Groundwater Update

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

Presentation to Community Advisory Council
November 12, 2020

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 Groundwater Characterization and Source Area Remediation Status
- Final Messages

Groundwater Status Report (Volume 2 of Site Environmental Report)

- Groundwater Status Report provides details of SER Chapter 7 Summary
- This presentation provides up to date status on groundwater cleanup program progress
- Maps based primarily on fourth quarter 2019 data
- Web link for 2019 Groundwater Status report

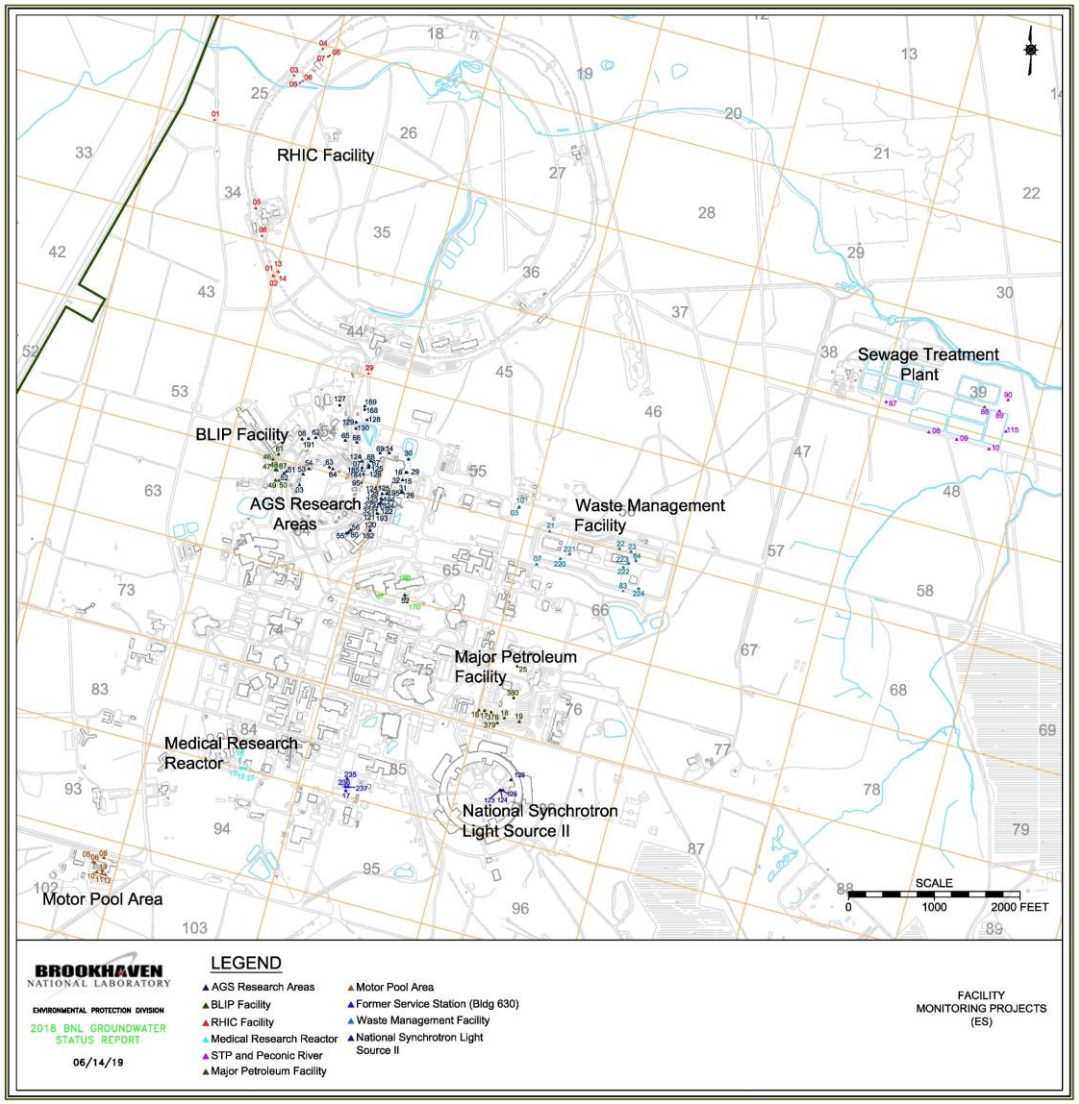
  https://www.bnl.gov/gpg/2019gw-report.php

