	PCE	9,500	2,800	49.1	4.1	5
MW-3	PCE	2,300	210	5.9	4.1	5
GW-8	PCE	Not available	Not available	0.69	4.1	5

(a) Values correspond to Target Hazard Quotent = $1x10^{-6}$ and Hazard Index = 0.1.
(b) EPA Tapwater RSL = U.S. Environmental Protection Agency Regional Screening Levels for Tapwater, May 2016.
(c) EPA MCL = Safe Drinking Water Act Maximum Contaminant Levels May 2016.

Values exceeding EPA Tapwater RSLs are red.
Values exceeding EPA MCL are highlighted in yellow.

Sample ID	Analyte	Sub-Slab Soil Gas Concentration ($µg/m^3$)	Indoor Air Concentration ($µg/m^3$)	EPA Residential ScreeningLevels[a]		EPA Industrial Screening Levels[a]	
				Sub-slab Soil Gas VISL[b] (µg/m3)	Indoor Air RSL [c] ($µg/m^3$)	Sub-slab Soil Gas VISL[b] ($µg/m^3$)	Indoor Air RSL [c] ($µg/m^3$)
O'Donovan Building 2012							
IA-2	PCE	---	420	140	580	4.2	18
IA-3	PCE	---	76	140	580	4.2	18
SS-2	PCE	230	---	140	580	4.2	18
O'Donovan Building 2013							
SS-1/IA-1	TCE	52.1	6.45	7	29	0.21	0.88
SS-2/IA-2	TCE	1.5	Not detected	7	29	0.21	0.88
SS-3/IA-3	TCE	0.21	44.1	7	29	0.21	0.88
SS-4/IA-4	TCE	5.21	Not detected	7	29	0.21	0.88
SS-5/IA-5	TCE	24.7	0.16	7	29	0.21	0.88
Former NOSC Building 2013							
SS-7/IA-7	TCE	5.21	2.2	7	29	0.21	0.88
SS-8	TCE	4.51	4.73	7	29	0.21	0.88

(a) Values correspond to Target Hazard Quotent = $1x10^{-6}$ and Hazard Index = 0.1.
(b) VISLs based on EPA RSLs and Health Advisory Levels (updated May 2016) modified using the methodology specified in the EPA Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), June 2015 by dividing by an attenuation factor of 0.03 for sub-slab soil.

(c) Criteria based on EPA RSLs and Health Advisory Levels (updated May 2016).

Values exceeding EPA Residential RSLs are red.
Values exceeding EPA Industrial RSLs are highlighted in yellow.

Soil/Surface Water Evaluation

- No surface soil sampling due to presence of hardscapes (pavement) at AFRC Albany Site 4.
- Soil analytical results indicate that the 2005 soil excavation was effective in removing potential subsurface soil VOC sources. Analytical results from additional soil samples collected from borings installed in 2013 in the area north of the former Wash Rack and OWS and immediately southeast of the O'Donovan building indicated only low-level concentrations of VOCs below residential and industrial soil RSLs and risk-based and MCL-based soil screening levels that are protective of groundwater.
- No onsite surface water bodies at the O'Donovan AFRC. No documentation of historical surface discharges. No potential for groundwater infiltration into the stormwater system or potential for stormwater and/or overland flow to come into contact with contaminated groundwater.

Data Gaps from SI

- Horizontal extent of PCE in groundwater had not been fully delineated to the northeast and west of the former Wash Rack/OWS
- A utility corridor located along the southeastern boundary of the O'Donovan AFRC was a suspected transport conduit for groundwater and contaminant migration that had not been previously investigated.
- Significant reductions in PCE concentrations indicated by analytical results from July and August 2012 and April 2013 sampling events were not explained in previous reports.
- Soil geologic data and groundwater geochemistry data had not been collected to evaluate feasibility of remediation technologies.
- Additional vapor intrusion (VI) sampling at the O'Donovan building and former NOSC buildings was needed to fully assess the VI pathway and the potential for exposure of current and future receptors to site-related contaminants in indoor air.

