Groundwater Update

Brookhaven National Laboratory
Review of Plumes, Treatment Systems, Performance and Progress

Presentation to Community Advisory Council
October 10, 2019

Bill Dorsch, Manager
Groundwater Protection Group

BROOKHAVEN NATIONAL LABORATORY

U.S. DEPARTMENT OF ENERGY

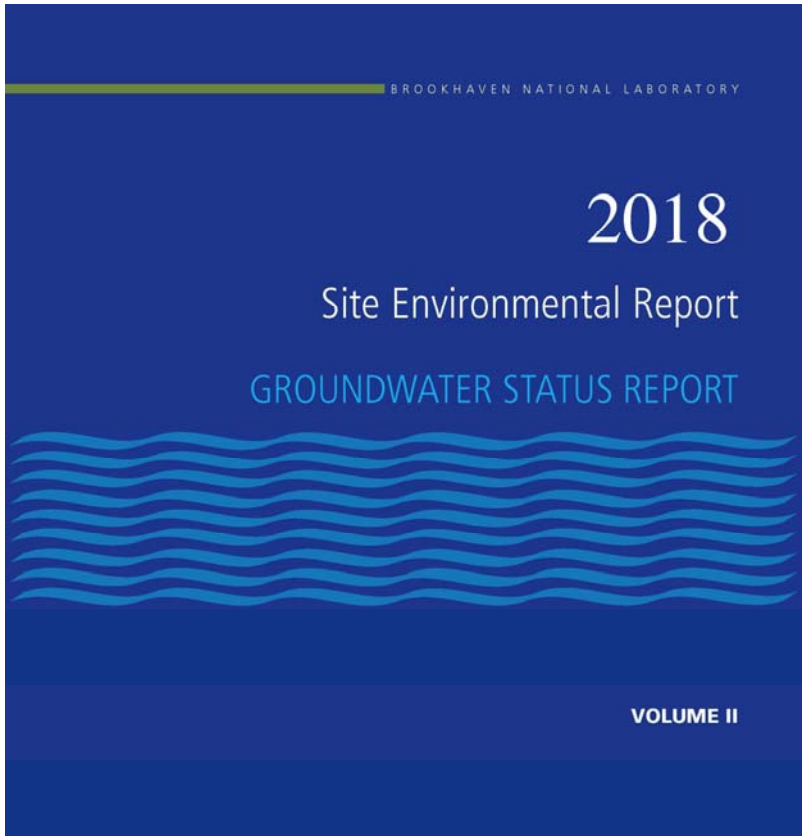
Agenda

- General Status of Plumes and Remediation Systems/System Optimization
- Focused Groundwater Discussion Items
- PFAS and 1,4-Dioxane Characterization Status/South Boundary Temporary Well Results Summary

Groundwater Status Report (Volume 2 of Site Environmental Report)

- Presentation provides up to date status on groundwater cleanup program progress
- Maps based on fourth quarter 2018 data
- Web link for 2018 Groundwater Status report (available November):

  https://www.bnl.gov/gpg/gw-reports.php

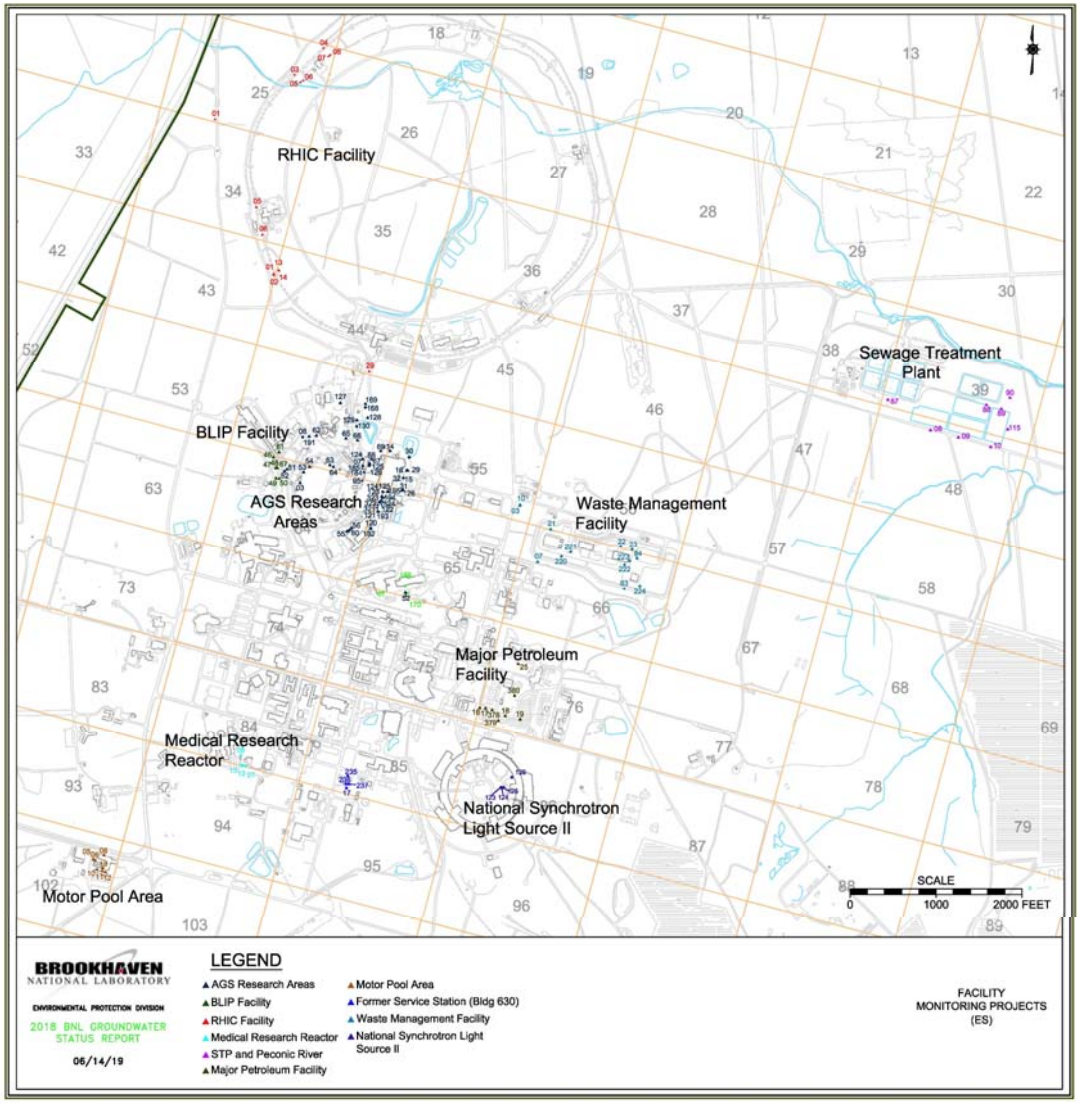


Facility Monitoring

Groundwater monitoring at active research and support facilities:

- 77 monitoring wells
- DOE required groundwater surveillance:
  - Accelerator Facilities (AGS, BLIP, RHIC, NSLS-II)
  - Underground gasoline storage tanks
- New York State permit required groundwater surveillance:
  - Waste Management Facility
  - Sewage Treatment Plant Recharge Basin Area
  - Major Petroleum Storage Facility (above ground storage tank area)

No new impacts detected during 2018 from active research and support activities



Groundwater Treatment System Completion Process

Achieve plume capture goal for system (typically < 50 µg/L Total VOC (TVOC) in monitoring and extraction wells)

Petition regulators for system shutdown

Upon approval, turn extraction wells off and maintain in standby mode/sample wells for several years, monitor for rebound

When concentrations are documented to remain low and stable, petition regulators for system closure (upon approval, decommission equipment, abandon wells, limited continued monitoring)

Groundwater Treatment System Status

Treatment System	Operational	Shutdown	Closure/Decommissioned
OU I S. Boundary			
Carbon Tet			
Bldg. 96			
Bldg. 452 Freon-11 [a]			
OU 3 Middle Rd.			
OU 3 S. Boundary			
OU 3 Western South Boundary			
OU 3 Industrial Park			
OU 3 Industrial Park E.			
OU 3 North St.			
OU 3 North St. E.			
OU 3 LIPA			
OU 3 Airport			
OU 4 AS/SVE			
OU 6 EDB			
HFBR Pump and Recharge			
Chemical Holes Sr-90			
BGRR Sr-90			

Notes-

a - Awaiting reglatory approval

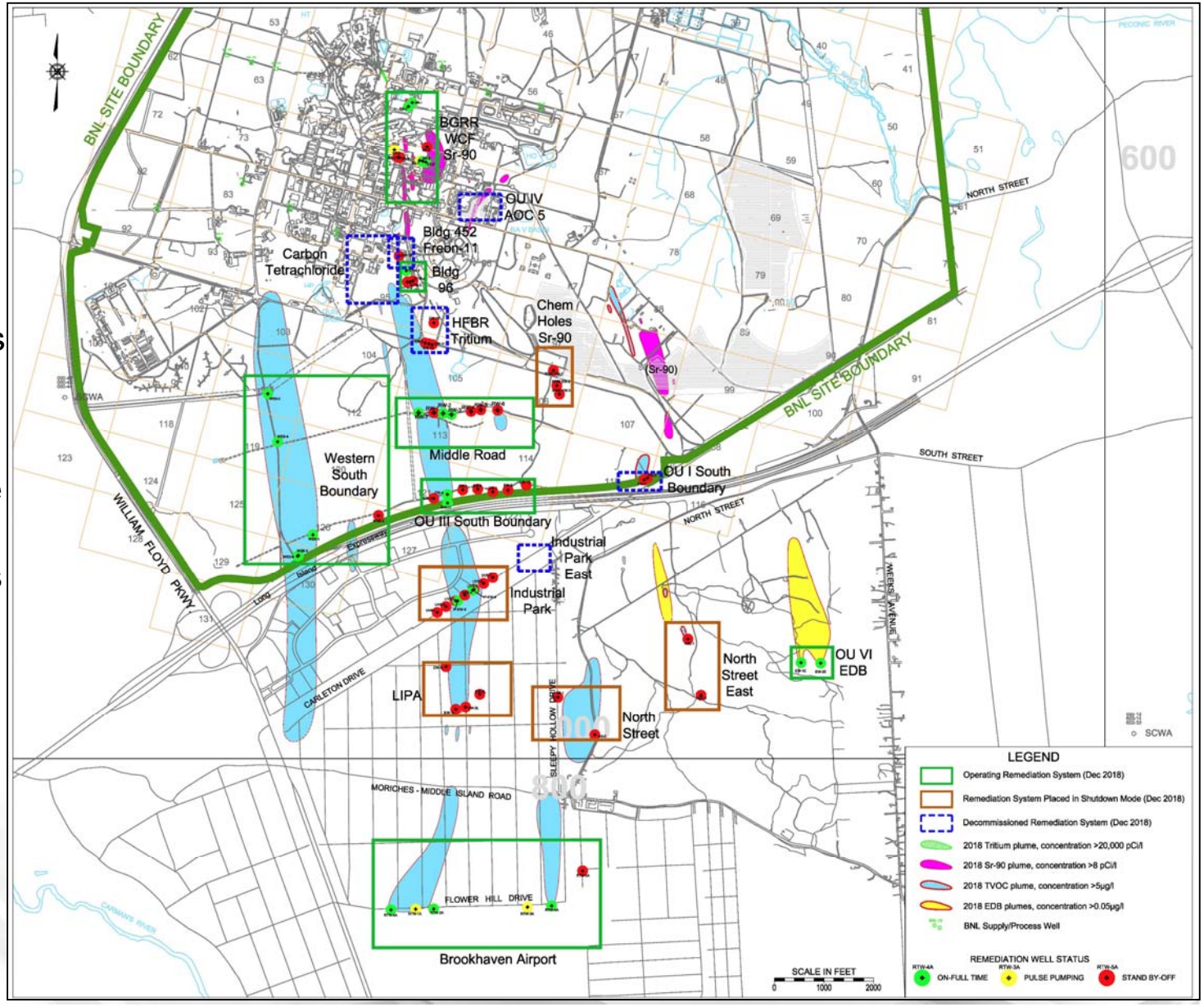
Groundwater Treatment Systems/Plumes Status

71 Existing Extraction Wells:

- 21 operational
- 4 pulsed pumping

1996 – 2018:

- 27 billion gallons of contaminated groundwater treated and recharged to the aquifer
- 7,600 lbs. VOCs removed
- 33 mCi Sr-90 removed