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 2019 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 regulatory 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			
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			

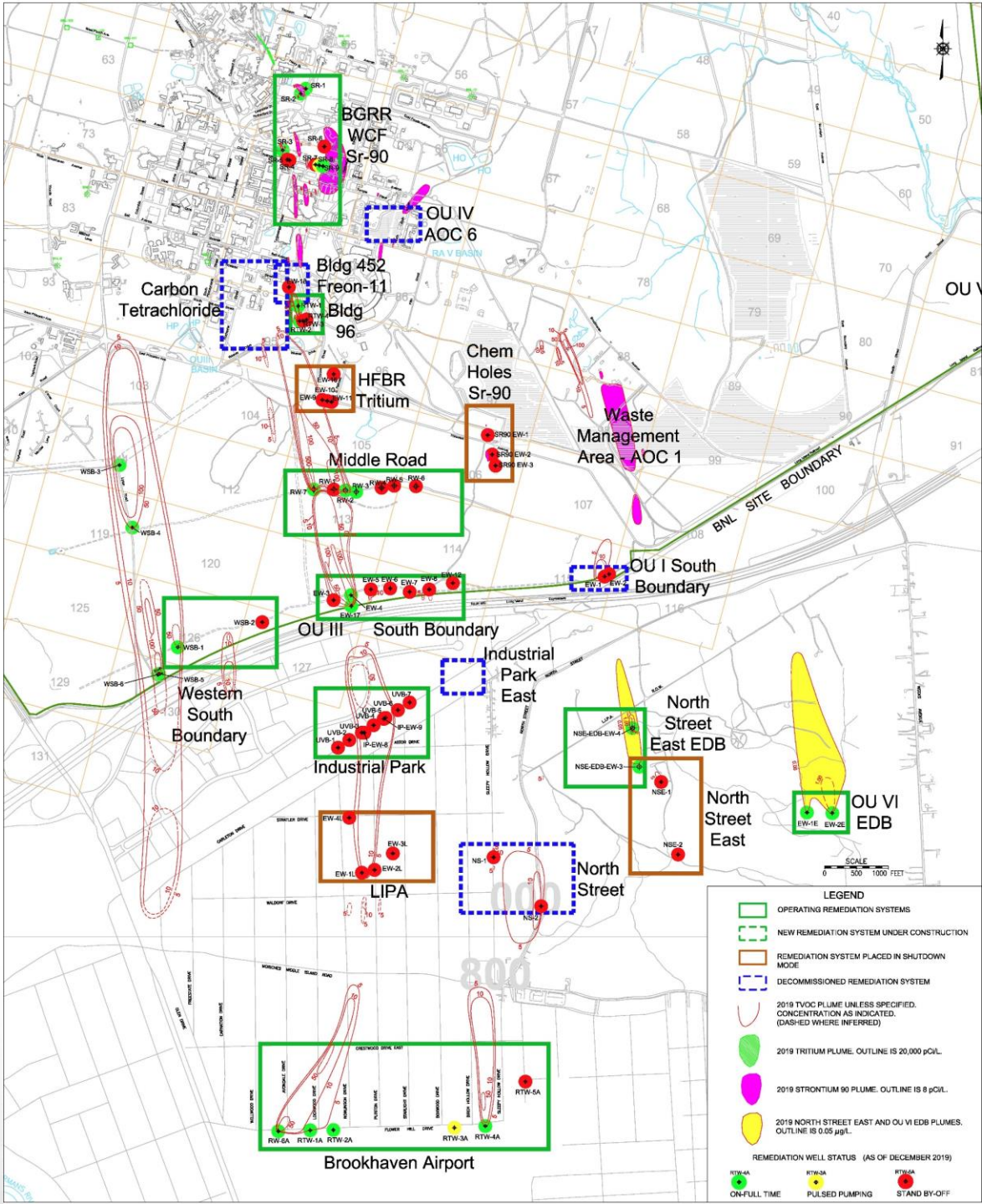
Groundwater Treatment Systems/Plumes Current Status