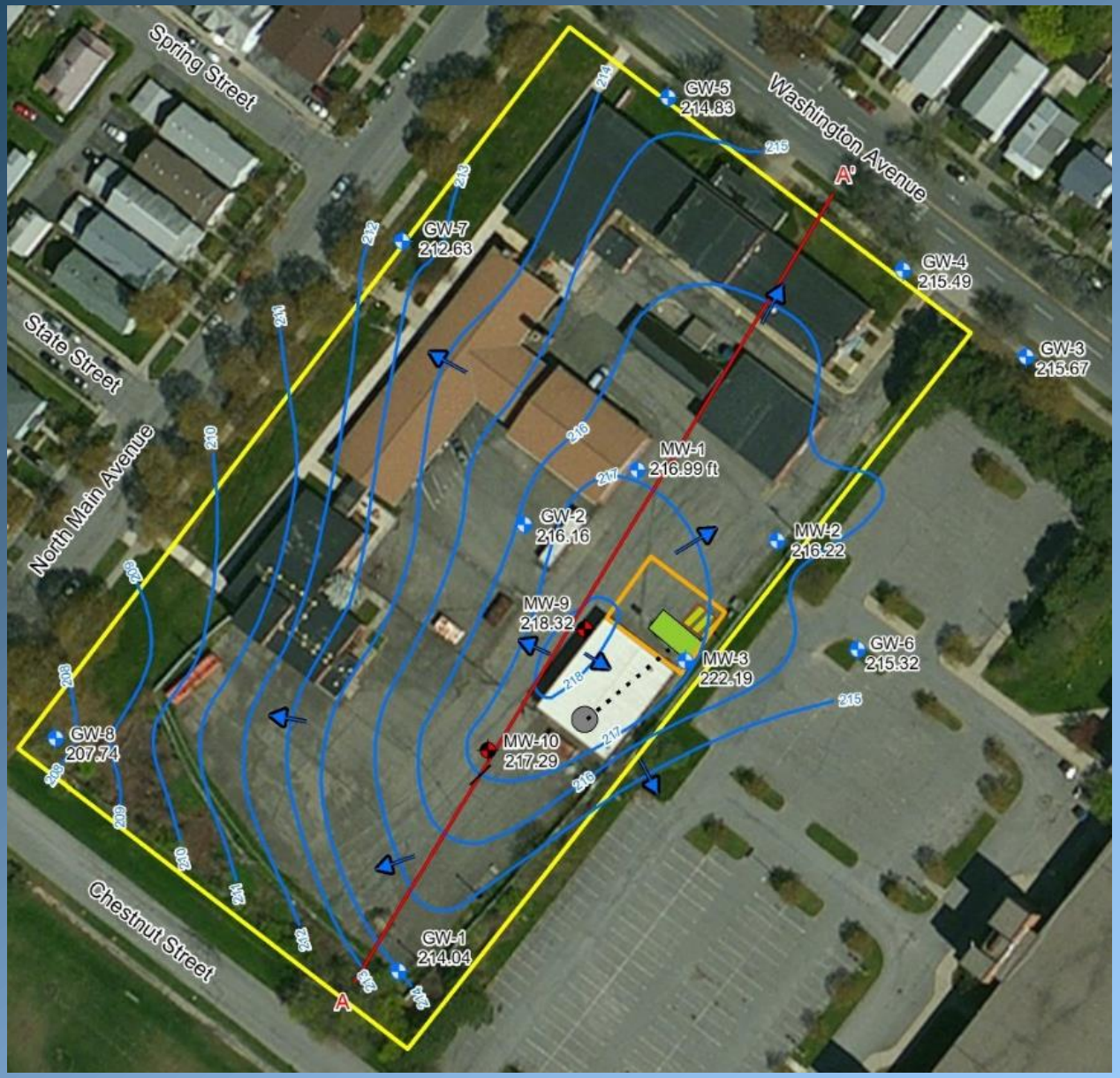
Remedial Investigation Approach

- **November 2015**
  - Install two shallow monitoring wells west of the former Wash Rack/OWS and collect soil geologic/geotechnical samples
  - Advance two direct-push groundwater sampling locations northeast of the former Wash Rack/OWS
  - Groundwater gauging and completion of rising and falling head tests to evaluate hydraulic conductivity
  - Groundwater sampling for VOCs and monitored natural attenuation parameters
  - VI investigation at the O'Donovan and former NOSC buildings
- **April 2016**
  - Confirmatory groundwater sampling for VOCs at select monitoring wells

