Groundwater Update

Brookhaven National Laboratory
Community Advisory Council Meeting
January 11, 2018

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70 YEARS OF DISCOVERY

A CENTURY OF SERVICE

U.S. DEPARTMENT OF ENERGY

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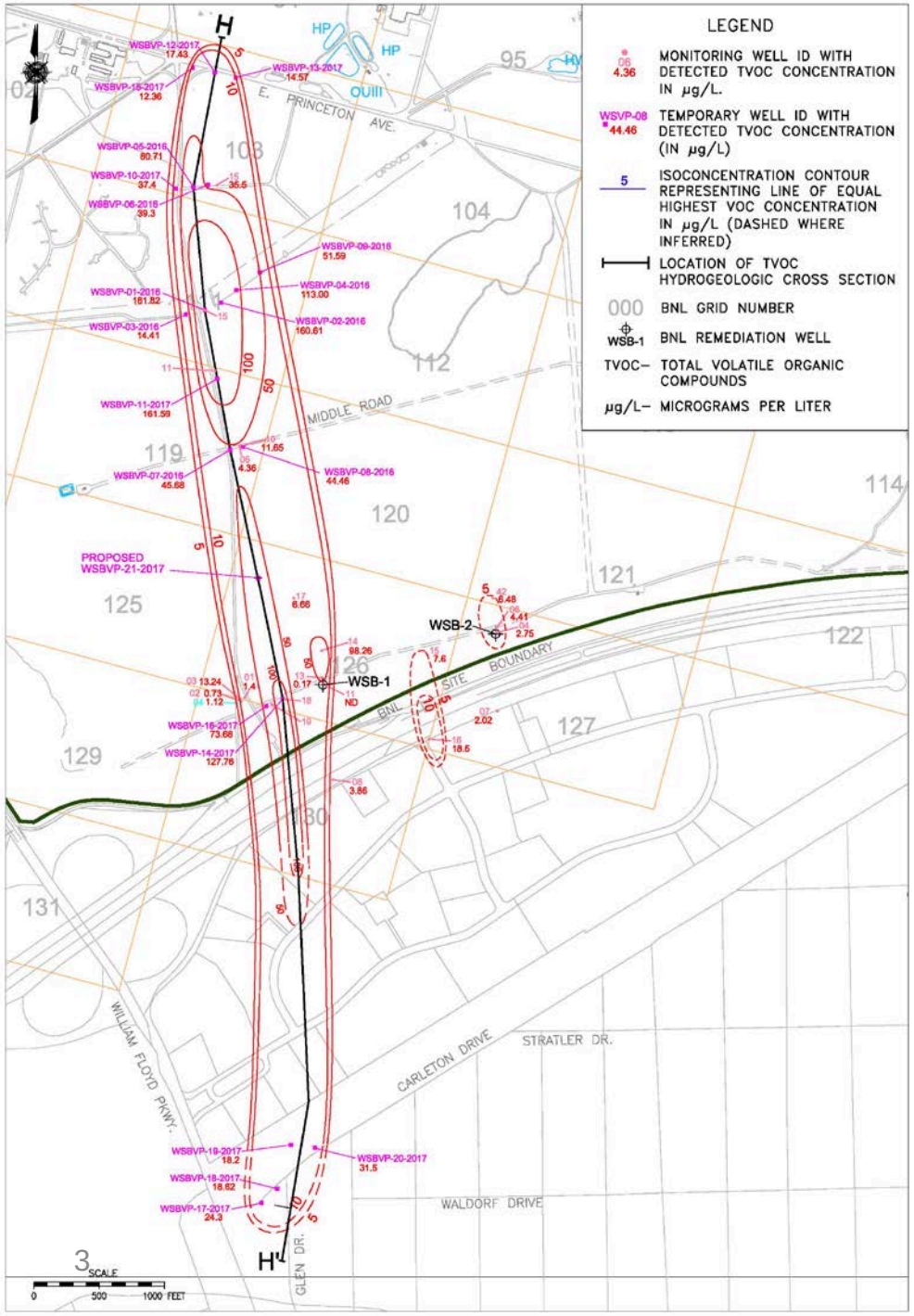
Agenda

- Completion of Western South Boundary (WSB) Off-Site VOC Characterization
- WSB Groundwater Modeling Simulation Results
- Path forward for WSB
- Response to Suffolk County Dept. of Health Services (SCDHS) request for additional 1,4-Dioxane characterization and characterization of low level Perfluorinated Compounds (PFCs) detected in BNL Supply Wells
- Update on Ethylene Dibromide (EDB) detections in North Street East Monitoring Well

Western South Boundary Deep VOCs: Off-Site Plume Characterization

- Since September CAC update, installed four temporary vertical profile wells on Carleton Dr.
- Highest VOC concentrations in VP-20 (145-160 ft. below land surface)
  - Freon-12 13 µg/L
  - 1,1,1-Trichloroethane (TCA) 4 µg/L
  - Trichloroethene (TCE) 6 µg/L
  - 1,1-Dichloroethene (DCE) 5 µg/L
  - Drinking Water Standard is 5 µg/L