75 Existing Extraction Wells:

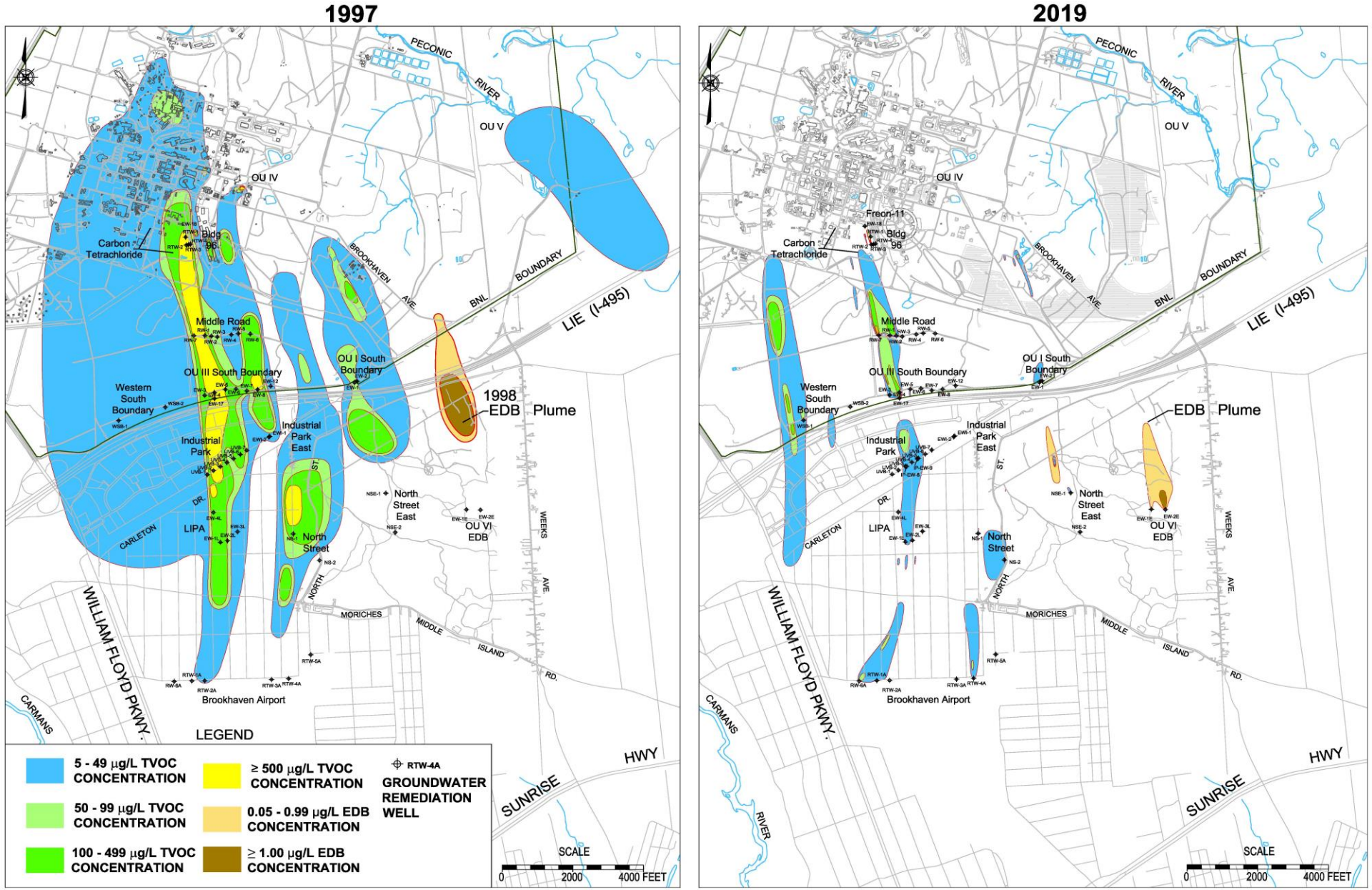
- 23 operational
- 4 pulsed pumping

1996 – 2019:

- 28 billion gallons of contaminated groundwater treated and recharged to the aquifer
- 7,650 lbs. VOCs removed
- 34 mCi Sr-90 removed