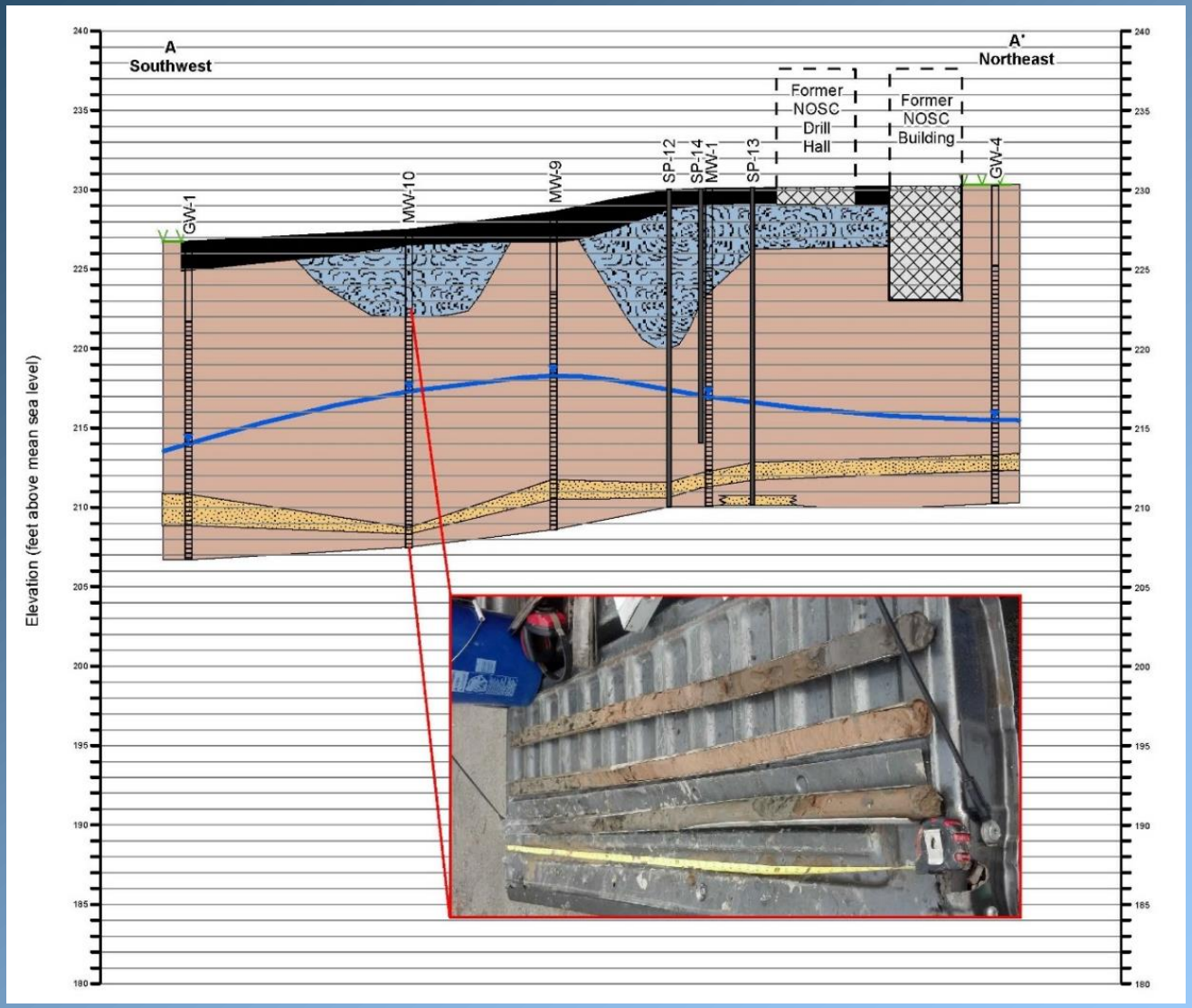
RI Site Physical Characteristics

- Subsurface material: fill overlying dense, cohesive clay and silty clay. 1-2ft thick lens of wet to saturated very fine sand/silty sand between approximately 13-20 ft bgs.
- Groundwater flow away from the center of the O'Donovan AFRC in a radial pattern. perched water zone at MW-03 (former excavation area) and in fill material at MW-10.
- Low hydraulic conductivity of 0.130-2.172 ft/day.
- Specific discharge ranging from 0.759 to 8.721 ft/year.
- Seepage velocity ranging from 3.795 to 80 ft/year.
- DO concentrations indicated aerobic conditions at wells where PCE concentrations were previously detected in groundwater (MW-1, MW-2, MW-3, GW-8).
- ORP values indicated oxidizing conditions at MW-1, MW-2, and GW-8, variability between oxidizing and reducing at MW-3.