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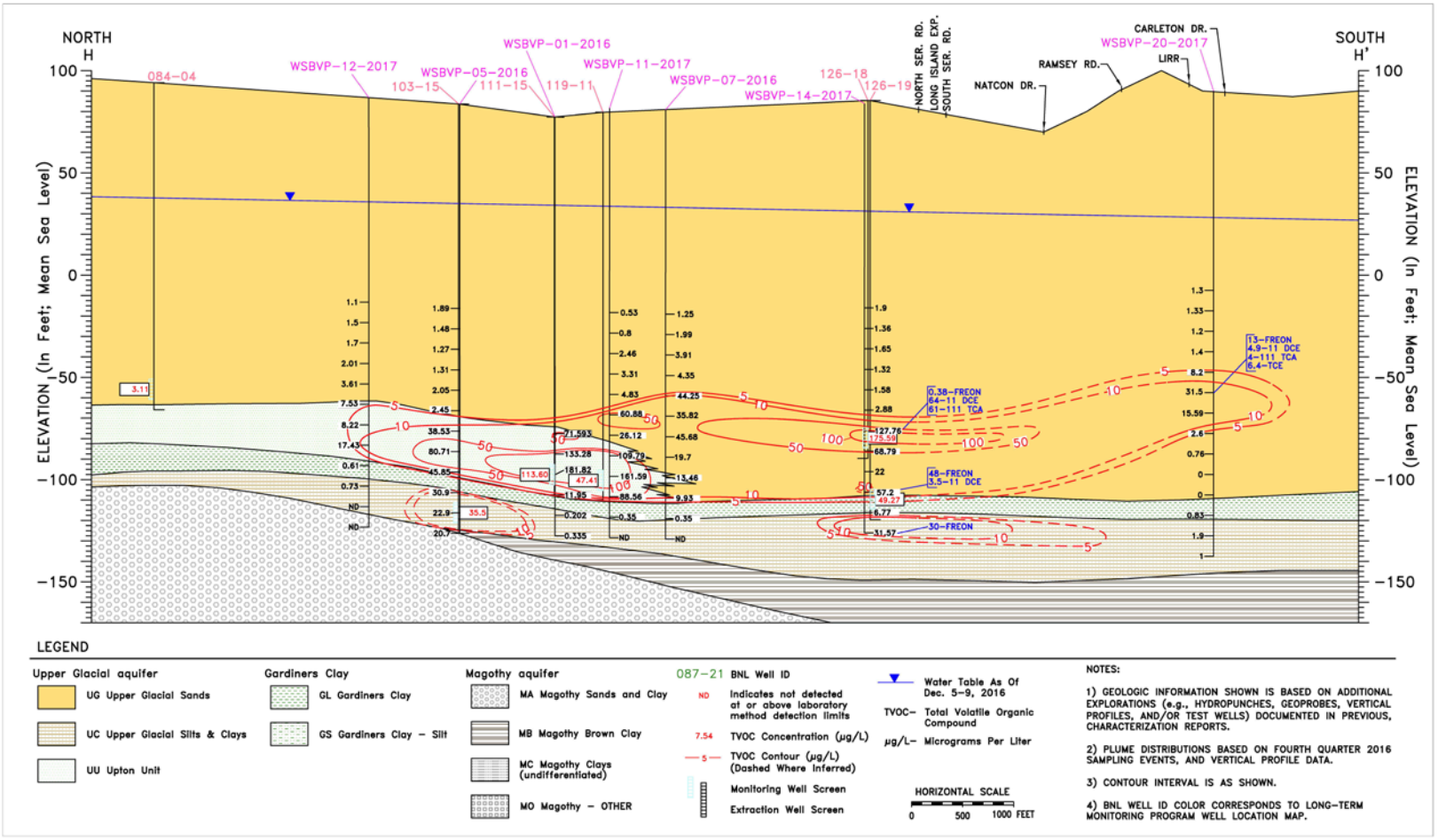
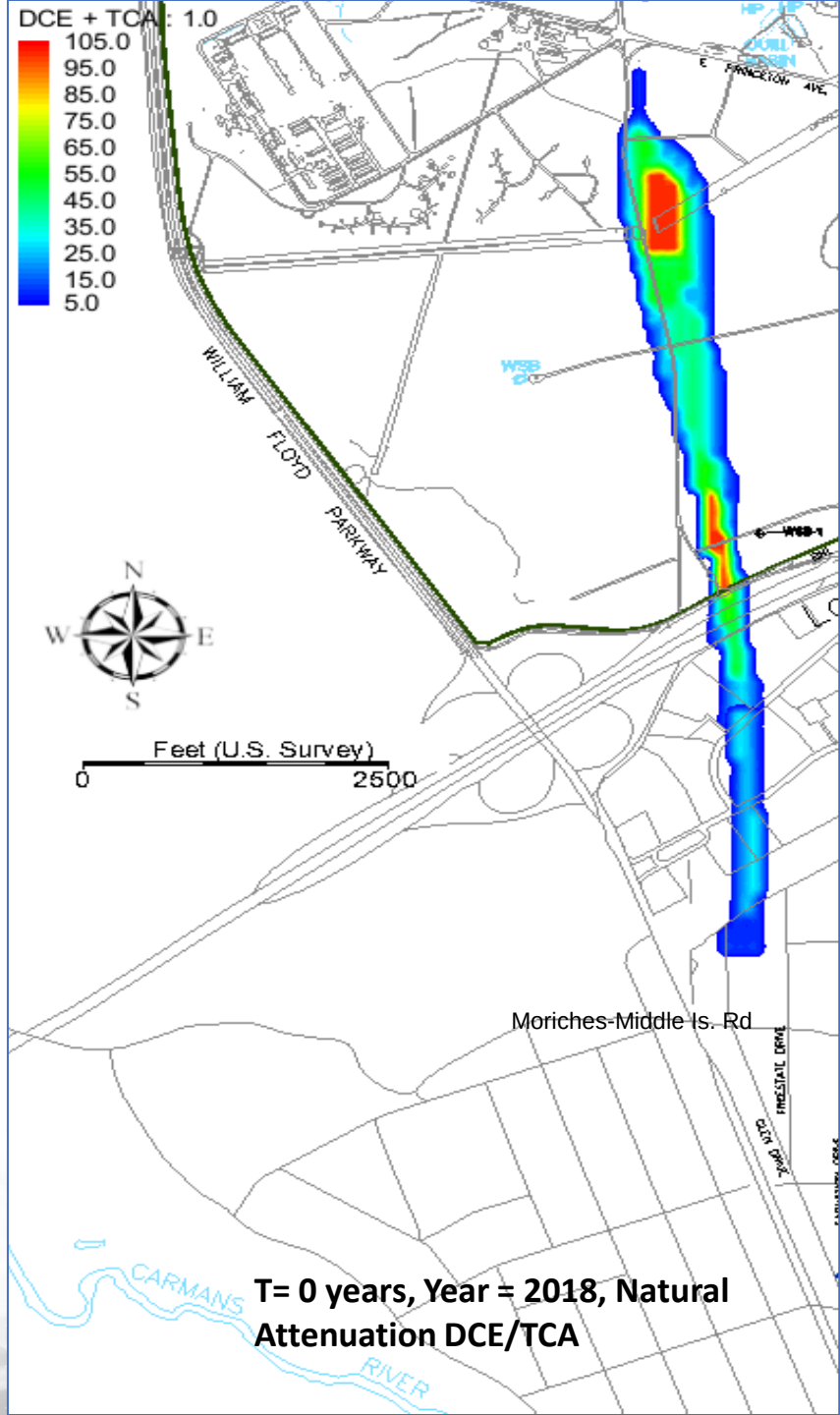
Western South Boundary Deep VOCs: Plume Characterization

- VOCs are present in two distinct zones within the deep Upper Glacial Aquifer:
  - DCE/TCA are the primary contaminants in the shallower zone (~150 ft. below land surface).
  - Freon-12 is the primary contaminant in the deeper zone (~210 ft. below land surface).
- The groundwater flow rate in the shallower zone is ~440 feet/yr. and in the deeper zone is ~90 feet/yr.

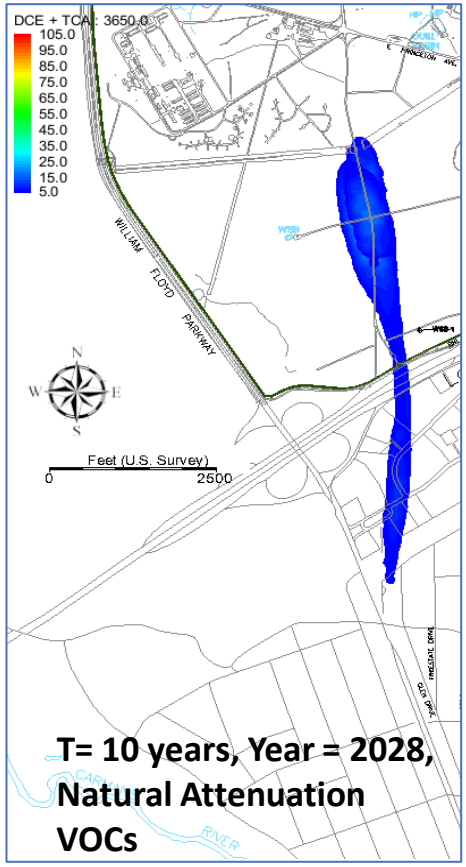


Western South Boundary DCE/TCA: Natural Attenuation Modeling

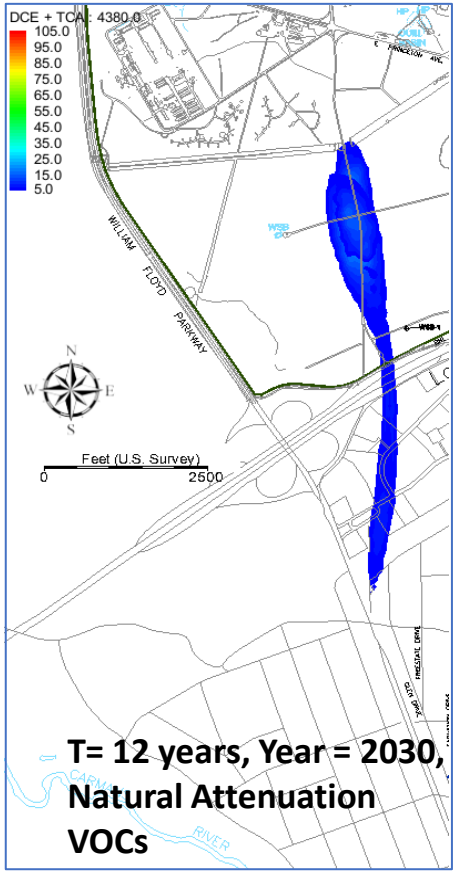
- Natural attenuation fate and transport simulations were run separately for DCE/TCA and Freon.
- The OU III ROD cleanup goal is to meet drinking water standards in the Upper Glacial aquifer by 2030. This contamination is in the deep Upper Glacial Aquifer.