TVOC Plume Comparison



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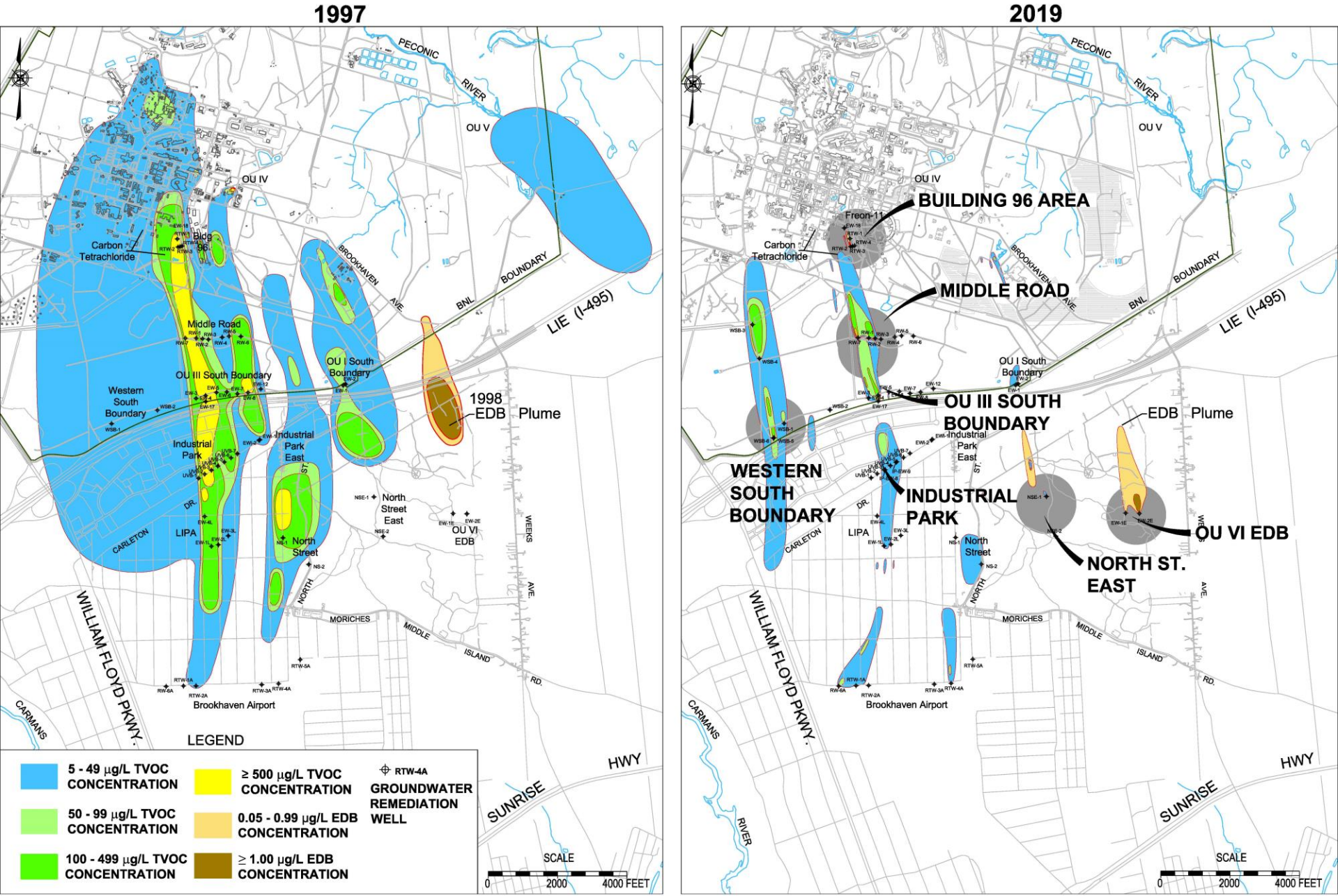
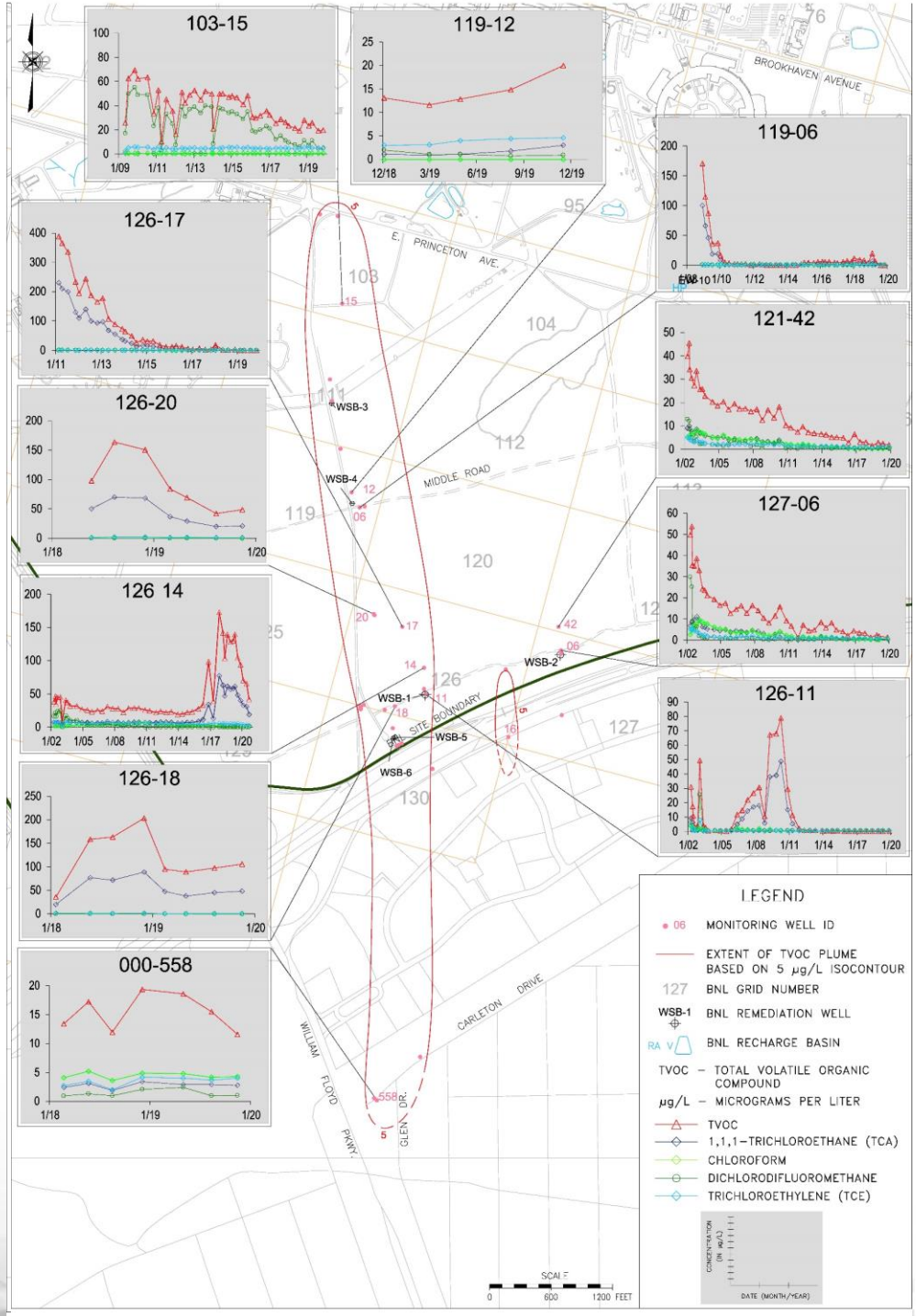