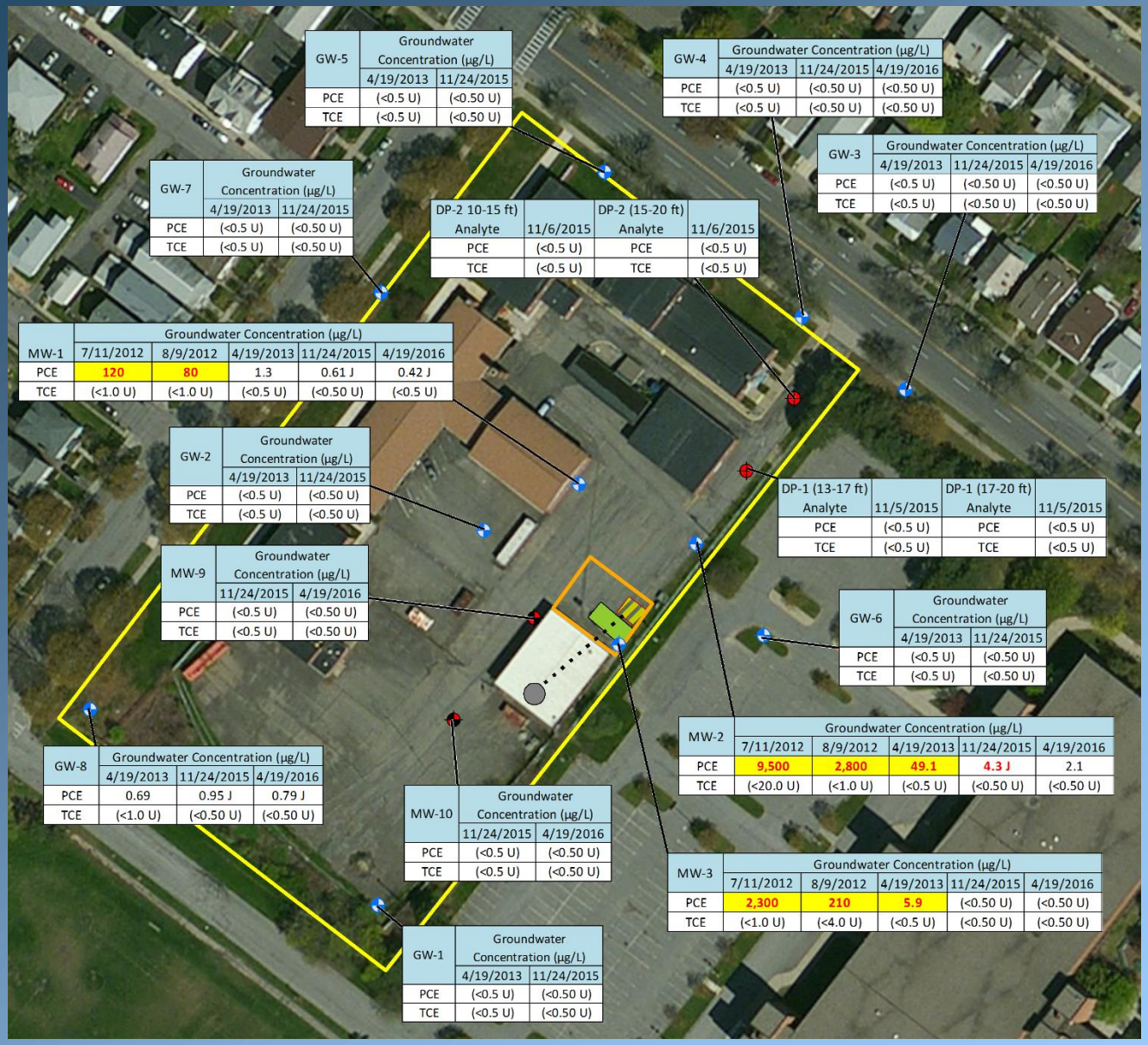
Groundwater Flow



Subsurface Lithology



Groundwater Investigation



GW-5	Groundwater Concentration (µg/L)	
	4/19/2013	11/24/2015
PCE	(<0.5 U)	(<0.50 U)
TCE	(<0.5 U)	(<0.50 U)