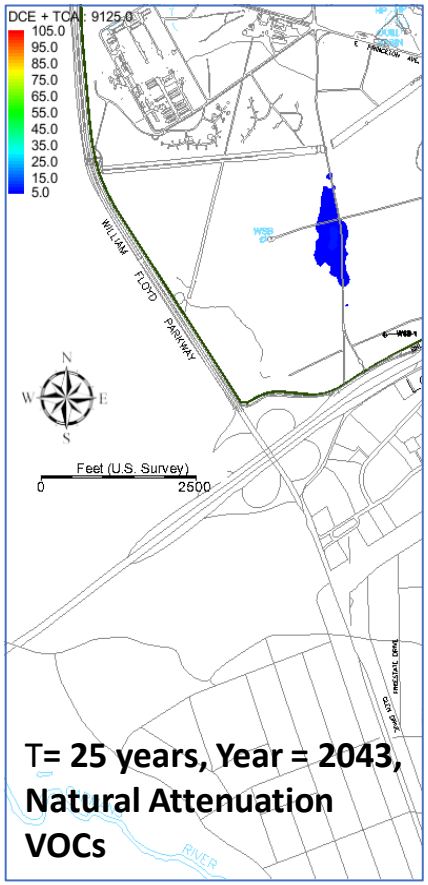
Western South Boundary DCE/TCA: Natural Attenuation Modeling



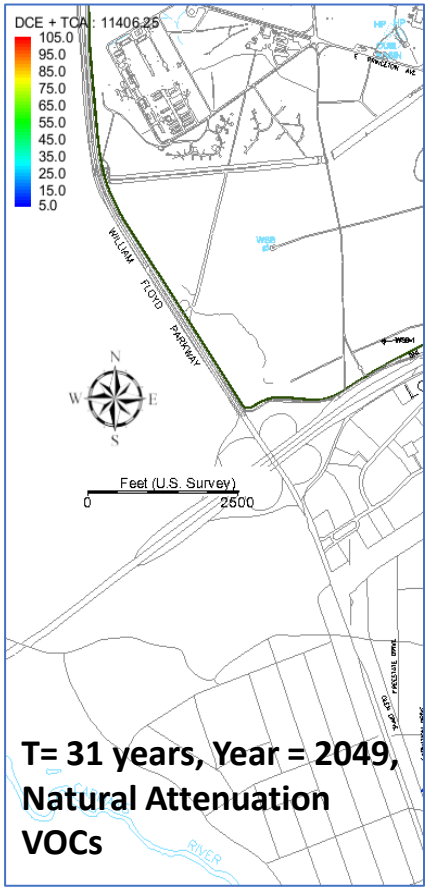
T= 10 years, Year = 2028, Natural Attenuation VOCs



T= 12 years, Year = 2030, Natural Attenuation VOCs



T= 25 years, Year = 2043, Natural Attenuation VOCs

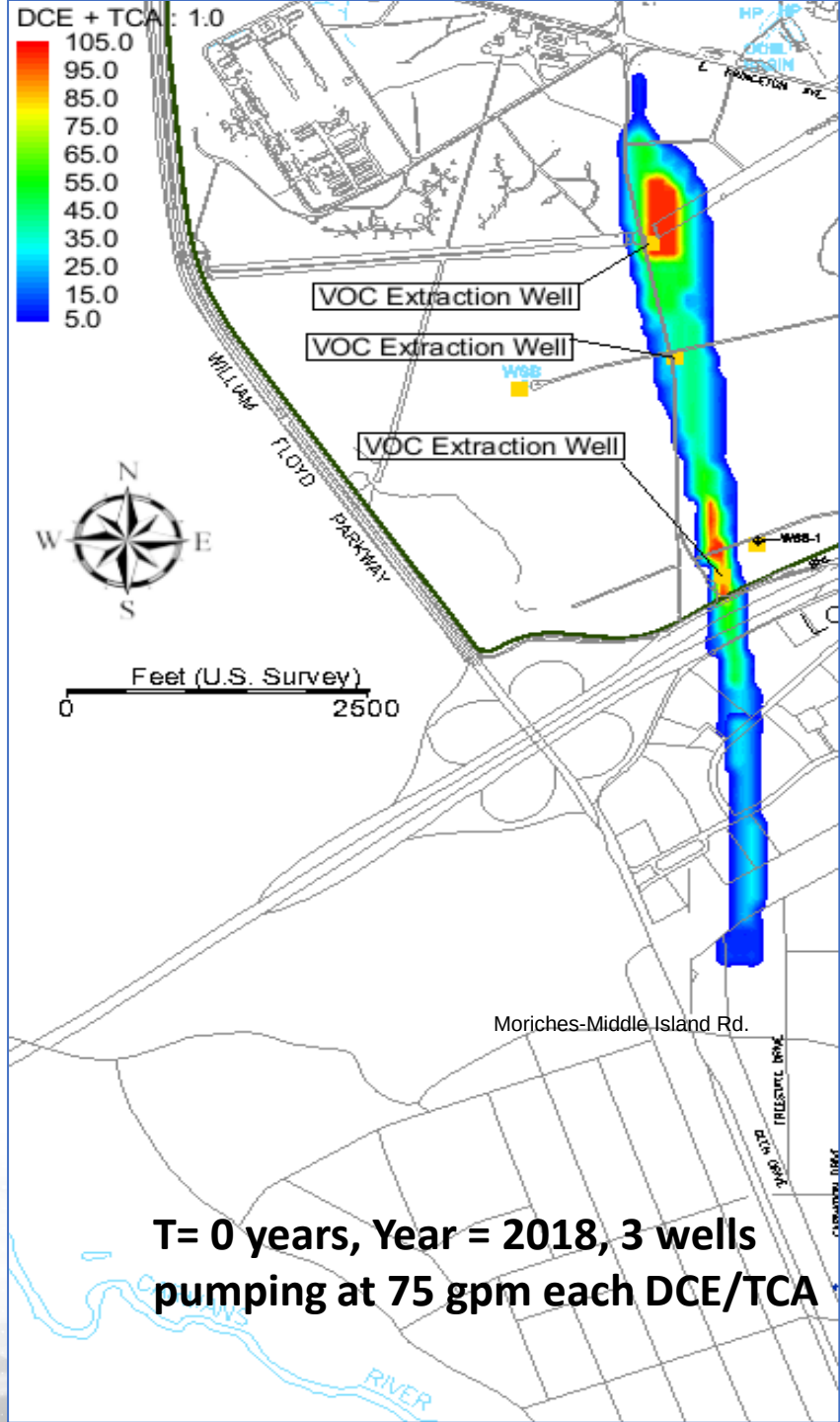


T= 31 years, Year = 2049, Natural Attenuation VOCs

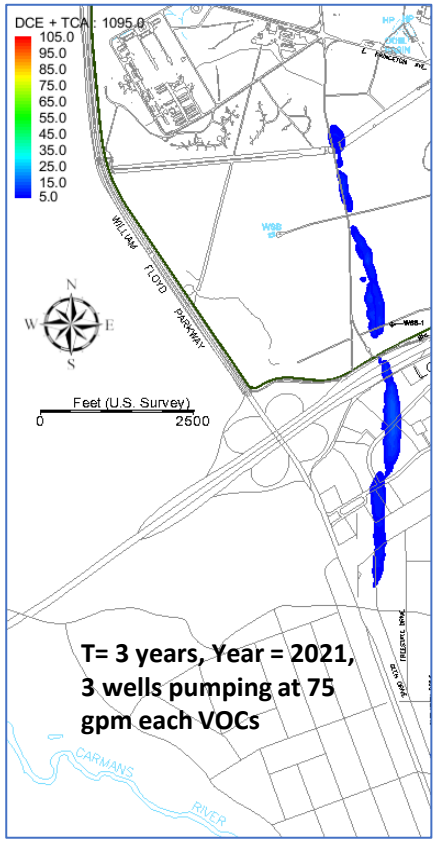
- Under natural attenuation, the DCE/TCA remains above drinking water standards for more than 30 years (~2049) and cleanup goal is not met.
- Under natural attenuation there is no impact to the Carman's River and the plume advances to approximately Moriches Middle Island Road.