U.S. DEPARTMENT OF ENERGY

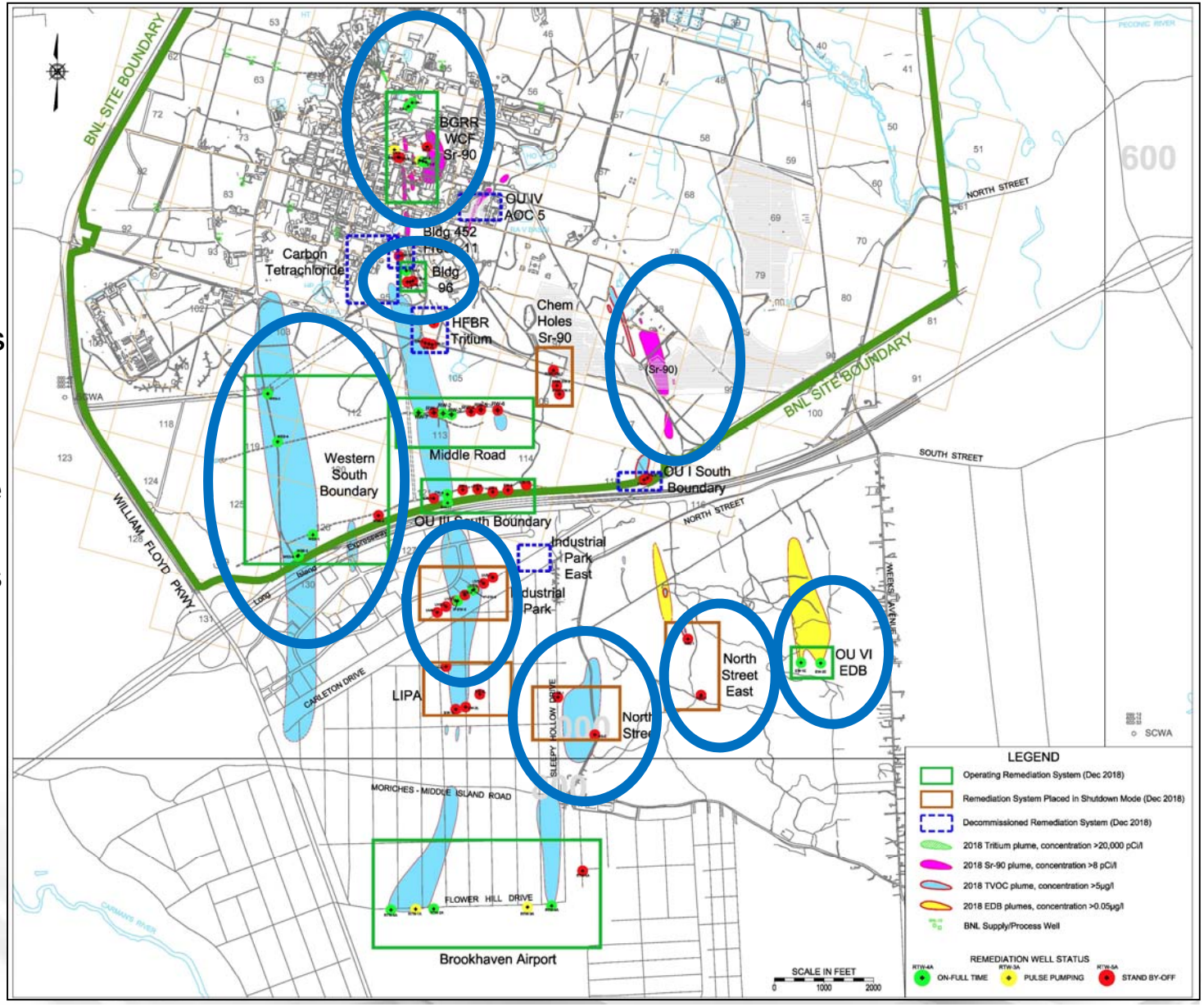
Groundwater Treatment Systems/Plumes Status

71 Existing Extraction Wells:

- 21 operational
- 4 pulsed pumping

1996 – 2018:

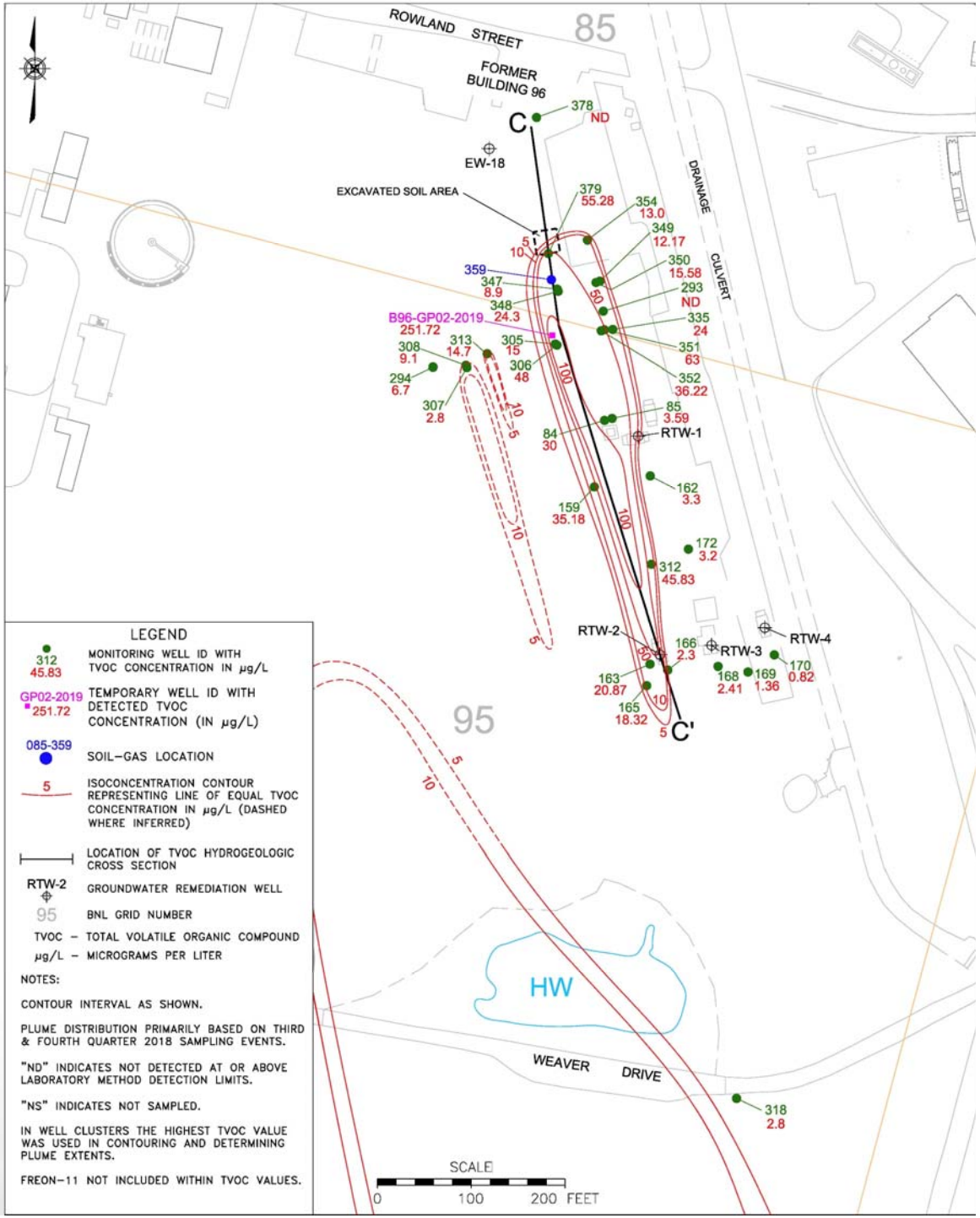
- 27 billion gallons of contaminated groundwater treated and recharged to the aquifer
- 7,600 lbs. VOCs removed
- 33 mCi Sr-90 removed



U.S. DEPARTMENT OF ENERGY

OU 3 Building 96 VOC Treatment System

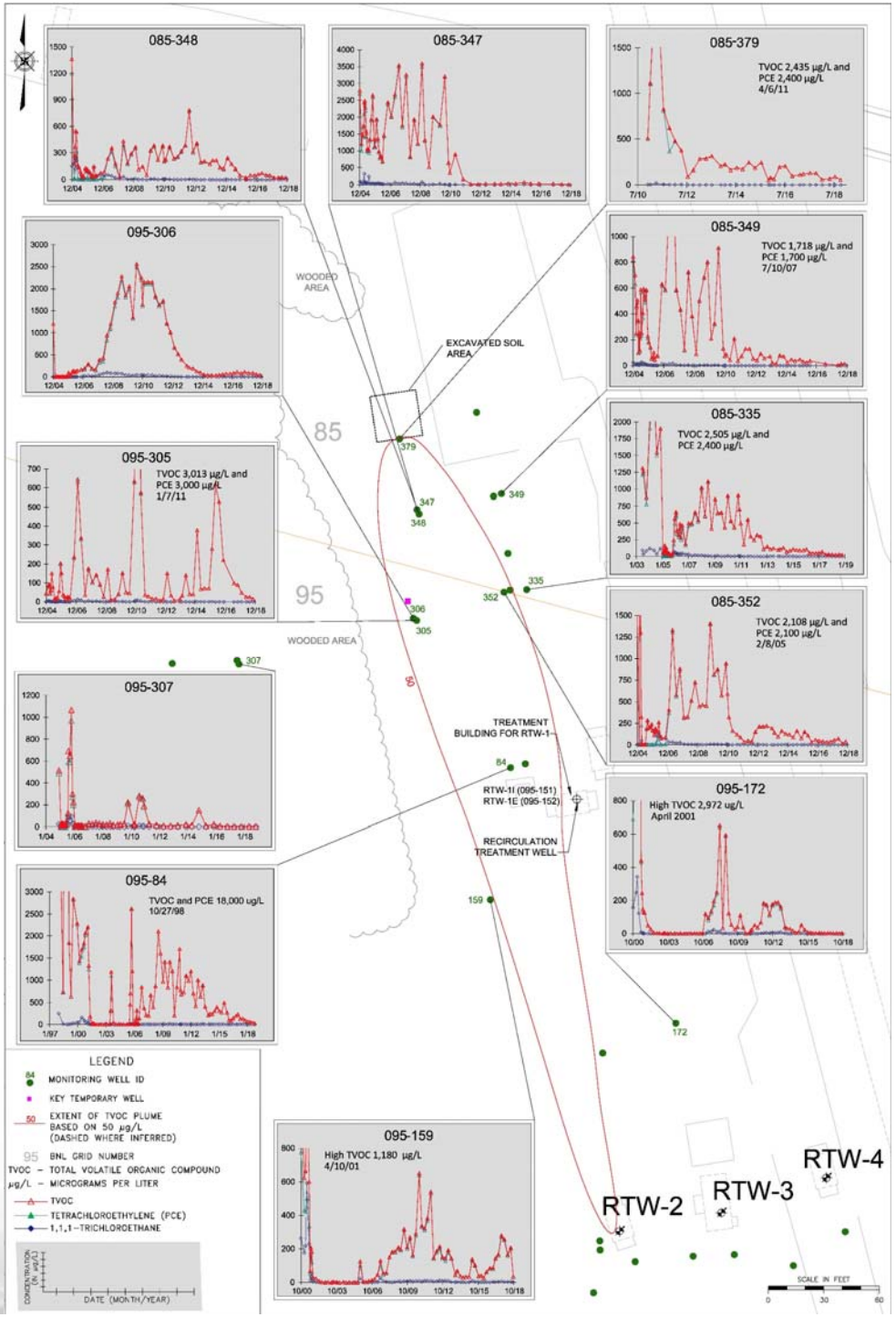
- Source area concentrations currently in 50 µg/L to 100 µg/L (parts per billion) range
  - Historic high was 18,000 µg/L
- Performed 2018 soil vapor extraction pilot test in source area.
  - Based on results, not a viable option to reduce VOC source area concentrations
- Increased pumping rate in extraction well RTW-1 from 30 gpm to 60 gpm based on 2017 Groundwater Report recommendation. This should allow for capture of the western edge of VOC plume
  - Increased pumping rate started in late June 2019