GW-4	Groundwater Concentration (µg/L)		
	4/19/2013	11/24/2015	4/19/2016
PCE	(<0.5 U)	(<0.50 U)	(<0.50 U)
TCE	(<0.5 U)	(<0.50 U)	(<0.50 U)

GW-3	Groundwater Concentration (µg/L)		
	4/19/2013	11/24/2015	4/19/2016
PCE	(<0.5 U)	(<0.50 U)	(<0.50 U)
TCE	(<0.5 U)	(<0.50 U)	(<0.50 U)

GW-7	Groundwater Concentration (µg/L)	
	4/19/2013	11/24/2015
PCE	(<0.5 U)	(<0.50 U)
TCE	(<0.5 U)	(<0.50 U)

DP-2 10-15 ft) Analyte	11/6/2015	DP-2 (15-20 ft) Analyte	11/6/2015
PCE	(<0.5 U)	PCE	(<0.5 U)
TCE	(<0.5 U)	TCE	(<0.5 U)

MW-1	Groundwater Concentration (µg/L)				
	7/11/2012	8/9/2012	4/19/2013	11/24/2015	4/19/2016
PCE	120	80	1.3	0.61 J	0.42 J
TCE	(<1.0 U)	(<1.0 U)	(<0.5 U)	(<0.50 U)	(<0.5 U)

GW-2	Groundwater Concentration (µg/L)	
	4/19/2013	11/24/2015
PCE	(<0.5 U)	(<0.50 U)
TCE	(<0.5 U)	(<0.50 U)

DP-1 (13-17 ft) Analyte	11/5/2015	DP-1 (17-20 ft) Analyte	11/5/2015
PCE	(<0.5 U)	PCE	(<0.5 U)
TCE	(<0.5 U)	TCE	(<0.5 U)

MW-9	Groundwater Concentration (µg/L)	
	11/24/2015	4/19/2016
PCE	(<0.5 U)	(<0.50 U)
TCE	(<0.5 U)	(<0.50 U)

GW-6	Groundwater Concentration (µg/L)	
	4/19/2013	11/24/2015
PCE	(<0.5 U)	(<0.50 U)
TCE	(<0.5 U)	(<0.50 U)

MW-2	Groundwater Concentration (µg/L)				
	7/11/2012	8/9/2012	4/19/2013	11/24/2015	4/19/2016
PCE	9,500	2,800	49.1	4.3 J	2.1
TCE	(<20.0 U)	(<1.0 U)	(<0.5 U)	(<0.50 U)	(<0.50 U)

GW-8	Groundwater Concentration (µg/L)		
	4/19/2013	11/24/2015	4/19/2016
PCE	0.69	0.95 J	0.79 J
TCE	(<1.0 U)	(<0.50 U)	(<0.50 U)

MW-10	Groundwater Concentration (µg/L)	
	11/24/2015	4/19/2016
PCE	(<0.5 U)	(<0.50 U)
TCE	(<0.5 U)	(<0.50 U)

MW-3	Groundwater Concentration (µg/L)				
	7/11/2012	8/9/2012	4/19/2013	11/24/2015	4/19/2016
PCE	2,300	210	5.9	(<0.50 U)	(<0.50 U)
TCE	(<1.0 U)	(<4.0 U)	(<0.5 U)	(<0.50 U)	(<0.50 U)

GW-1	Groundwater Concentration (µg/L)	
	4/19/2013	11/24/2015
PCE	(<0.5 U)	(<0.50 U)
TCE	(<0.5 U)	(<0.50 U)

Legend

- O'Donovan AFRC Boundary
- AFRC Albany Site 4
- Former Wash Rack
- Oil Water Separator
- Former Trench Drain
- Existing Monitoring Well
- Newly Installed Monitoring Well
- Direct Push GW Grab Sampling Location

Analyte	EPA Tapwater RSL (µg/L)	EPA Maximum Contaminant Level (µg/L)
PCE	4.1	5
TCE	0.49	5