OU 3 Western South Boundary Treatment System Optimization

- Four new extraction wells began operation in March 2019
- Remediation progressing as planned
- Highest TVOC concentration in sentinel wells below 20 µg/L since 2018
- Continue to monitor well 126-14 TVOCs in anticipation of placing WSB-1 on standby (41 µg/L August 2020)



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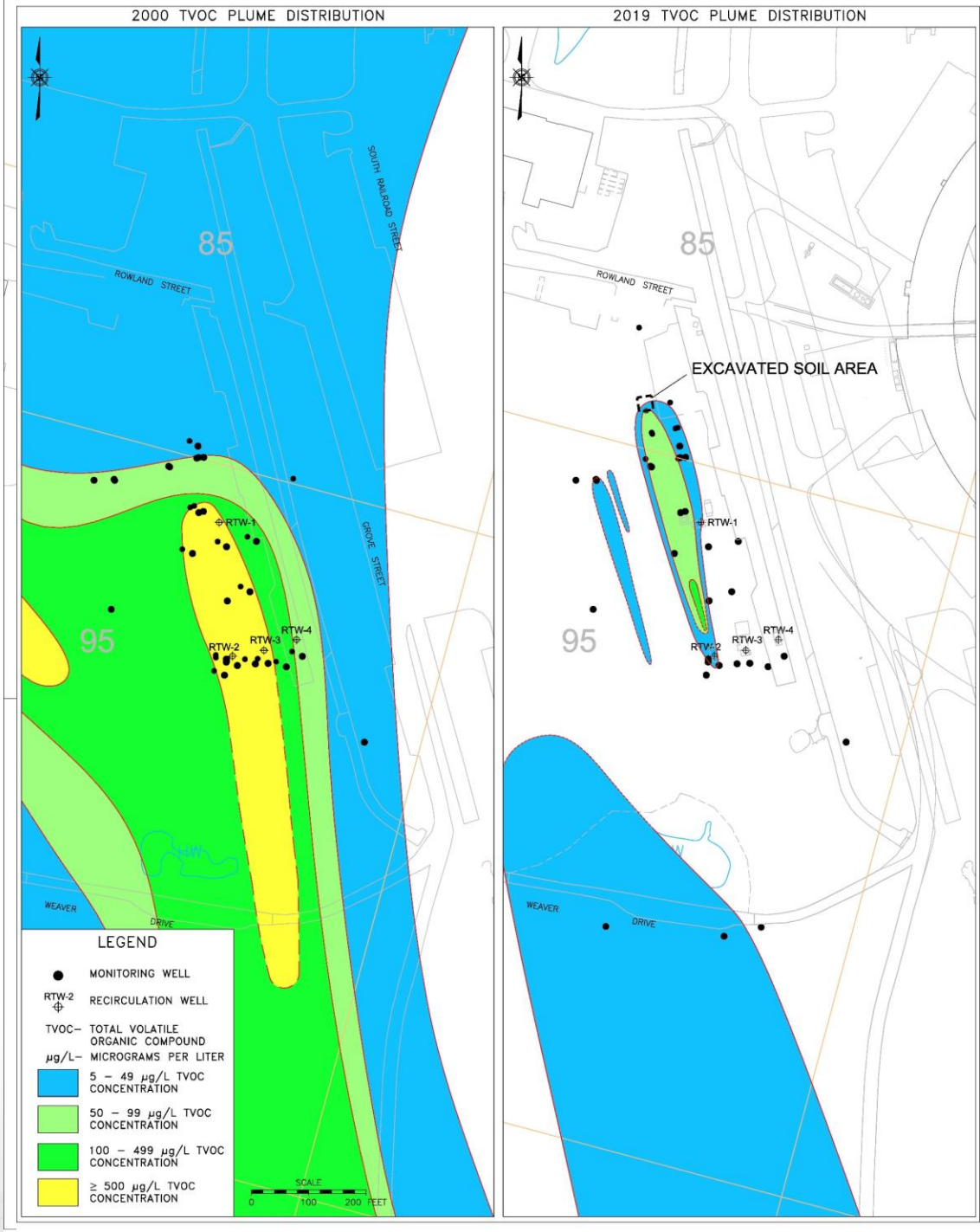
OU 3 Building 96 VOC Treatment System Optimization

- Source area TVOC concentrations continue in the 50 µg/L to 100 µg/L range
  - Historic high concentration was 18,000 µg/L (1998)
  - Evaluating source area groundwater as part of Five-Year Review
- Increased pumping rate in extraction well RTW-1 from 30 gpm to 60 gpm based on Groundwater Report recommendation to increase capture of western plume edge
- TVOC concentration has declined significantly in well 095-159. This indicates that the western edge of the plume is being captured by RTW-1