U.S. DEPARTMENT OF ENERGY

OU 3 Building 96 VOC Treatment System

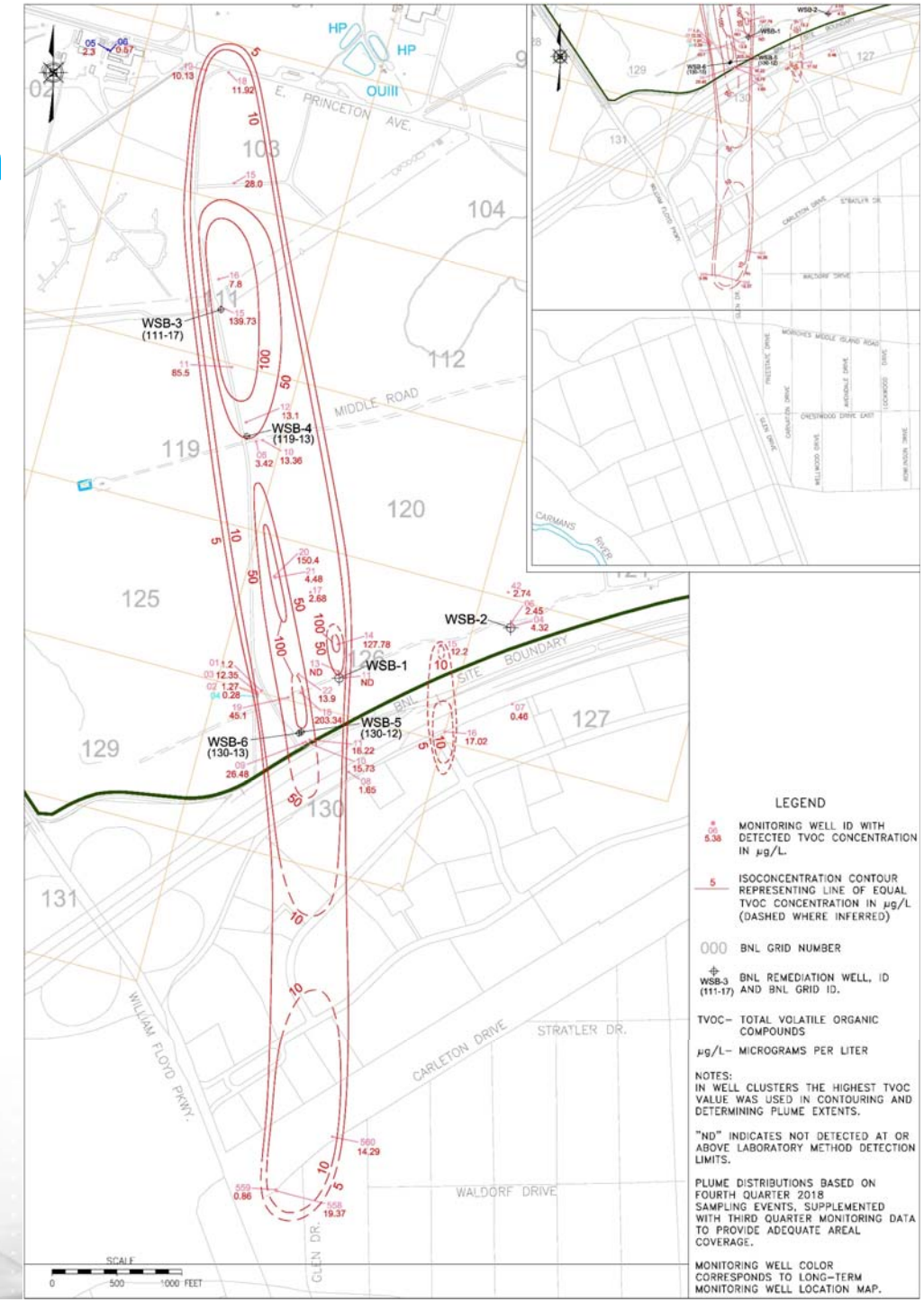
- Source area concentrations currently in 50 µg/L to 100 µg/L (parts per billion) range
  - Historic high was 18,000 µg/L
- Performed 2018 soil vapor extraction pilot test in source area.
  - Based on results, not a viable option to reduce VOC source area concentrations
- Increased pumping rate in extraction well RTW-1 from 30 gpm to 60 gpm based on 2017 Groundwater Report recommendation. This should allow for capture of the western edge of VOC plume
  - Increased pumping rate started in late June 2019



U.S. DEPARTMENT OF ENERGY

OU 3 Western South VOC Boundary Treatment System

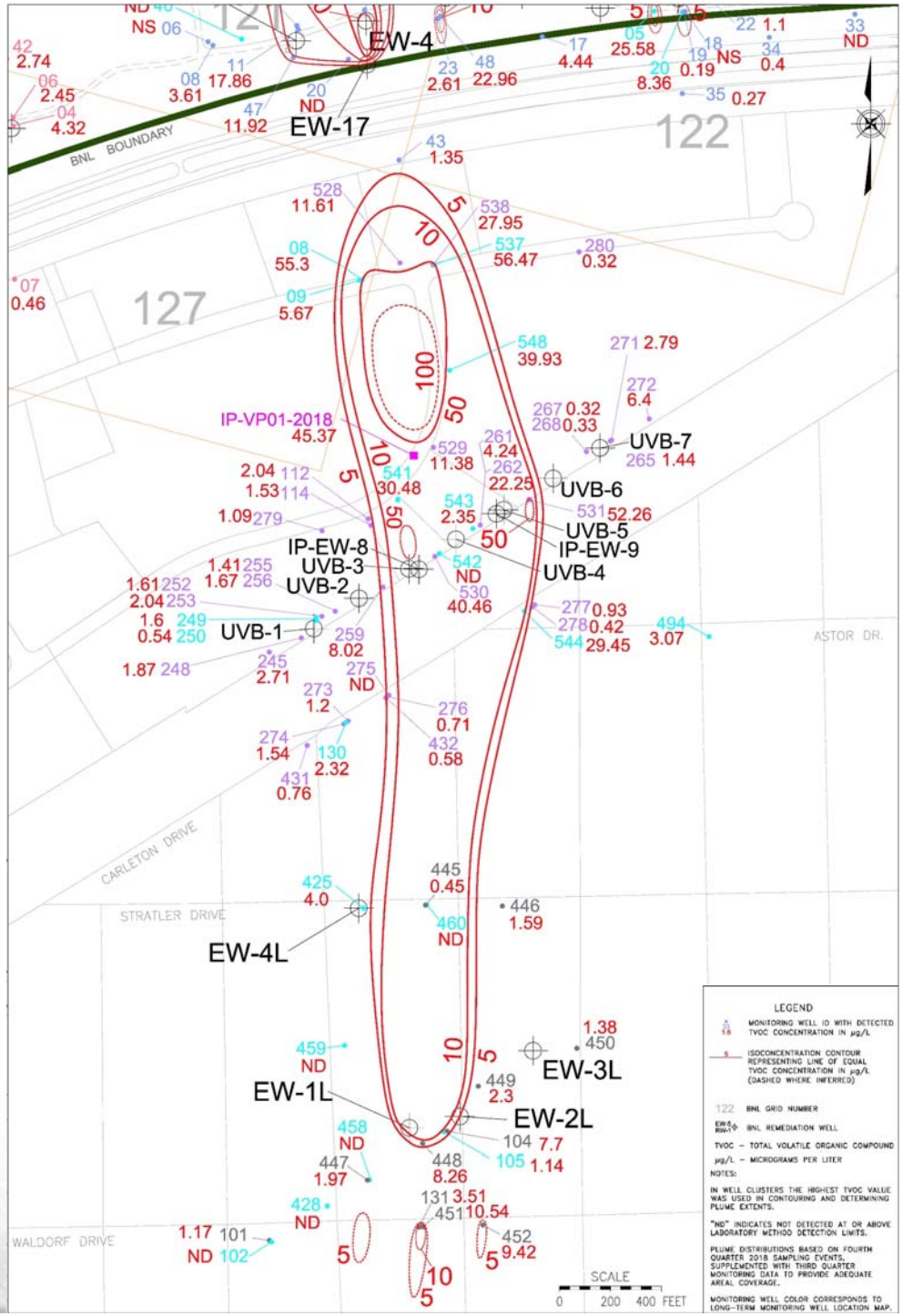
- The detection of deeper VOCs previously not observed required a system modification to meet the cleanup goal timeframe
- Four new extraction wells began operation in March 2019
- VOC concentrations in new extraction wells confirm that high concentration segments of plume are now being captured and treated



U.S. DEPARTMENT OF ENERGY

OU 3 Industrial Park VOC Treatment System

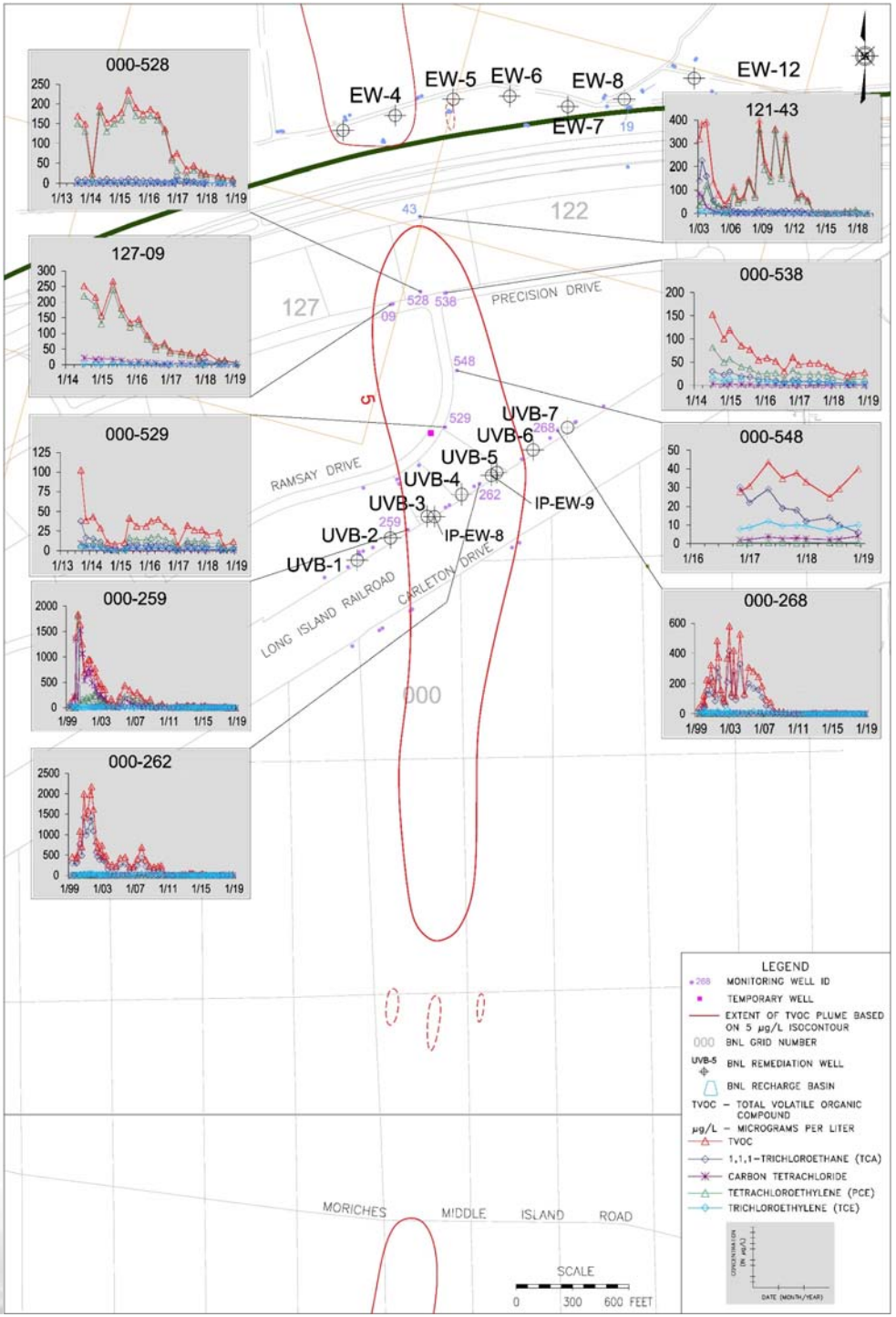
- Treatment system began operation in 1999
- The seven original extraction wells have been in shutdown mode since 2017. TVOC concentrations have been below the capture goal (50 µg/L)
- Two new extraction wells IP-EW-8, IP-EW-9) installed in 2014 have only shown low detections of VOCs (nothing above individual VOC standards since 2016)
- 2018 Groundwater Report recommendation is to place IP-EW-8 and IP-EW-9 in standby mode (implemented July 2019)
- Will continue monitoring the attenuation of higher concentration segment of plume in Industrial Park