Concentrations exceeding EPA Tapwater RSL are red

Concentrations exceeding EPA MCL are highlighted in yellow

Vapor Intrusion Investigation

SS-1 Analyte	2013 Sub-Slab Vapor Concentration (µg/m³)	2015 Sub-Slab Vapor Concentration (µg/m³)	Duplicate 2015 Sub-Slab Vapor Concentration (µg/m³)
PCE	4.48	(<17 U)	9.9 J
TCE	52.1	(<14 U)	16 J
IA-1 Analyte	**2013 Indoor Air Concentration (µg/m³)**	**2015 Indoor Air Concentration (µg/m³)**	**Duplicate 2015 Indoor Air Concentration (µg/m³)**
PCE	(<0.2 U)	(<0.21 U)	0.027 J
TCE	6.45	(<0.17 U)	(<0.17 U)

SS-9 Analyte	2013 Indoor Air Concentration (µg/m³)
PCE	1.02
TCE	(<0.08 U)
IA-9 Analyte	**2013 Sub-Slab Vapor Concentration (µg/m³)**
PCE	0.27
TCE	(<0.08 U)
IA-9RE Analyte	**2013 Sub-Slab Vapor Concentration (µg/m³)**
PCE	0.34
TCE	(<0.08 U)

SS-6 Analyte	2013 Indoor Air Concentration (µg/m³)
PCE	(<0.2 U)
TCE	(<0.08 U)
IA-6 Analyte	**2013 Sub-Slab Vapor Concentration (µg/m³)**
PCE	0.61
TCE	0.64
IA-6RE Analyte	**2013 Sub-Slab Vapor Concentration (µg/m³)**
PCE	0.95
TCE	(<0.91 U)

SS-8 Analyte	2013 Sub-Slab Vapor Concentration (µg/m³)	2015 Sub-Slab Vapor Concentration (µg/m³)
PCE	Not sampled	0.11 J
TCE	Not sampled	(<4.3 U)
IA-8 Analyte	**2013 Indoor Air Concentration (µg/m³)**	**2015 Indoor Air Concentration (µg/m³)**
PCE	(<0.2 U)	Not sampled
TCE	4.51	Not sampled
IA-8RE Analyte	**2013 Indoor Air Concentration (µg/m³)**	**2015 Indoor Air Concentration (µg/m³)**
PCE	(<0.2 U)	Not sampled
TCE	4.73	Not sampled

SS-5 Analyte	2013 Sub-Slab Vapor Concentration (µg/m³)	2015 Sub-Slab Vapor Concentration (µg/m³)
PCE	2.85	(<5.3 U)
TCE	24.7	(<4.2 U)
IA-5 Analyte	**2013 Indoor Air Concentration (µg/m³)**	**2015 Indoor Air Concentration (µg/m³)**
PCE	(<0.2 U)	(<0.21 U)
TCE	0.16	(<0.16 U)

SS-2 Analyte	2013 Sub-Slab Vapor Concentration (µg/m³)	2015 Sub-Slab Vapor Concentration (µg/m³)
PCE	3.73	2.2 J
TCE	1.5	(<4.4 U)
IA-2 Analyte	**2013 Indoor Air Concentration (µg/m³)**	**2015 Indoor Air Concentration (µg/m³)**
PCE	(<0.2 U)	0.24
TCE	(<0.08 U)	(<0.17 U)

SS-7 Analyte	2013 Indoor Air Concentration (µg/m³)	2015 Sub-Slab Vapor Concentration (µg/m³)
PCE	1.29	0.18 J
TCE	5.21	(<4 U)
IA-7 Analyte	**2013 Sub-Slab Vapor Concentration (µg/m³)**	**2015 Indoor Air Concentration (µg/m³)**
PCE	0.54	(<0.2 U)
TCE	2.2	(<0.16 U)

SS-3 Analyte	2013 Sub-Slab Vapor Concentration (µg/m³)	2015 Sub-Slab Vapor Concentration (µg/m³)
PCE	3.59	11
TCE	0.21	(<4.2 U)
IA-3 Analyte	**2013 Indoor Air Concentration (µg/m³)**	**2015 Indoor Air Concentration (µg/m³)**
PCE	1.42	0.28 J
TCE	44.1	0.29 J