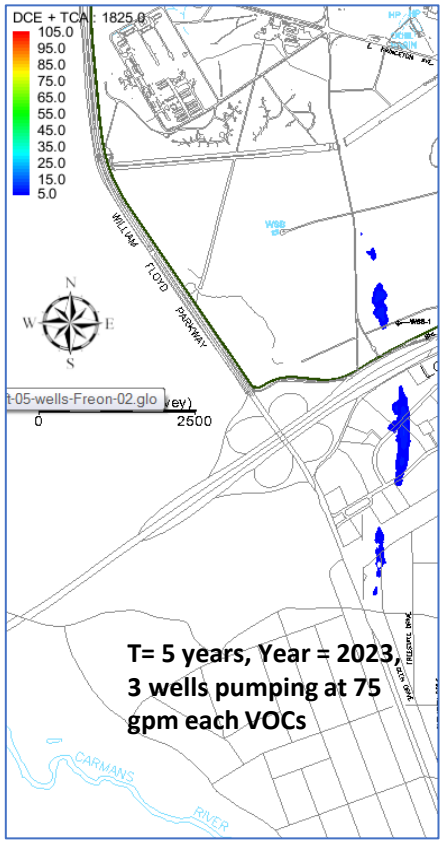
Western South Boundary DCE/TCA: Pump and Treat Modeling

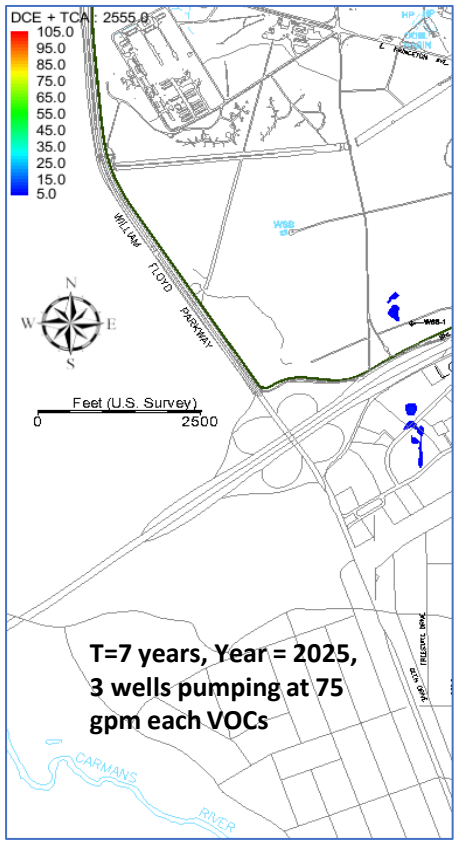
- Optimal pumping scenario to meet cleanup goal requires three new extraction wells.

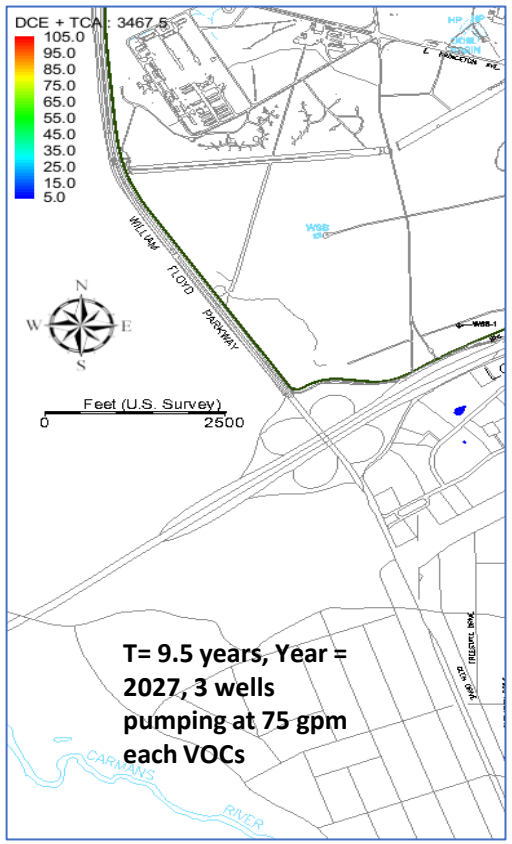


Western South Boundary DCE/TCA: Pump and Treat Modeling





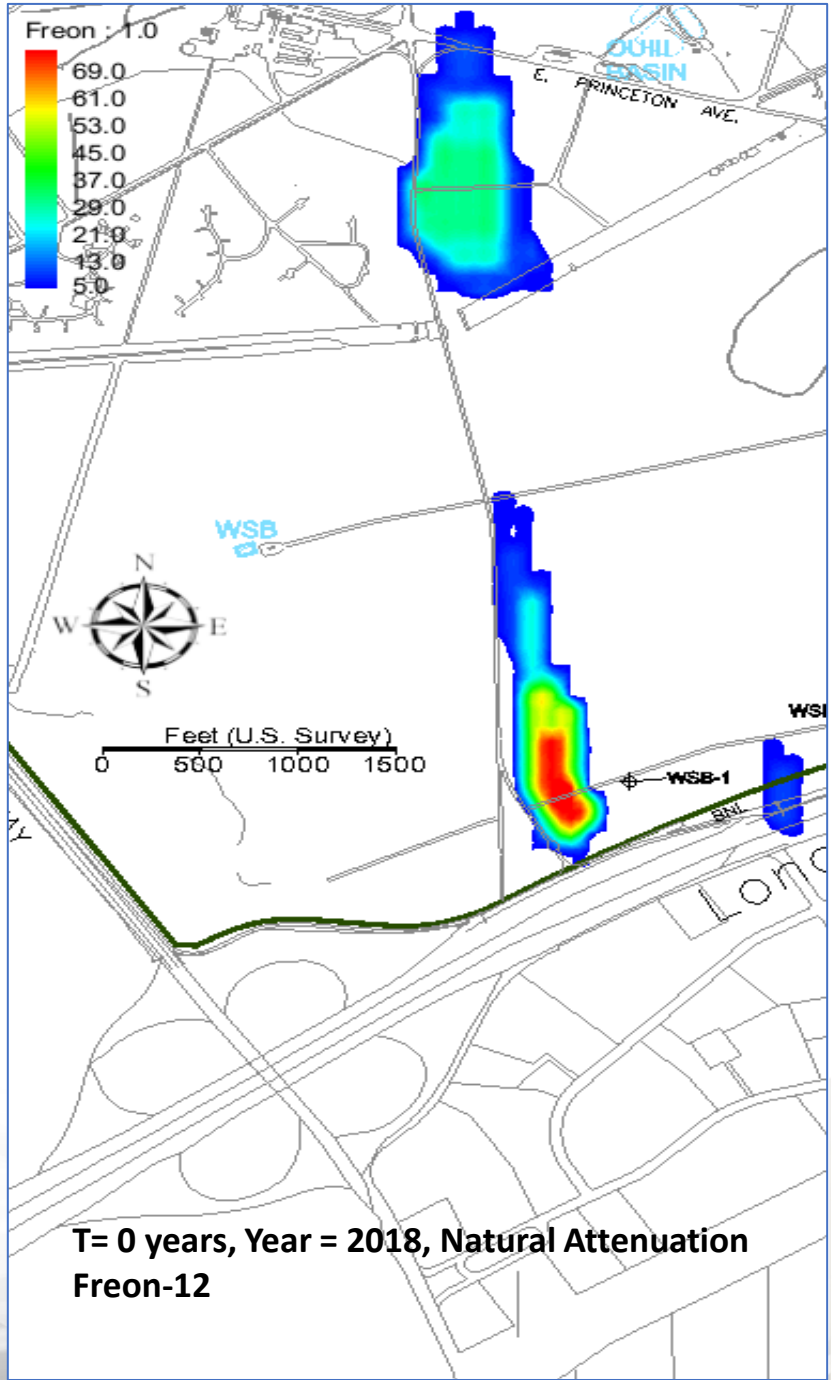




- This scenario meets the cleanup goal by 2027.