U.S. DEPARTMENT OF ENERGY

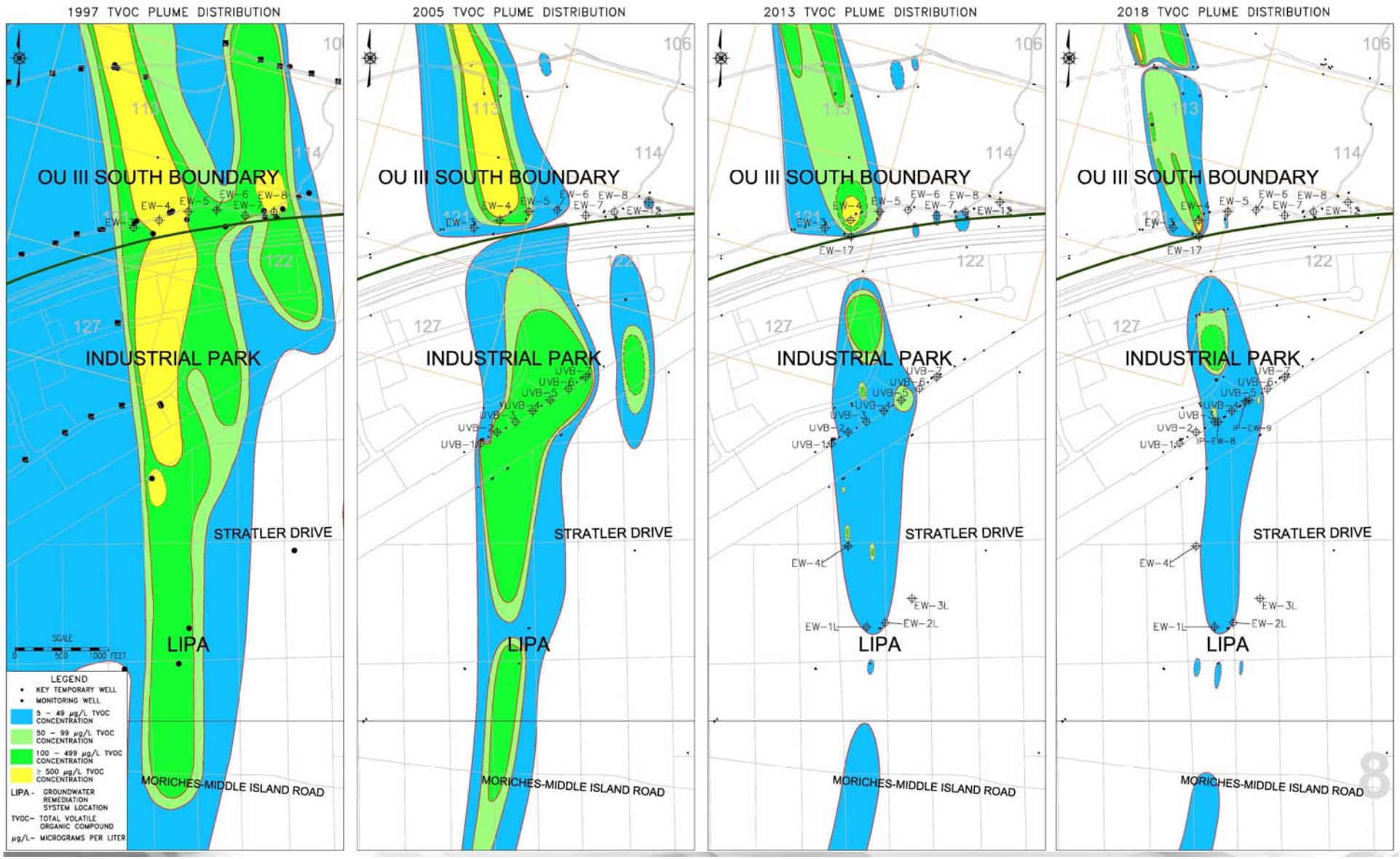
OU 3 Industrial Park VOC Treatment System

- Treatment system began operation in 1999
- The seven original extraction wells have been in shutdown mode since 2017. TVOC concentrations have been below the capture goal (50 µg/L)
- Two new extraction wells IP-EW-8, IP-EW-9) installed in 2014 have only shown low detections of VOCs (nothing above individual VOC standards since 2016)
- 2018 Groundwater Report recommendation is to place IP-EW-8 and IP-EW-9 in standby mode (implemented July 2019)
- Will continue monitoring the attenuation of higher concentration segment of plume in Industrial Park



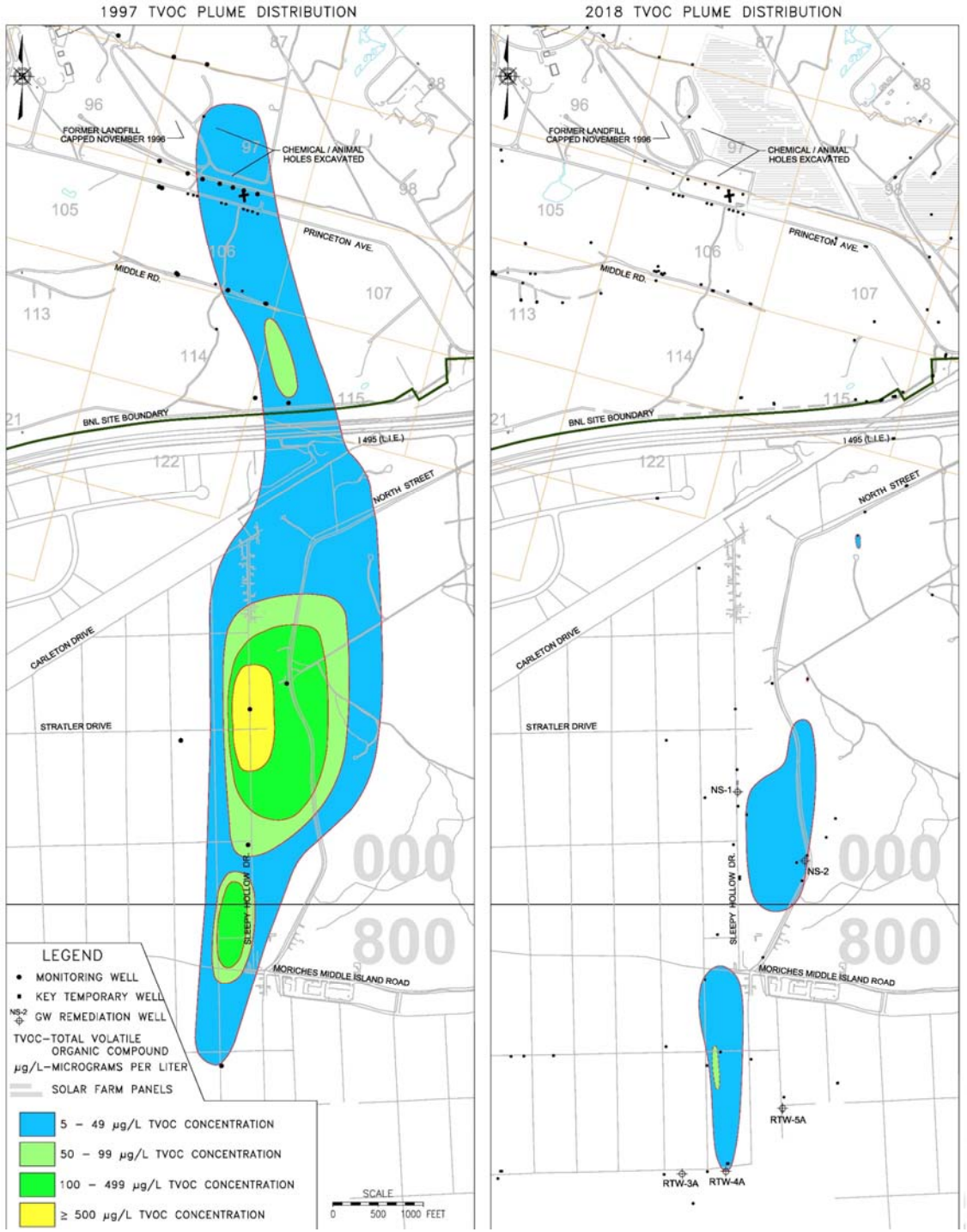
U.S. DEPARTMENT OF ENERGY

OU 3 Industrial Park VOC Treatment System



OU 3 North Street VOC Treatment System

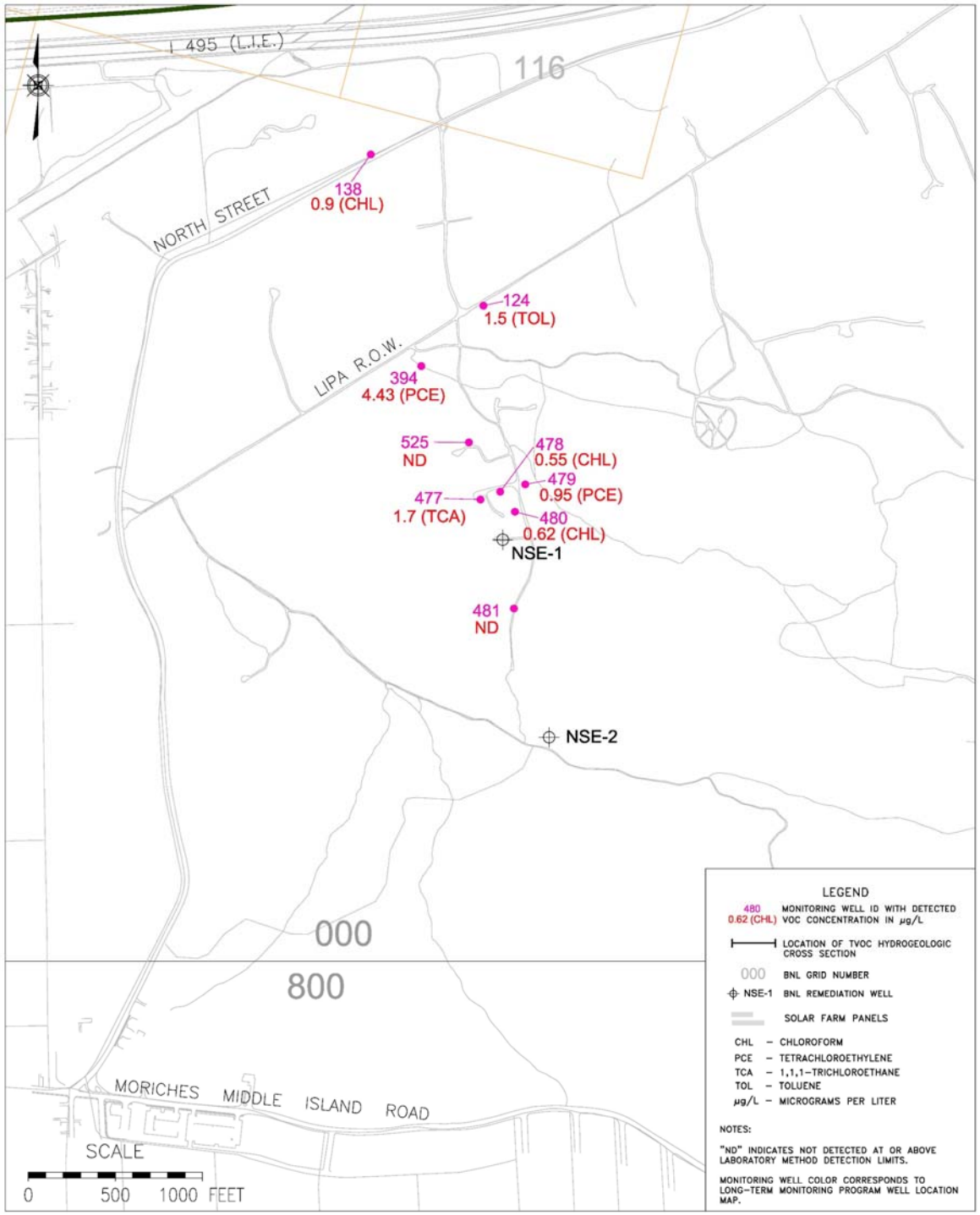
- System started operations in 2004 and placed in shutdown mode in 2013
- VOC concentrations in extraction and monitoring wells were below capture goal of 50 µg/L 2017 through 2019
- 2018 Groundwater Report recommendation to submit petition for closure to regulators in 2019