SS-4B Analyte	2013 Sub-Slab Vapor Concentration (µg/m³)	2015 Sub-Slab Vapor Concentration (µg/m³)
PCE	1.22	0.54 J
TCE	5.21	0.44 J
IA-4 Analyte	**2013 Indoor Air Concentration (µg/m³)**	**2015 Indoor Air Concentration (µg/m³)**
PCE	(<0.2 U)	(<0.21 U)
TCE	(<0.08 U)	(<0.16 U)

OA-1 Analyte	2013 Outdoor Air Concentration (µg/m³)	2015 Indoor Air Concentration (µg/m³)
PCE	(<0.2 U)	0.12 J
TCE	(<0.08 U)	0.057 J

Legend

- O'Donovan AFRC Boundary
- AFRC Albany Site 4
- Former Wash Rack
- Oil Water Separator
- Former Trench Drain
- Sub-Slab Vapor/Indoor Air Sample Location
- Outdoor Air Sample Location

EPA Sub-Slab Soil Gas VISLs (THQ = 0.1; attenuation factor of 0.03)		
VOC	Residential RSL (µg/m³)	Industrial RSL (µg/m³)
PCE	140	580
TCE	7	29
EPA Indoor Air RSLs (THQ = 0.1)		
VOC	Residential RSL (µg/m³)	Industrial RSL (µg/m³)
PCE	4.2	18
TCE	0.21	0.88

Concentrations exceeding EPA Residential RSL are red

Concentrations exceeding EPA Industrial RSL highlighted in yellow

Groundwater Summary

- PCE was identified as the primary contaminant in groundwater during previous investigations.
- Based on the site-specific data and well understood contaminant fate and transport dynamics of PCE in groundwater, the July-August 2012 groundwater results are highly questionable. The 2012 groundwater data are highly suspect and are not considered representative of the historic groundwater concentrations for the site.
- PCE declined to below the EPA Safe Drinking Water Act MCL of 5 µg/L in November 2015 and to below the EPA tapwater RSL of 4.1 µg/L in April 2016.
- The lack of a continued subsurface source material and the effects of dispersion, dilution, diffusion, and potentially co-metabolic or abiotic degradation of PCE has allowed for decreasing trends to continue to levels below regulatory criteria.

Human Health Risk Assessment

- Groundwater
  - No unacceptable risk - residential scenario
- Vapor Intrusion
  - No unacceptable risk from vapor intrusion – residential scenario
  - COCs in indoor air were not COCs in sub-slab soil gas or groundwater
  - COCs in sub-slab soil gas were not COCs in indoor air

Ecological Risk Assessment

- No potentially complete pathways for biota.
- Deemed not necessary for AFRC Albany Site 4.
  - No threatened/endangered species at O'Donovan AFRC.
  - No wetlands, sensitive environments, or aquatic receptors at or adjacent to O'Donovan AFRC.
  - Vegetated areas consist of mowed lawns with trees located along the O'Donovan AFRC property boundary.

Conclusions

- VOCs associated with AFRC Albany Site 4 were not detected in groundwater at concentrations above EPA Safe Drinking Water Act MCLs (November 2015) or EPA tapwater RSLs (April 2016).
- VOCs (with the exception of chloroform) were not detected at both sub-slab soil gas and co-located indoor air sampling locations at concentrations above EPA industrial or residential target sub-slab soil gas screening levels from the VISL calculator and EPA industrial or residential indoor air RSLs.
  - Chloroform was not detected in groundwater during the RI or previous investigations and is concentrations in sub-slab vapor and indoor air may be attributed to leaking sewer or water pipes beneath O'Donovan building slab
- HHRA determined there are no unacceptable human health risks for exposure to groundwater at the Site, and that there are no unacceptable human health risks from VI of VOCs from groundwater to indoor air.

Recommendations

- VOC concentrations in groundwater, soil gas, and sub-slab soil gas related to AFRC Albany Site 4 are expected to continue decline as a source for these VOCs is not present.
- AFRC Albany Site 4 is recommended for No Action under the current land use and zoning, and reasonably anticipated future land use (i.e., commercial/ industrial).
- The site should be carried through the CERCLA process with a No Action Record of Decision / Decision Document.

Questions?

- Open Discussion
- Action Items