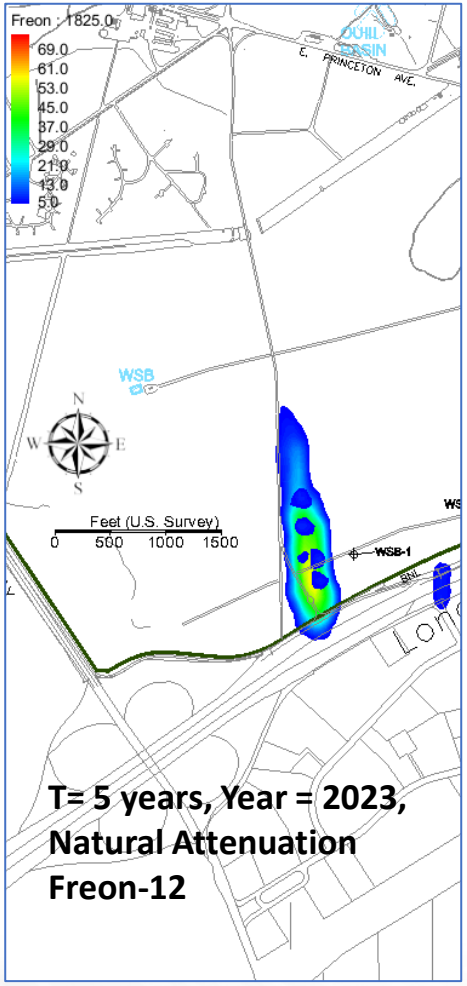
Western South Boundary Deep Freon-12: Natural Attenuation Modeling

- Under natural attenuation, the Freon-12 remains above drinking water standards for more than 50 years (~2068)
- Under natural attenuation, there is no impact to the Carman's River.

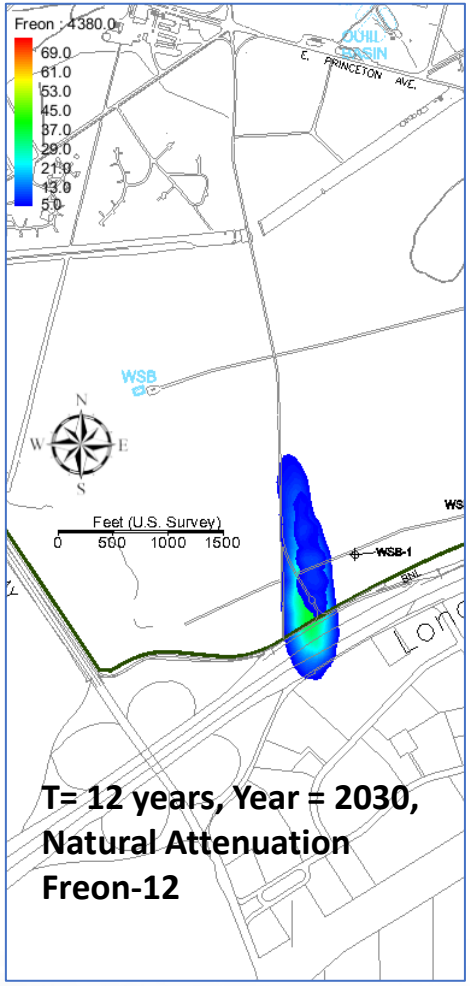


T= 0 years, Year = 2018, Natural Attenuation Freon-12

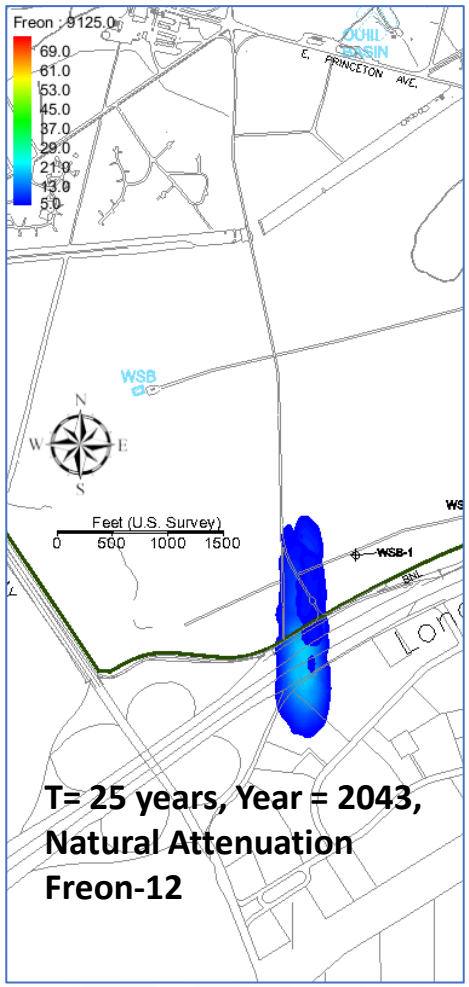
Western South Boundary Deep Freon-12: Natural Attenuation Modeling



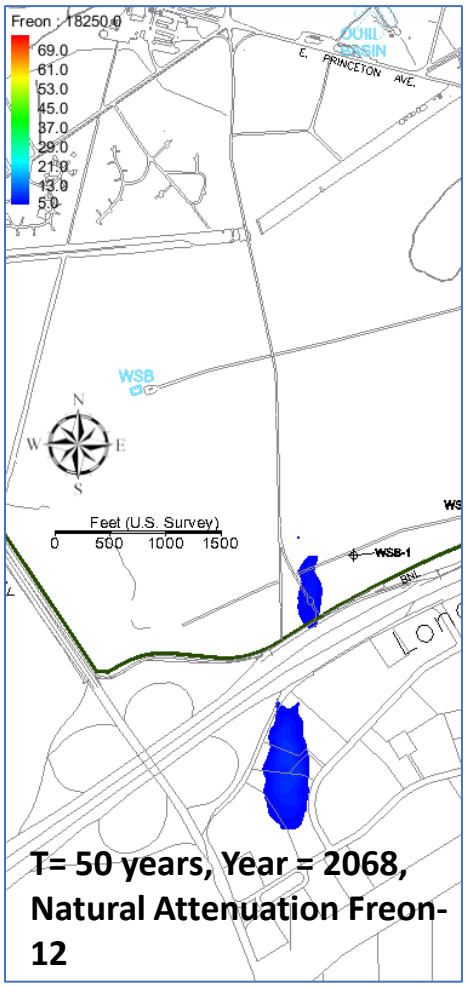
T= 5 years, Year = 2023, Natural Attenuation Freon-12