U.S. DEPARTMENT OF ENERGY

OU 3 North Street East VOC Treatment System

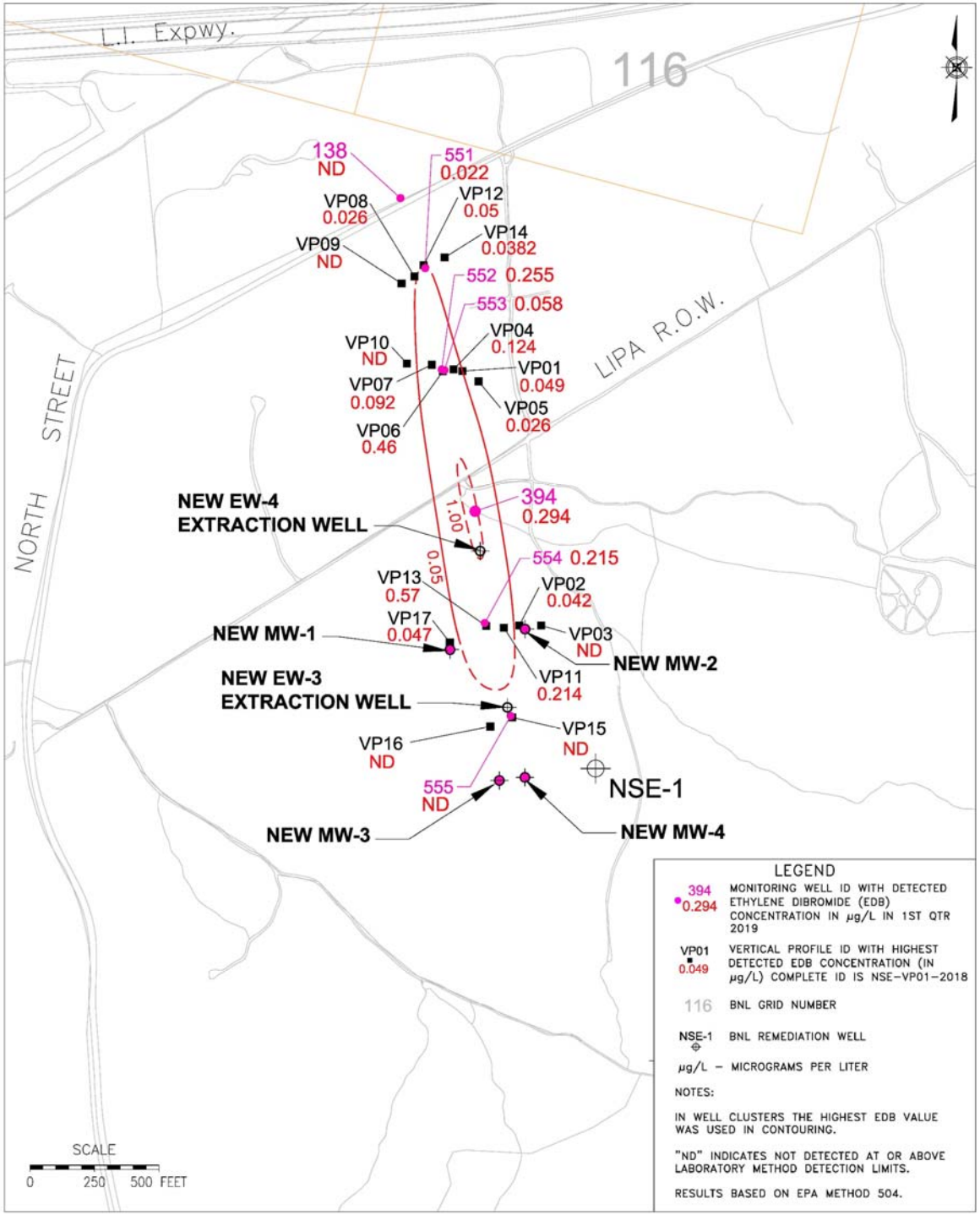
- System began operation in 2004 and was placed in shutdown mode in June 2014
- Ethylene Dibromide (EDB) first detected in well 000-394 in August 2015 (Drinking Water Standard of 0.05 µg/L)
- Submitted design modification report to regulators
- Since last CAC update in June, BNL installed two new extraction wells and four new monitoring wells. New EDB monitoring network will consist of 11 wells
- Currently working on plumbing, electrical and communications connections to treatment system building
- Anticipate startup of new extraction wells in early 2020



U.S. DEPARTMENT OF ENERGY

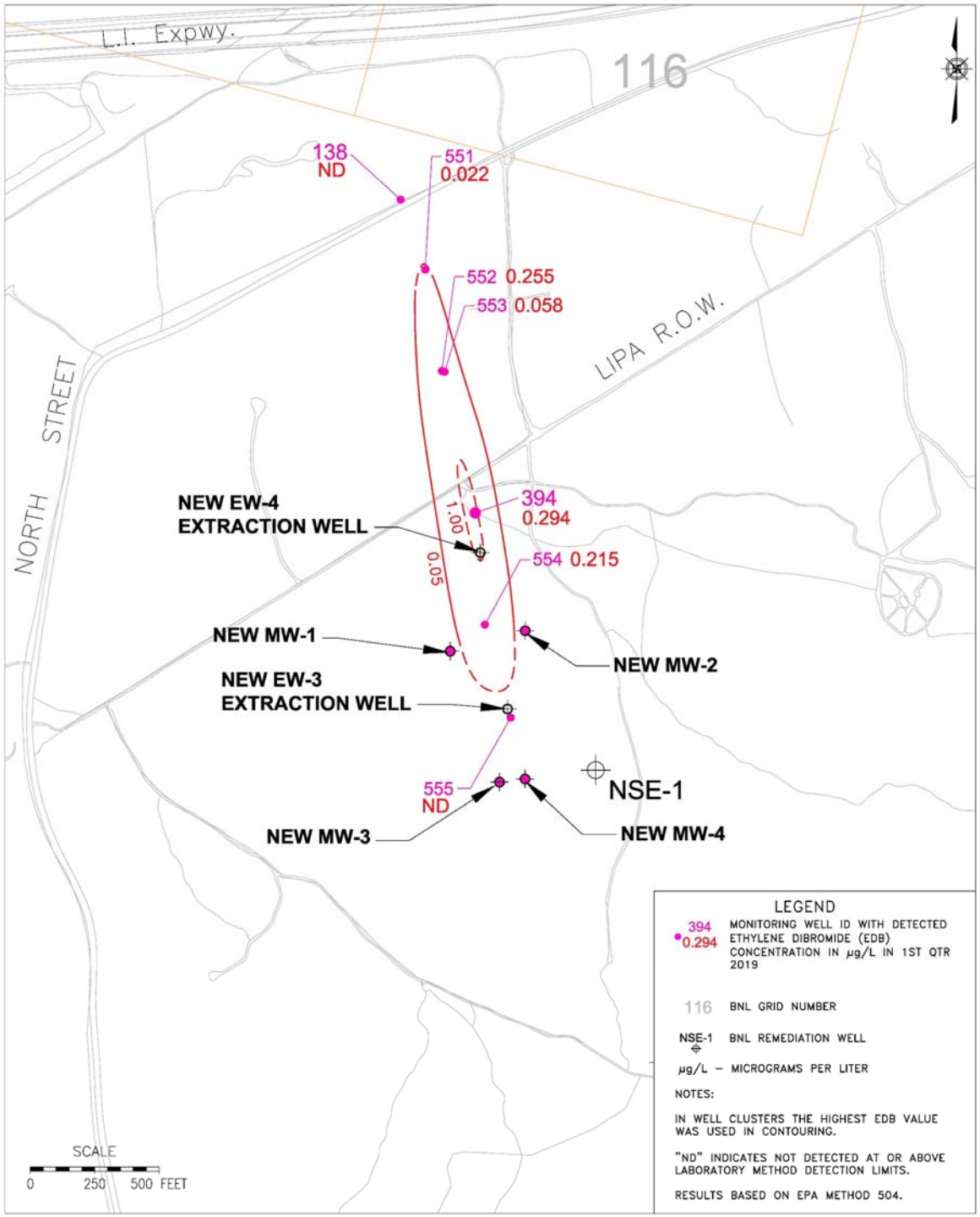
OU 3 North Street East VOC Treatment System

- System began operation in 2004 and was placed in shutdown mode in June 2014
- Ethylene Dibromide (EDB) first detected in well 000-394 in August 2015 (Drinking Water Standard of 0.05 µg/L)
- Submitted design modification report to regulators
- Since last CAC update in June, BNL installed two new extraction wells and four new monitoring wells. New EDB monitoring network will consist of 11 wells
- Currently working on plumbing, electrical and communications connections to treatment system building
- Anticipate startup of new extraction wells in early 2020



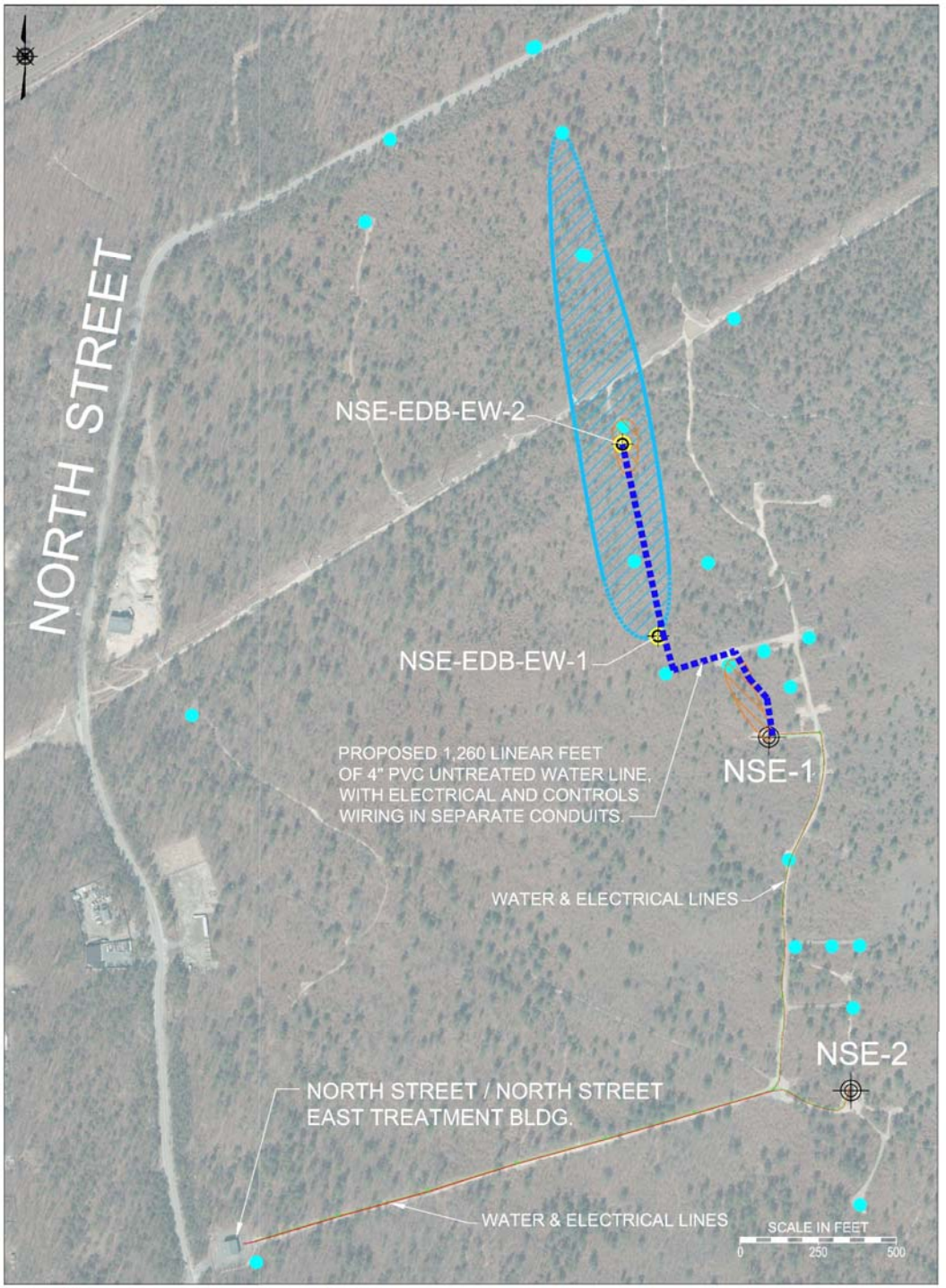
OU 3 North Street East VOC Treatment System

- System began operation in 2004 and was placed in shutdown mode in June 2014
- Ethylene Dibromide (EDB) first detected in well 000-394 in August 2015 (Drinking Water Standard of 0.05 µg/L)
- Submitted design modification report to regulators
- Since last CAC update in June, BNL installed two new extraction wells and four new monitoring wells. New EDB monitoring network will consist of 11 wells
- Currently working on plumbing, electrical and communications connections to treatment system building
- Anticipate startup of new extraction wells in early 2020