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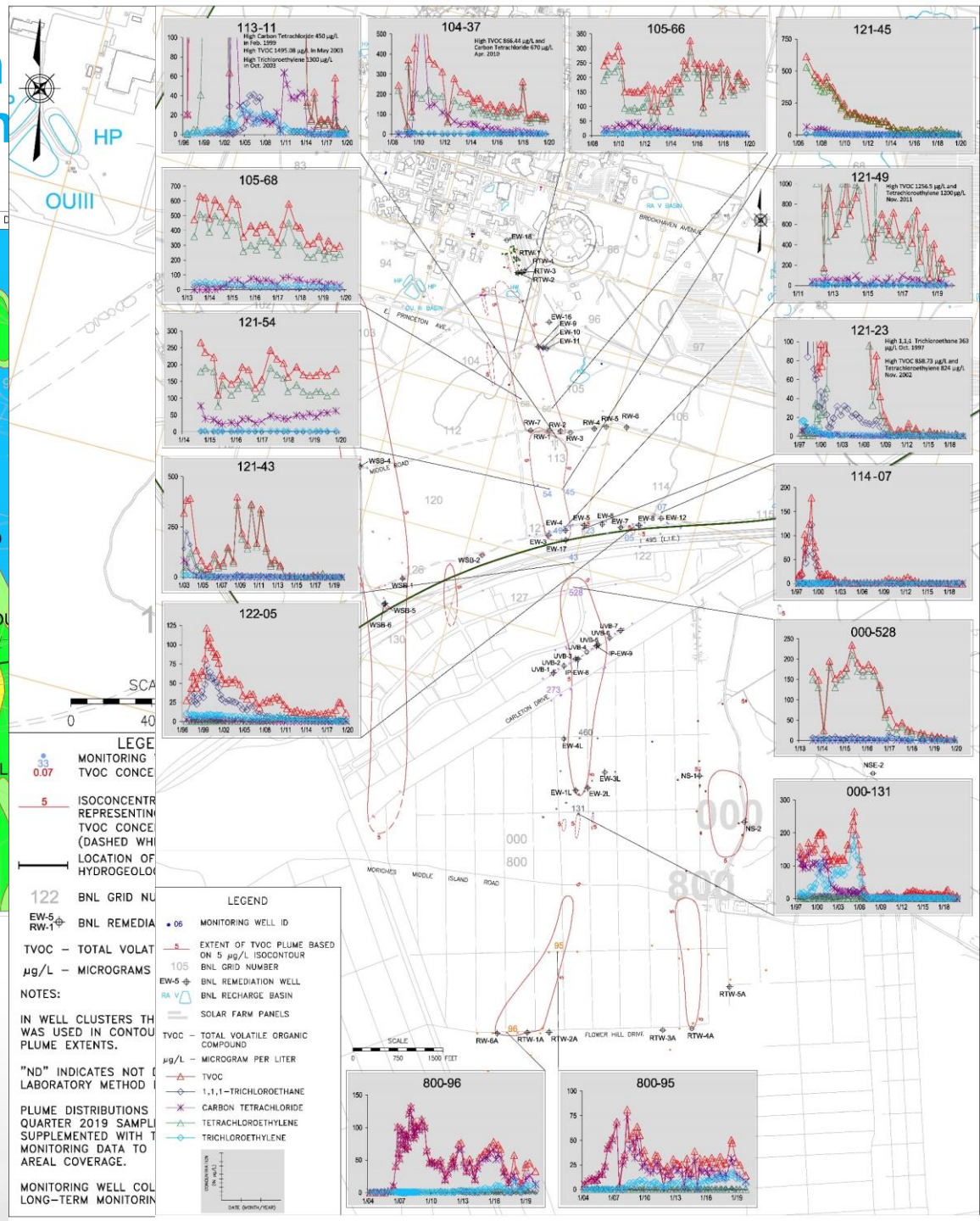
OU 3 Middle Road/South Boundary VOC Treatment System

- Substantial cleanup progress to date on each of these systems
- Extraction wells currently operational include RW-2, RW-3, RW-7 (Middle Road) and EW-17, EW-4 (South Boundary)
- Evaluating as part of Five-Year Review whether current rate of cleanup progress will achieve CERCLA Record of Decision (ROD) Cleanup Goal