T= 12 years, Year = 2030, Natural Attenuation Freon-12



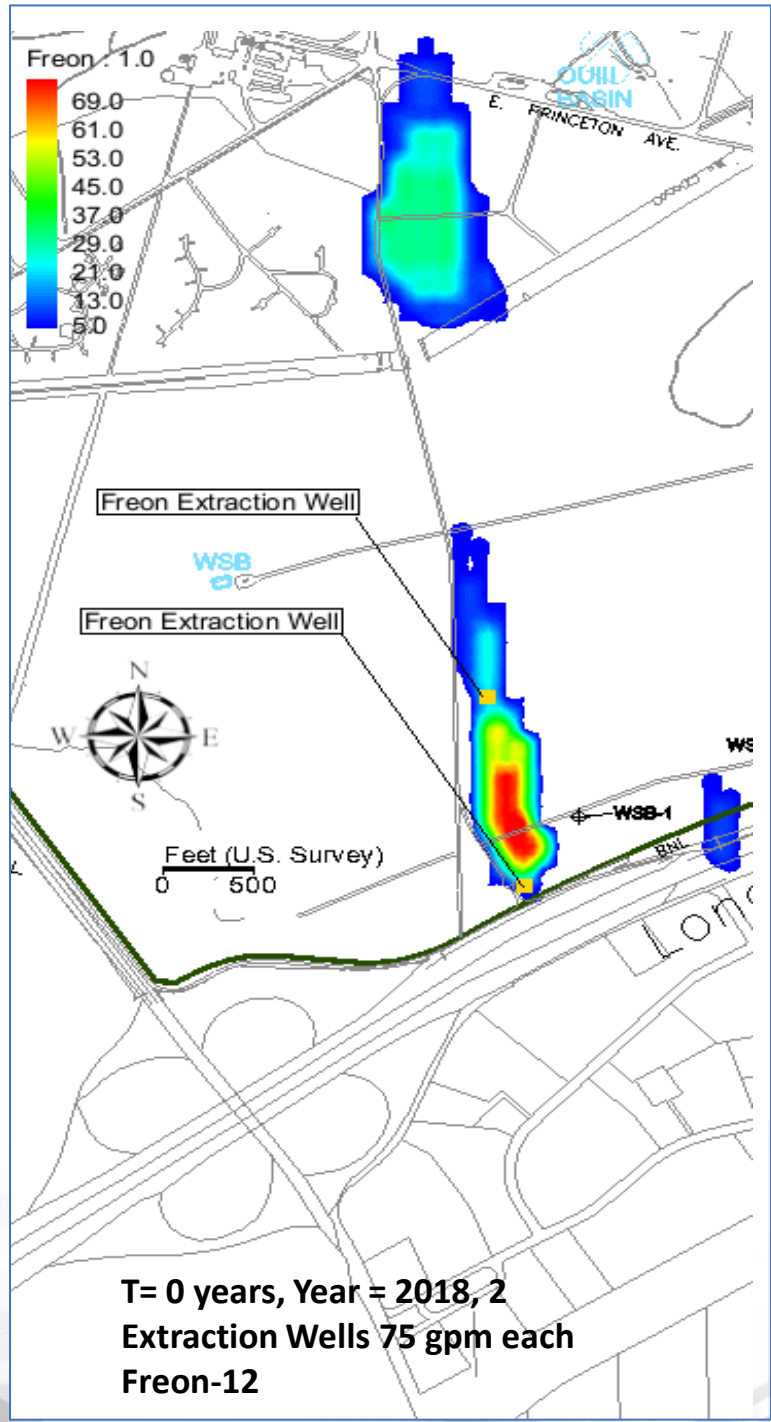
T= 25 years, Year = 2043, Natural Attenuation Freon-12



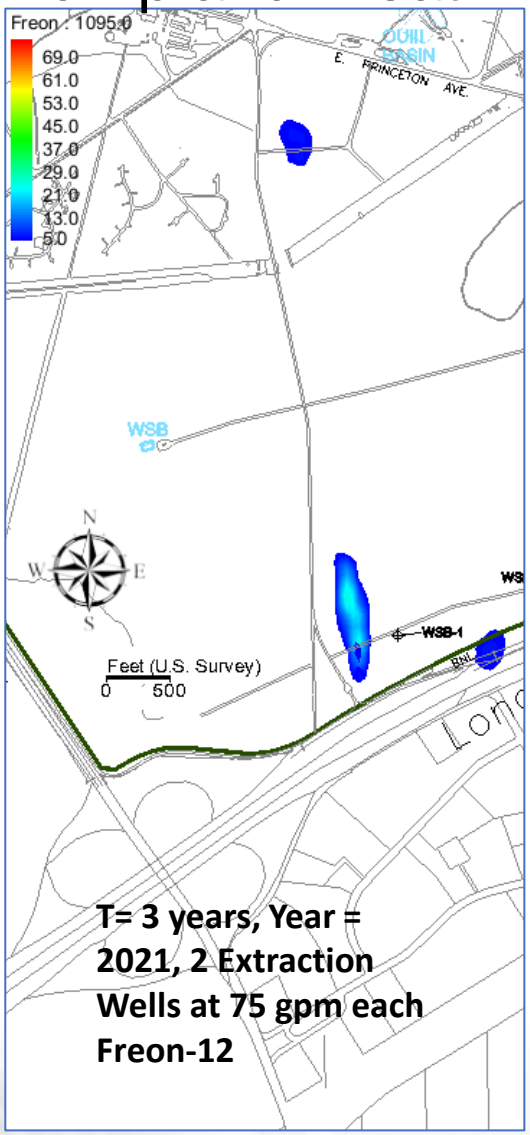
T= 50 years, Year = 2068, Natural Attenuation Freon-12

Western South Boundary Freon-12: Pump and Treat Modeling

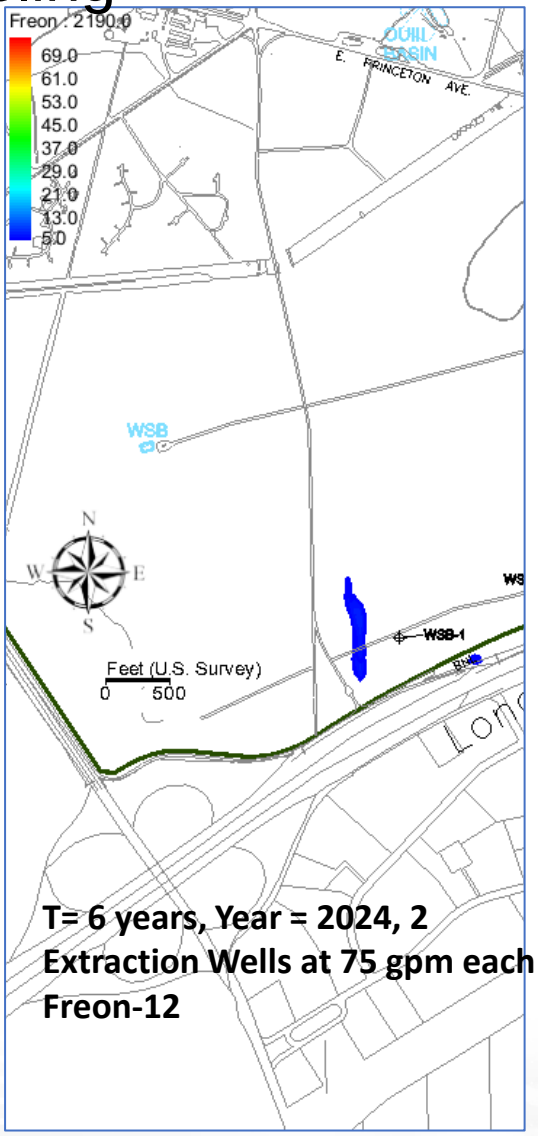
- Optimal pumping scenario to meet cleanup goal requires two new extraction wells.
- This scenario meets the cleanup goal by 2030.