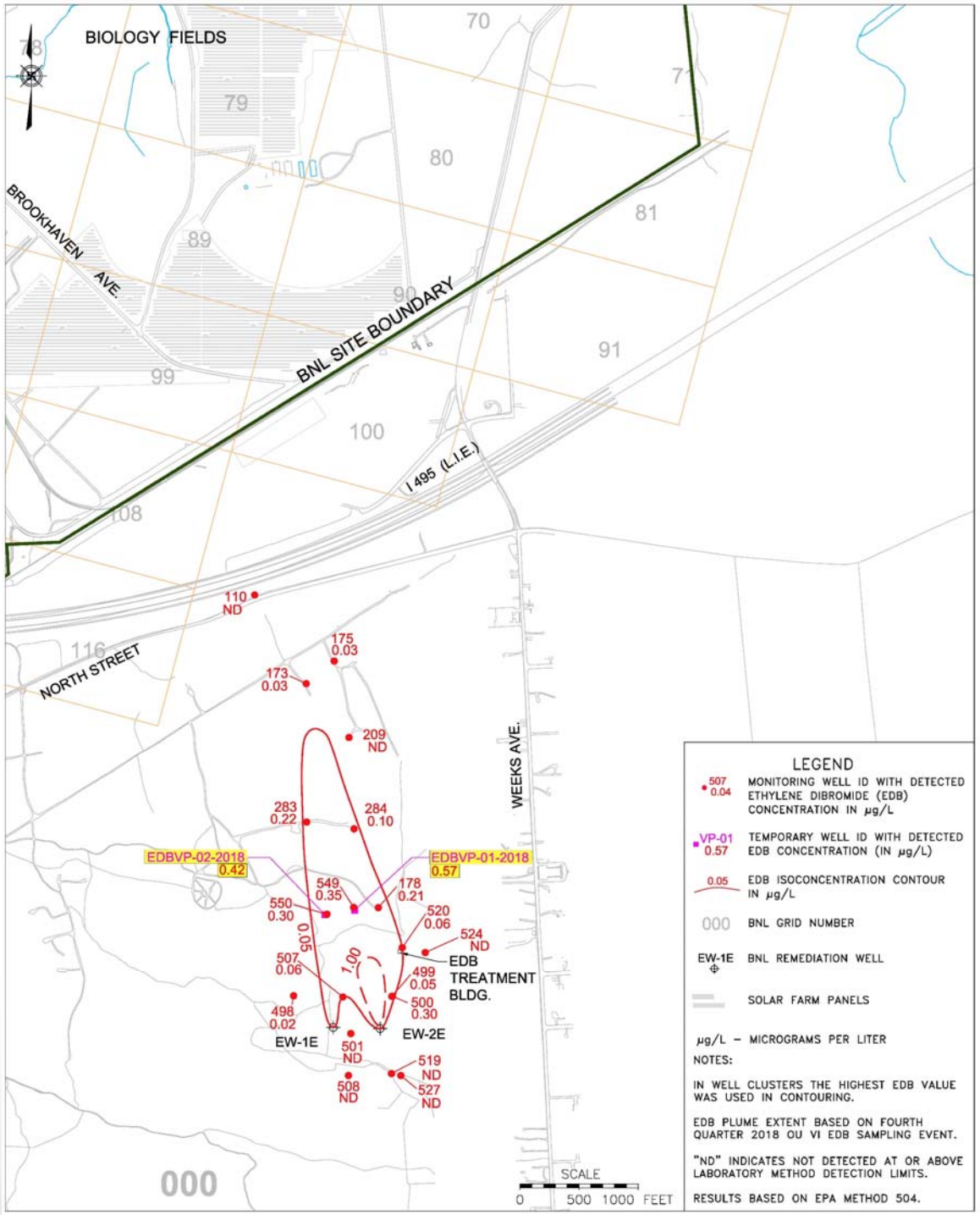
OU 3 North Street East VOC Treatment System

- System began operation in 2004 and was placed in shutdown mode in June 2014
- Ethylene Dibromide (EDB) first detected in well 000-394 in August 2015 (Drinking Water Standard of 0.05 µg/L)
- Submitted design modification report to regulators
- Since last CAC update in June, BNL installed two new extraction wells and four new monitoring wells. New EDB monitoring network will consist of 11 wells
- Currently working on plumbing, electrical and communications connections to treatment system building
- Anticipate startup of new extraction wells in early 2020



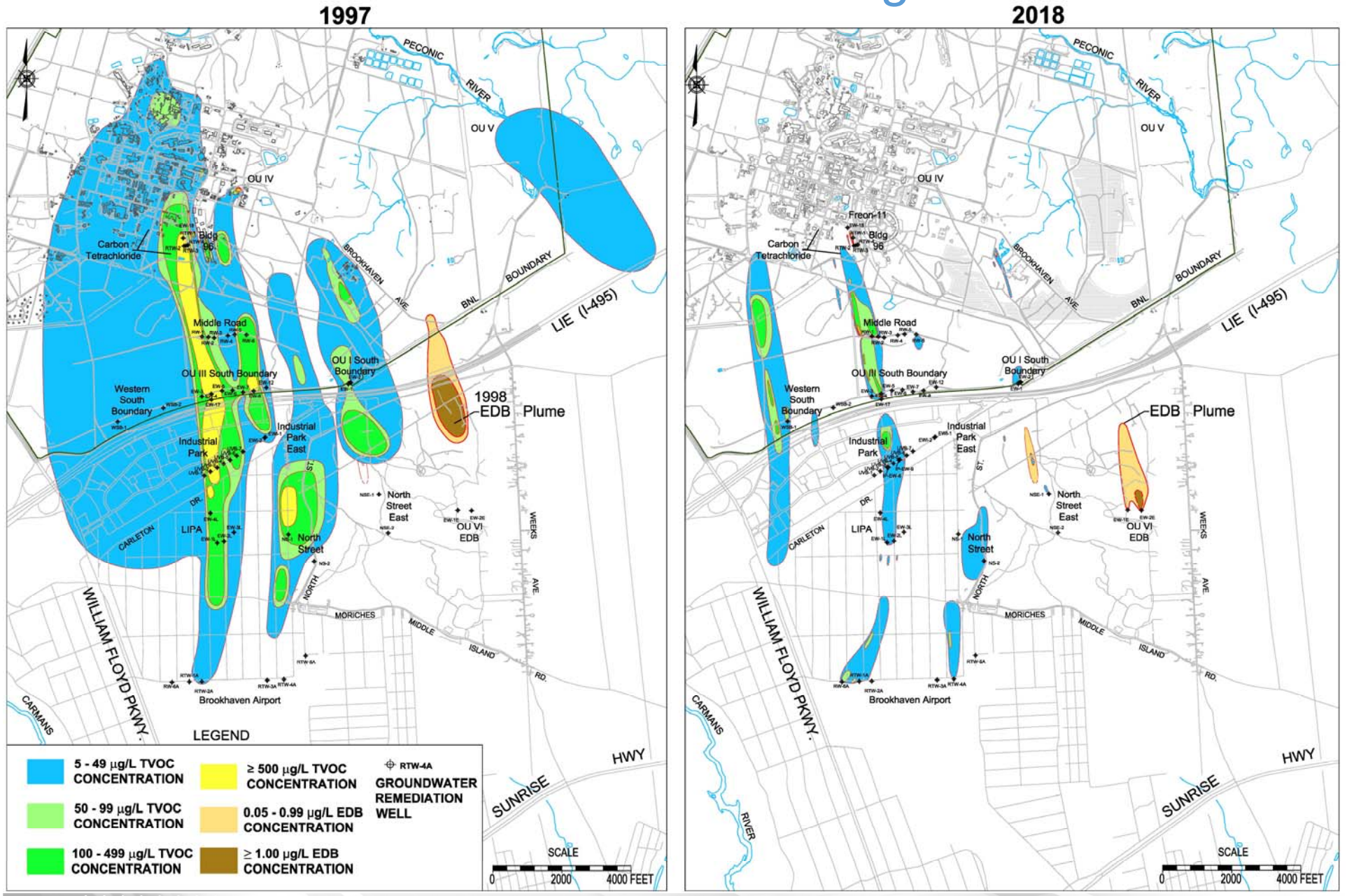
OU 6 EDB Treatment System

- Treatment system began operation in 2004
- Original project cleanup completion date was 2014, however plume migration was slower than expected
- Installed two temporary and two permanent wells in 2018 (based on 2017 Groundwater Report recommendation) to fill data gap
- BNL will perform groundwater modeling simulations utilizing latest data to forecast updated cleanup timeframe



U.S. DEPARTMENT OF ENERGY

VOC Remediation Progress



OU 3 BGRR, Pile Fan Sump, Waste Concentration Facility Sr-90

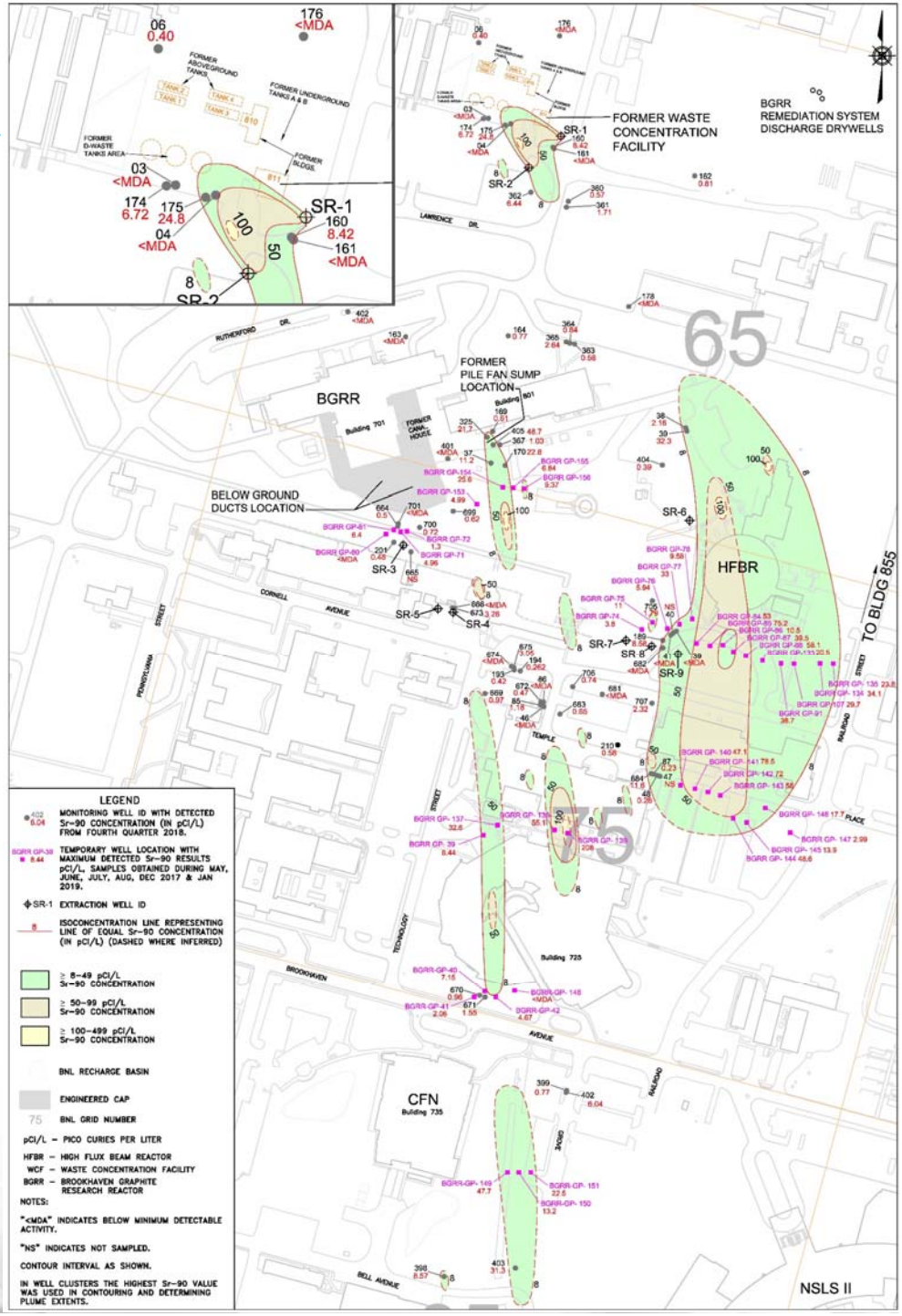
Based on 2017 and 2018 Groundwater Report recommendations to address data gaps in monitoring network:

- 27 temporary wells were installed during 2018 and early 2019
- 17 temporary wells will be installed during Fall 2019
- One new sentinel monitoring well to be installed in 2019

<u>System Status</u>

Nine extraction wells:

- SR-1, SR-2, SR-3, and SR-9 operational
- SR-4, SR-5, SR-6, and SR-7 shut down
- SR-8 pulsed pumping