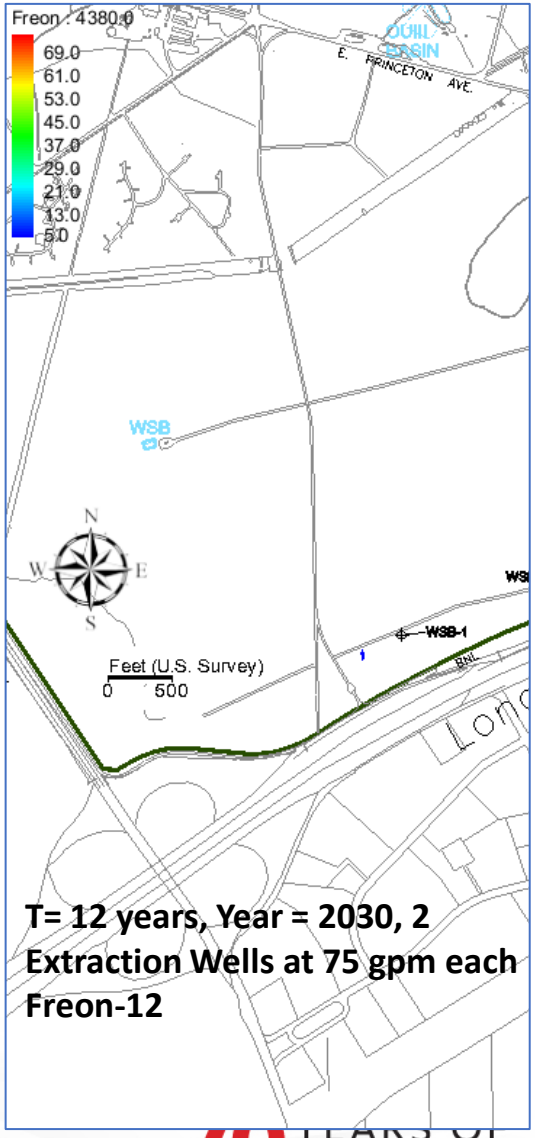
Western South Boundary Freon-12: Pump and Treat Modeling



T= 3 years, Year = 2021, 2 Extraction Wells at 75 gpm each Freon-12



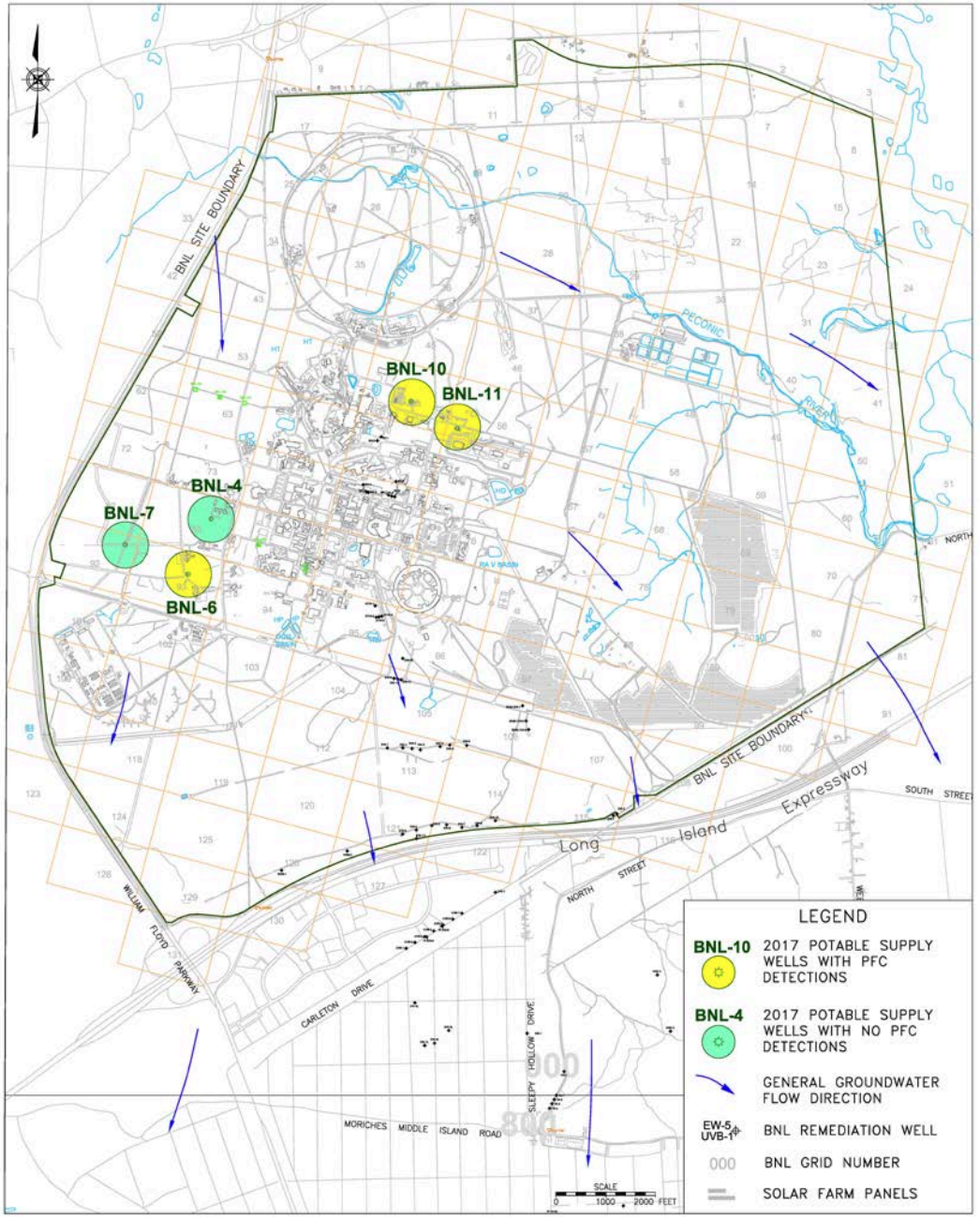
T= 6 years, Year = 2024, 2 Extraction Wells at 75 gpm each Freon-12



T= 12 years, Year = 2030, 2 Extraction Wells at 75 gpm each Freon-12

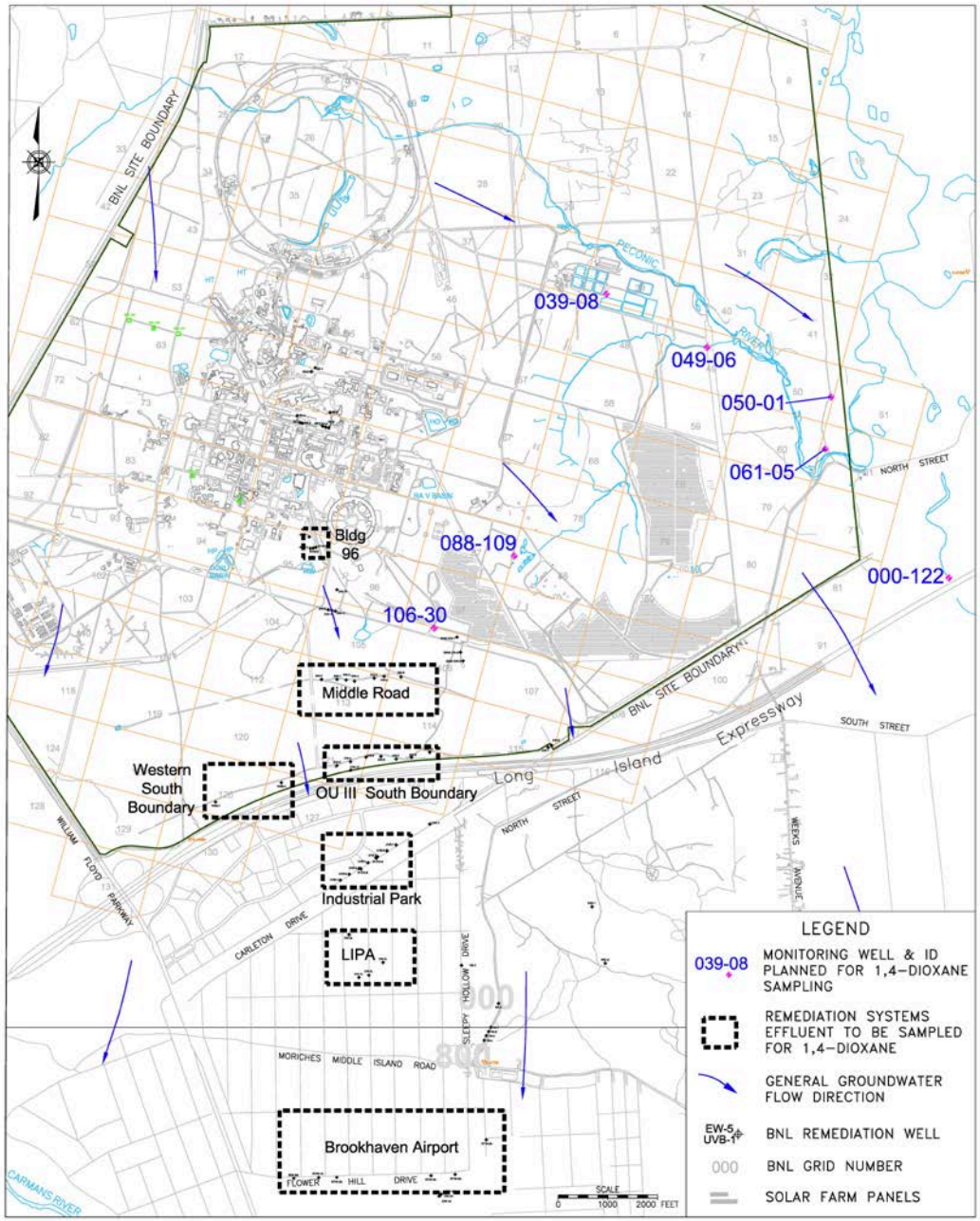
Emerging Contaminants – Perfluorinated Compounds (PFCs)

- Testing by SCDHS in 2017 detected PFCs in three of BNL's potable supply wells
  - Maximum PFOS/PFOA = 24 ng/L
  - EPA Health Advisory = 70 ng/L
  - Routine testing will be added to potable water monitoring program in 2018
- SCDHS requested an investigation on source of PFCs
  - Source is unknown
  - In 2018, temporary wells will be installed to determine distribution of PFCs in supply well source areas
- Current sampling protocol needs to be revised to prevent possible cross contamination of samples
  - Cannot use:
    - PFC (Teflon) containing sampling pumps, tubing, or containers
    - Water proof clothing or work boots
    - Water proof field notebooks
    - Certain personal care products



Emerging Contaminants – 1,4-Dioxane

- 1,4-Dioxane has been used as a stabilizer for TCA
- January 2017 – BNL sampled 22 representative monitoring wells for 1,4-Dioxane in response to NYSDEC/NYSDOH request
  - Briefed CAC in March 2017
  - Detected in 17 of 22 wells
  - Below current NYS standard of 50 µg/L
- Fall 2017 - SCDHS requested additional sampling for 1,4-Dioxane
  - BNL responded with the planned sampling approach
  - In early December, BNL collected samples from 7 additional monitoring wells, the Sewage Treatment Plant effluent, and the effluent from five operating VOC treatment systems
  - Data will be available in late January



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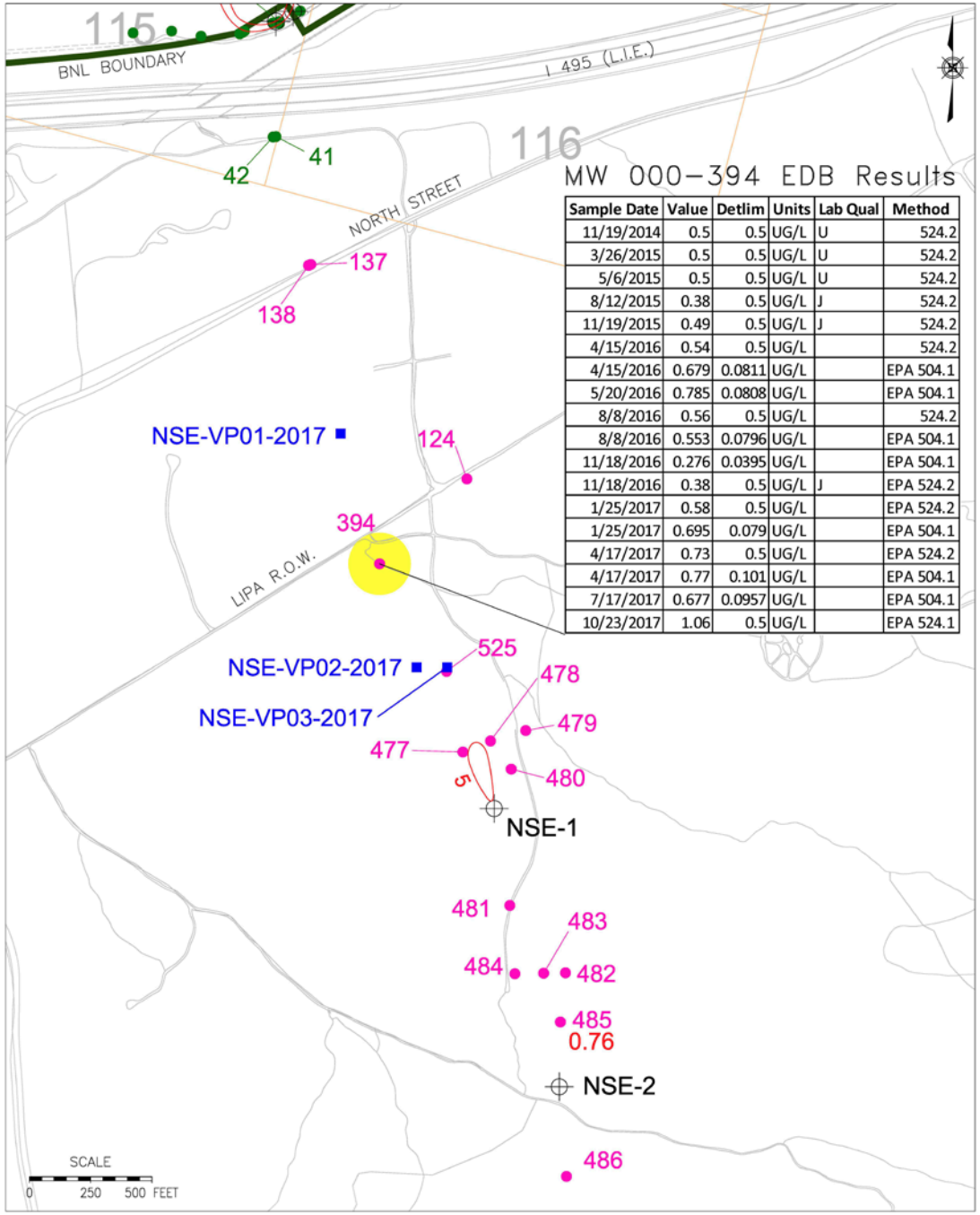
North Street East – Ethylene Dibromide (EDB) Update

- Following September CAC update, EDB concentration in well 000-394 increased to 1.06 µg/L. The drinking water standard is 0.05 µg/L.
- There have been no detections of EDB in NSE-1 or the area monitoring wells
- Recommendation in 2016 Groundwater Status Report was to perform additional characterization if concentrations did not show consistent decrease in 2017
- Planning to install three temporary vertical profile wells to better characterize extent of EDB in this area



MW 000-394 EDB Results

Sample Date	Value	Detlim	Units	Lab Qual	Method
11/19/2014	0.5	0.5	UG/L	U	524.2
3/26/2015	0.5	0.5	UG/L	U	524.2
5/6/2015	0.5	0.5	UG/L	U	524.2
8/12/2015	0.38	0.5	UG/L	J	524.2
11/19/2015	0.49	0.5	UG/L	J	524.2
4/15/2016	0.54	0.5	UG/L		524.2
4/15/2016	0.679	0.0811	UG/L		EPA 504.1
5/20/2016	0.785	0.0808	UG/L		EPA 504.1
8/8/2016	0.56	0.5	UG/L		524.2
8/8/2016	0.553	0.0796	UG/L		EPA 504.1
11/18/2016	0.276	0.0395	UG/L		EPA 504.1
11/18/2016	0.38	0.5	UG/L	J	EPA 524.2
1/25/2017	0.58	0.5	UG/L		EPA 524.2
1/25/2017	0.695	0.079	UG/L		EPA 504.1
4/17/2017	0.73	0.5	UG/L		EPA 524.2
4/17/2017	0.77	0.101	UG/L		EPA 504.1
7/17/2017	0.677	0.0957	UG/L		EPA 504.1
10/23/2017	1.06	0.5	UG/L		EPA 524.1

Questions?