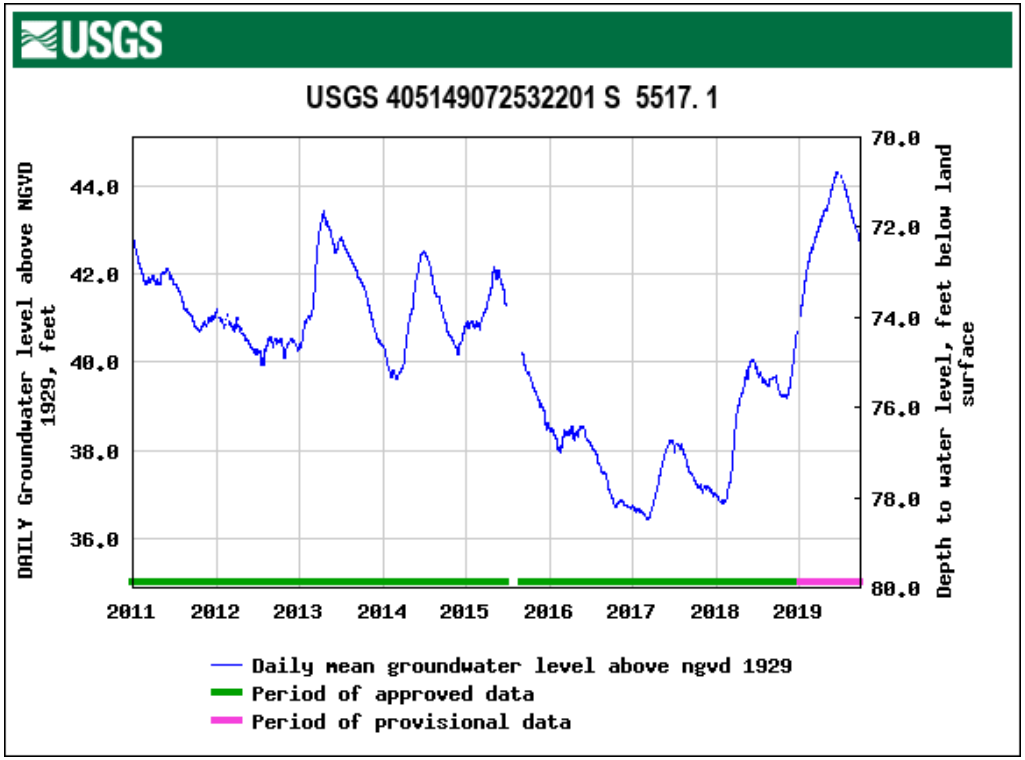


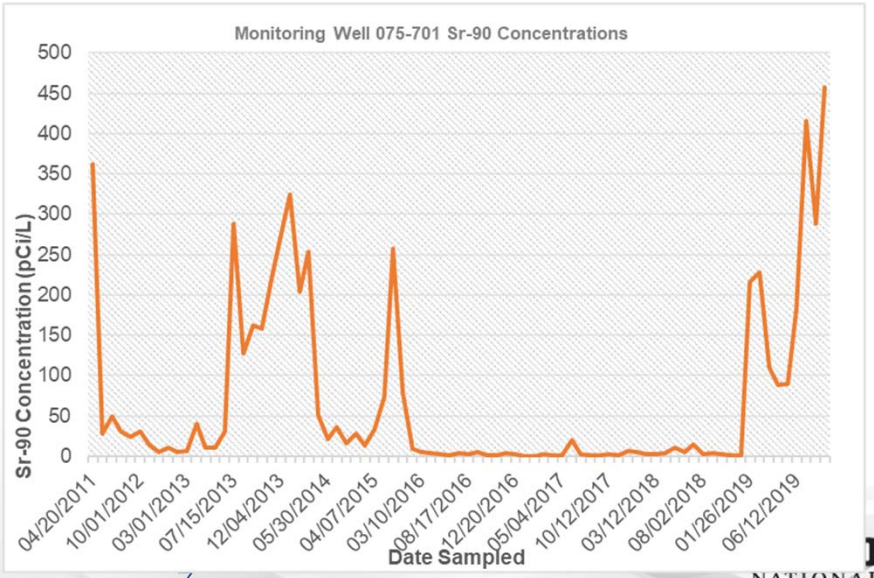
U.S. DEPARTMENT OF ENERGY

OU 3 BGRR Building 701 Source Area Sr-90

- BGRR source area Sr-90 concentrations recently increased
- Source area well 075-701 has been monitored monthly since 2014 to detect Sr-90 increases due to water table fluctuations

- Comparison of well 075-701 Sr-90 concentration vs. water table elevation (shallow USGS well onsite) shows correlation between increasing water table elevation and source area Sr-90 concentrations

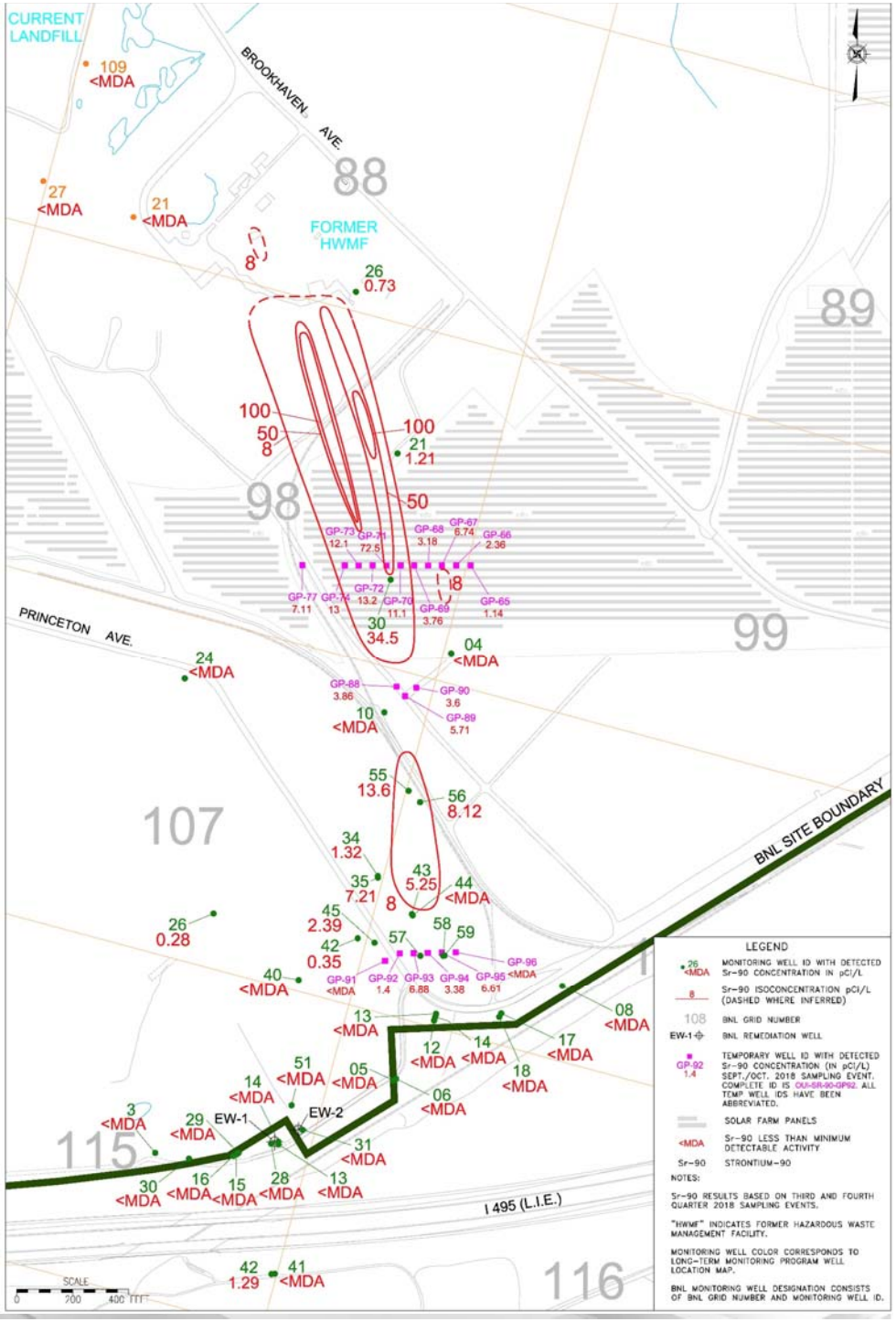




OU I Former Hazardous Waste Management Facility Sr-90 Plume

Monitoring the natural attenuation of Sr-90 downgradient of the former Hazardous Waste Management Facility

- 20 temporary wells were installed in 2018 to supplement the monitoring well network
- 3 new sentinel monitoring wells installed in 2018
- 3 new source area monitoring wells are planned to be installed in late 2019

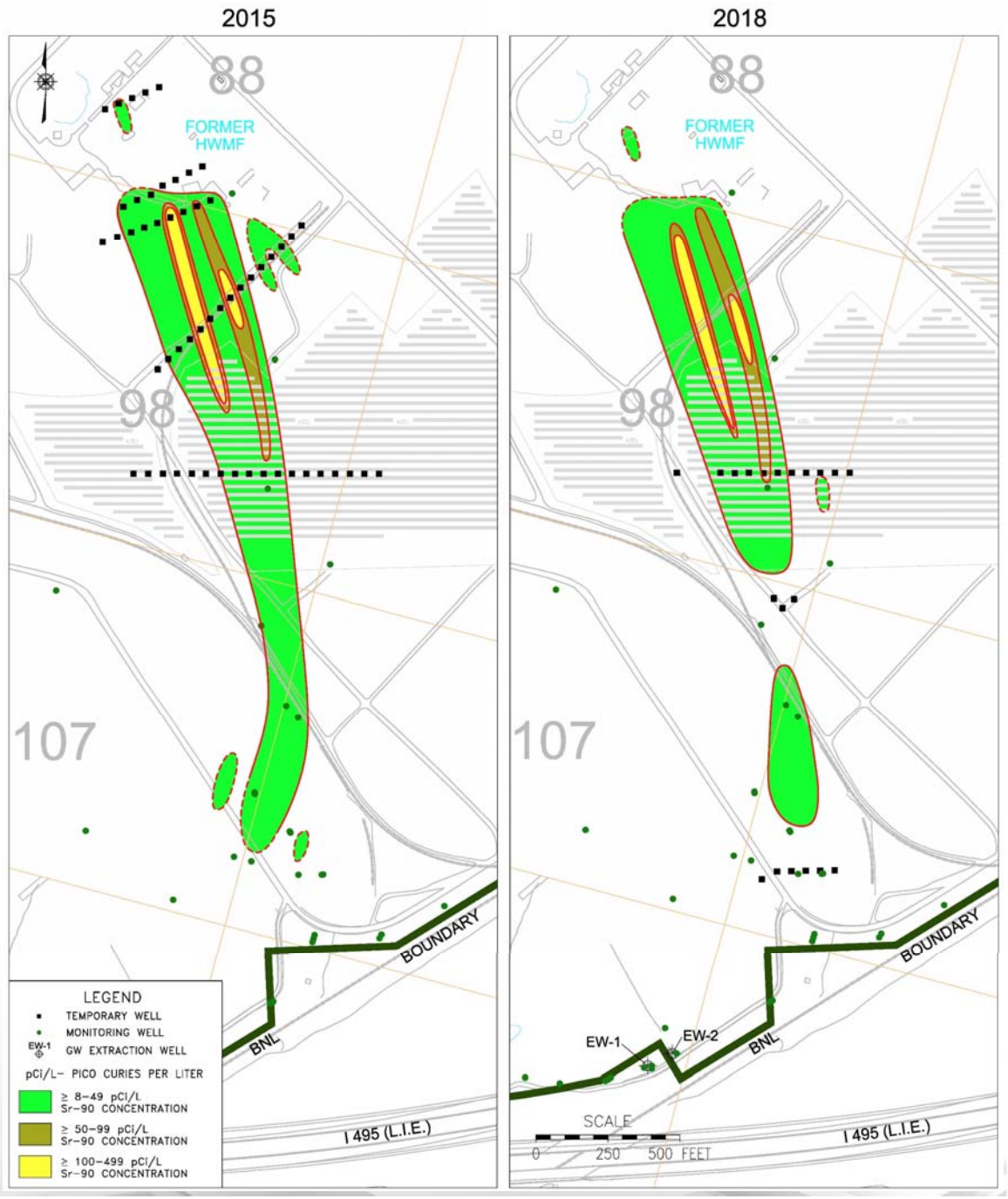


U.S. DEPARTMENT OF ENERGY

OU I Former Hazardous Waste Management Facility Sr-90 Plume

Monitoring the natural attenuation of Sr-90 downgradient of the former Hazardous Waste Management Facility

- 20 temporary wells were installed in 2018 to supplement the monitoring well network
- 3 new sentinel monitoring wells installed in 2018
- 3 new source area monitoring wells are planned to be installed in late 2019

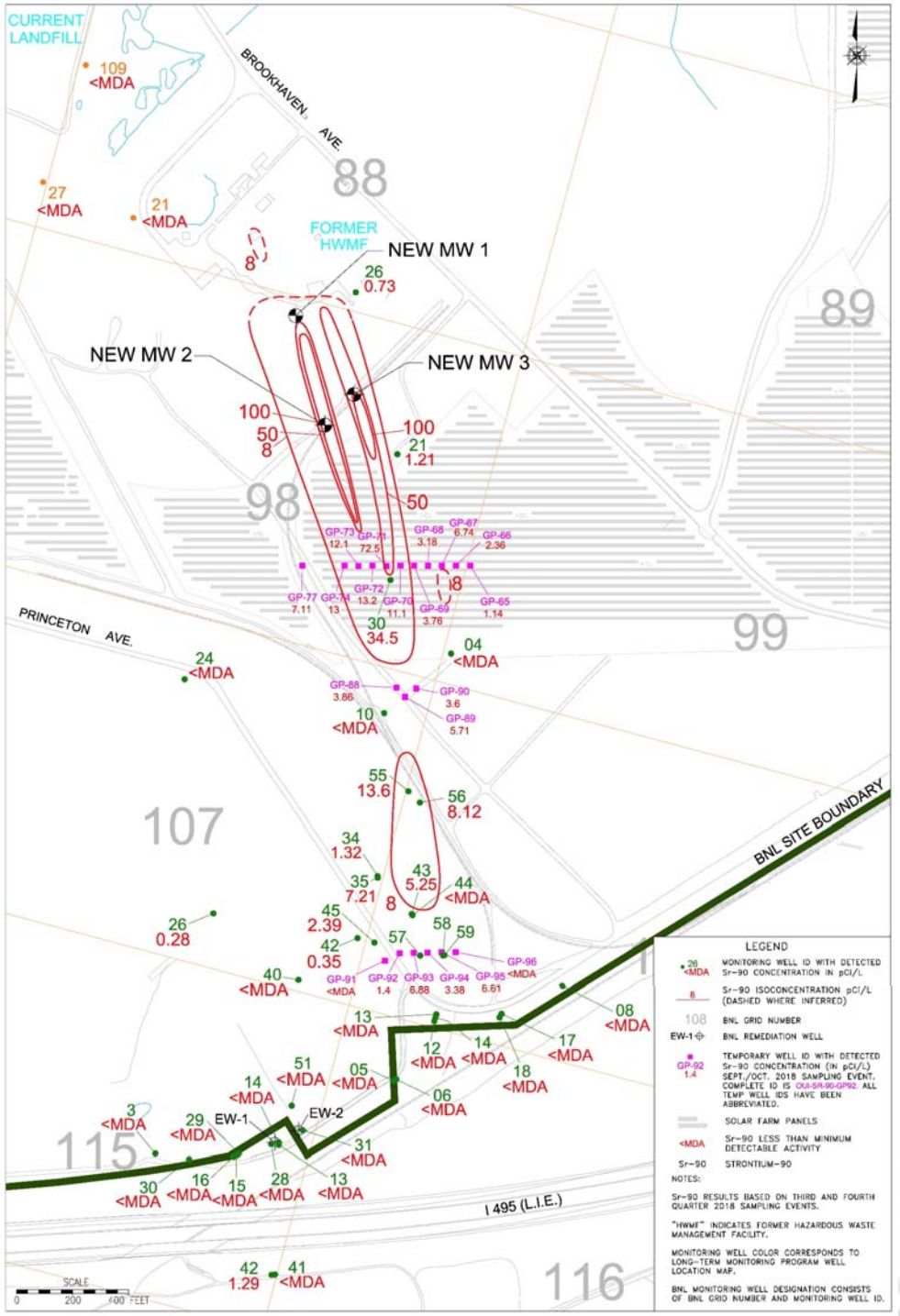


U.S. DEPARTMENT OF ENERGY

OU I Former Hazardous Waste Management Facility Sr-90 Plume

Monitoring the natural attenuation of Sr-90 downgradient of the former Hazardous Waste Management Facility

- 20 temporary wells were installed in 2018 to supplement the monitoring well network
- 3 new sentinel monitoring wells installed in 2018
- 3 new source area monitoring wells are planned to be installed in late 2019



U.S. DEPARTMENT OF ENERGY

Emerging Contaminants

Discussed in detail during previous CAC meetings. In summary:

Phased effort to determine extent of PFAS contamination:

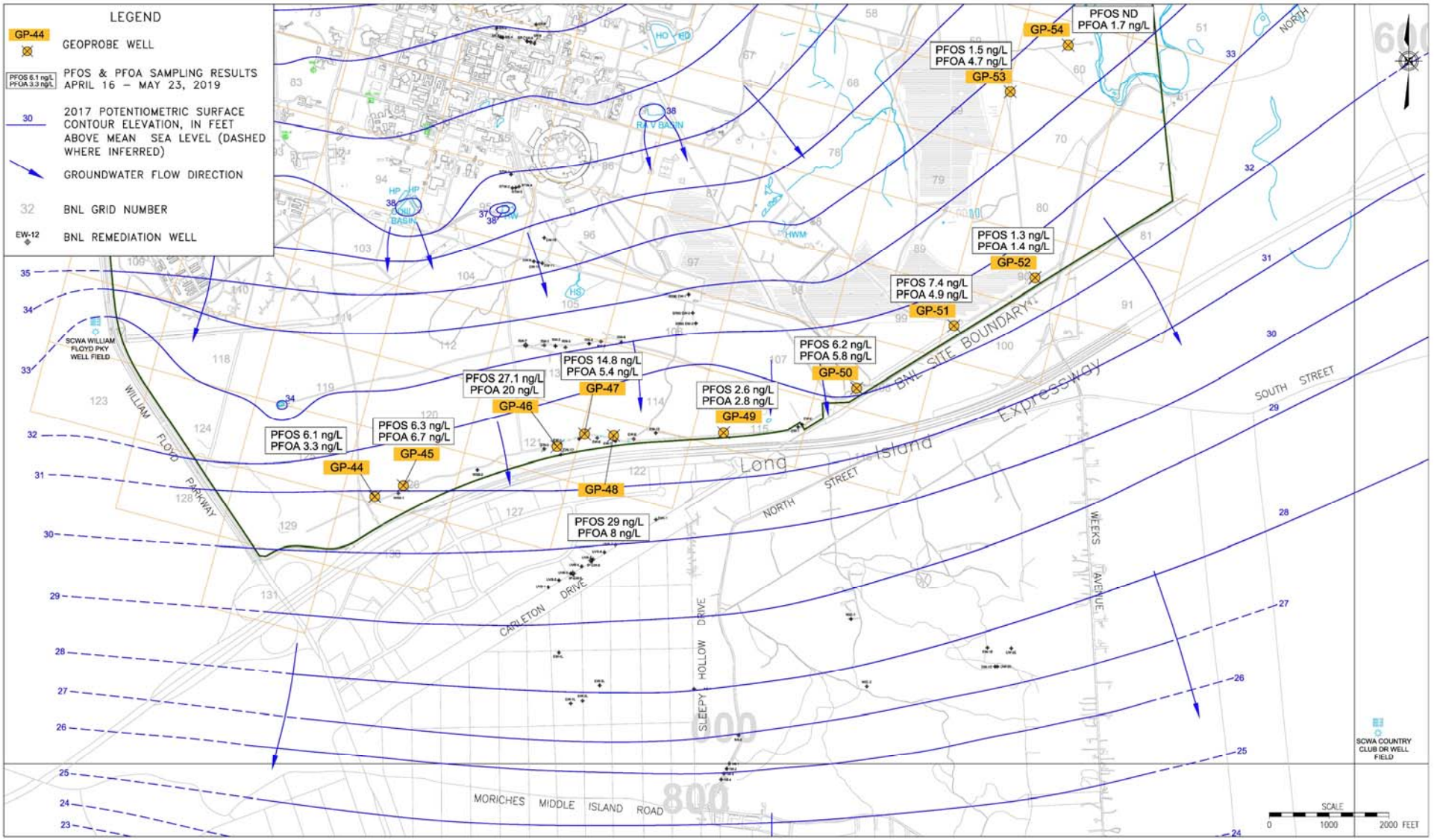
- Phase 1 (2018) - Source water contributing areas for the supply wells
- Phase 2 (2018) - Eight foam release areas
- Phase 3 (2019) - Groundwater treatment wells/systems, landfill areas, Sewage Treatment Plant effluent and groundwater, southern boundary temporary and permanent monitoring wells

Testing for 1,4-dioxane:

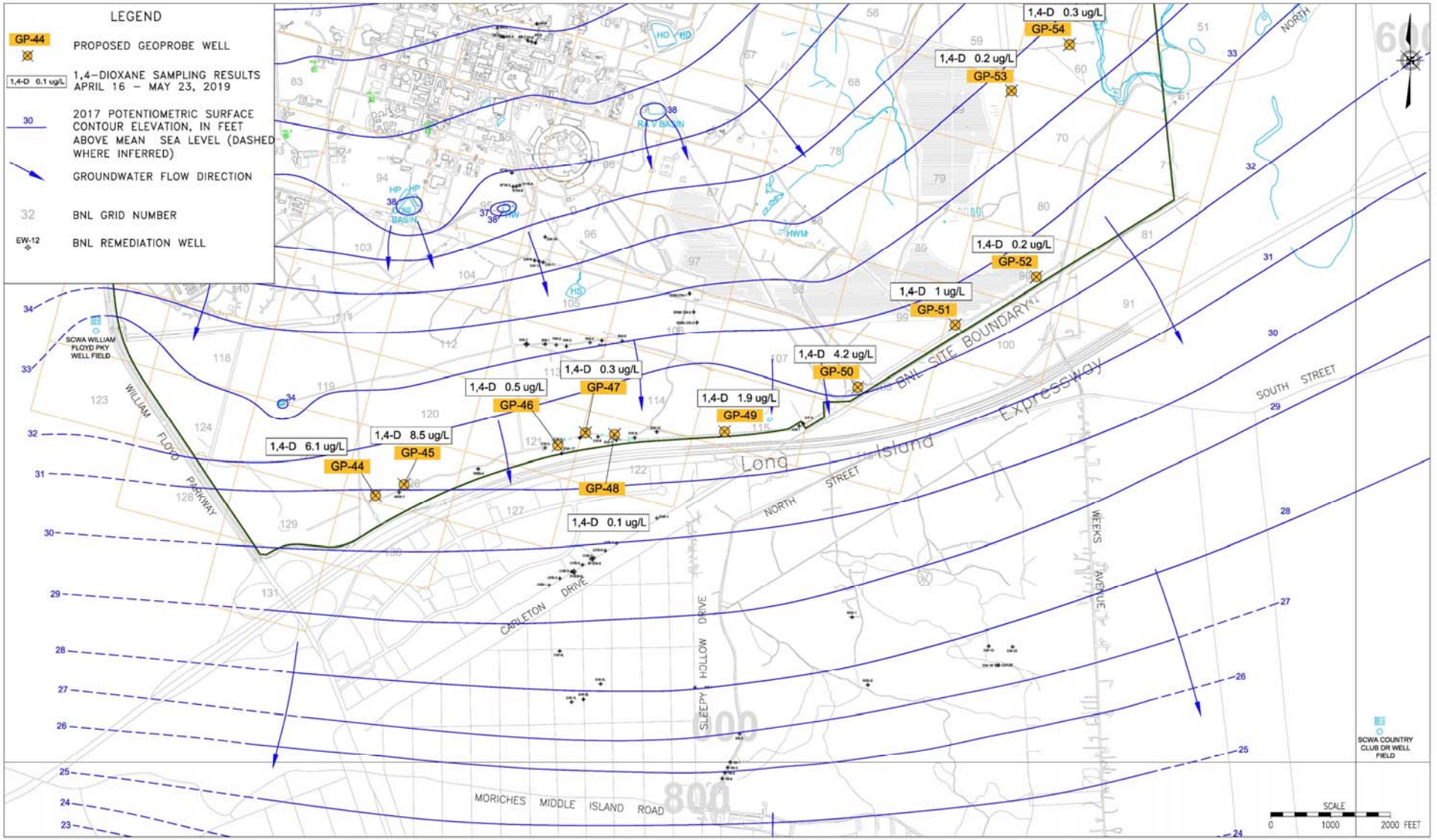
- 2017 - Sampled select on-site and off-site monitoring wells and remediation systems
- 2019 - Sampled select permanent and temporary monitoring wells along the BNL southern boundary. Coordinated with PFAS investigation

Temporary Well Sampling

Emerging Contaminants
PFAS Characterization Along BNL Site Boundary



Emerging Contaminants
1,4-dioxane Characterization Along BNL Site Boundary



Final Messages

- Groundwater Cleanup Program continues to show significant groundwater quality improvements
- Cleanup is continually optimized based on analysis and review of data
- BNL has taken important first steps in understanding the Emerging Contaminants issue
  - BNL will continue to work on this issue in close coordination with the regulatory agencies
  - Once drinking water standards have been established, any required remedial responses will be conducted under the established CERCLA process


Questions?