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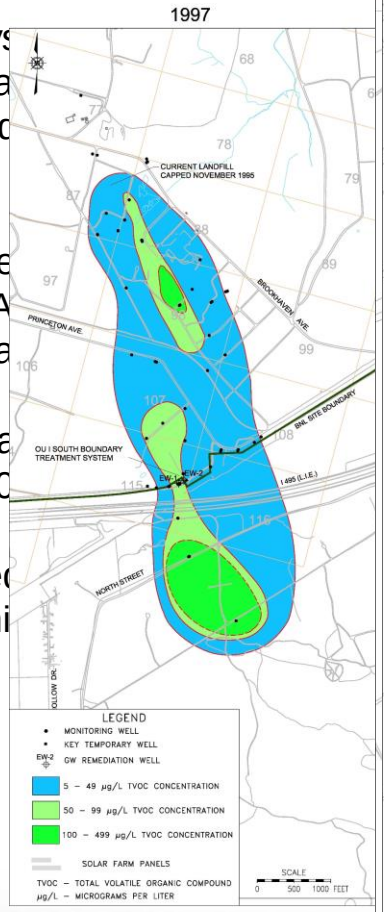
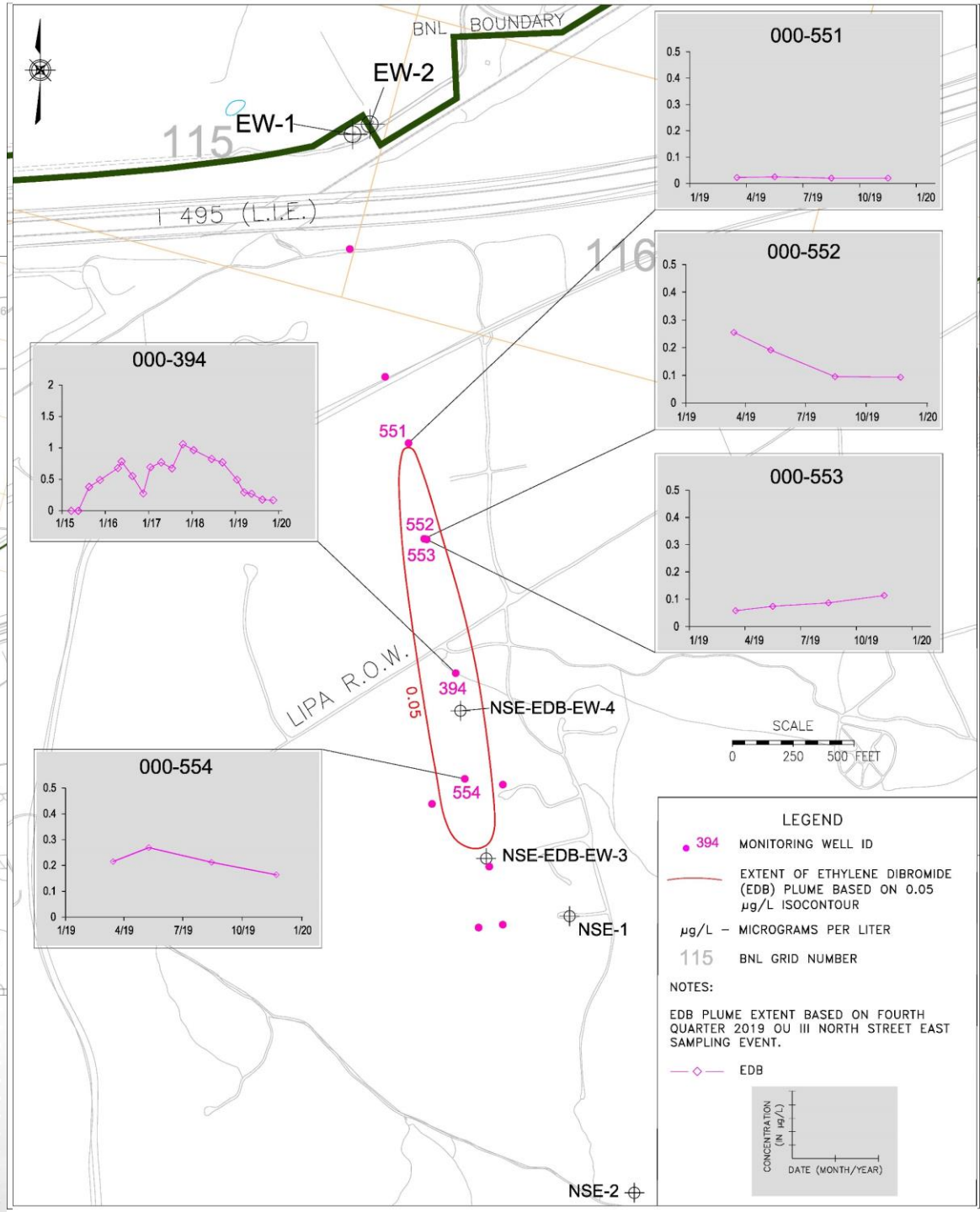
OU 3 North Street East VOC Treatment System Optimization

- VOC Treatment Sys
  EW-2) began opera
  was placed in shutd
  2014
- Ethylene Dibromide
  in well 000-394 in A
  (Drinking Water Sta
- Two new EDB extra
  operation July 2020
- EDB being captured
  extraction wells whi
  several years.





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 a temporary and two permanent wells in September 2020 to provide additional geologic information and groundwater data points
- Using updated groundwater data to run model simulations on cleanup timeframe
- Will evaluate need for additional extraction well as part of CERCLA Five –Year Review

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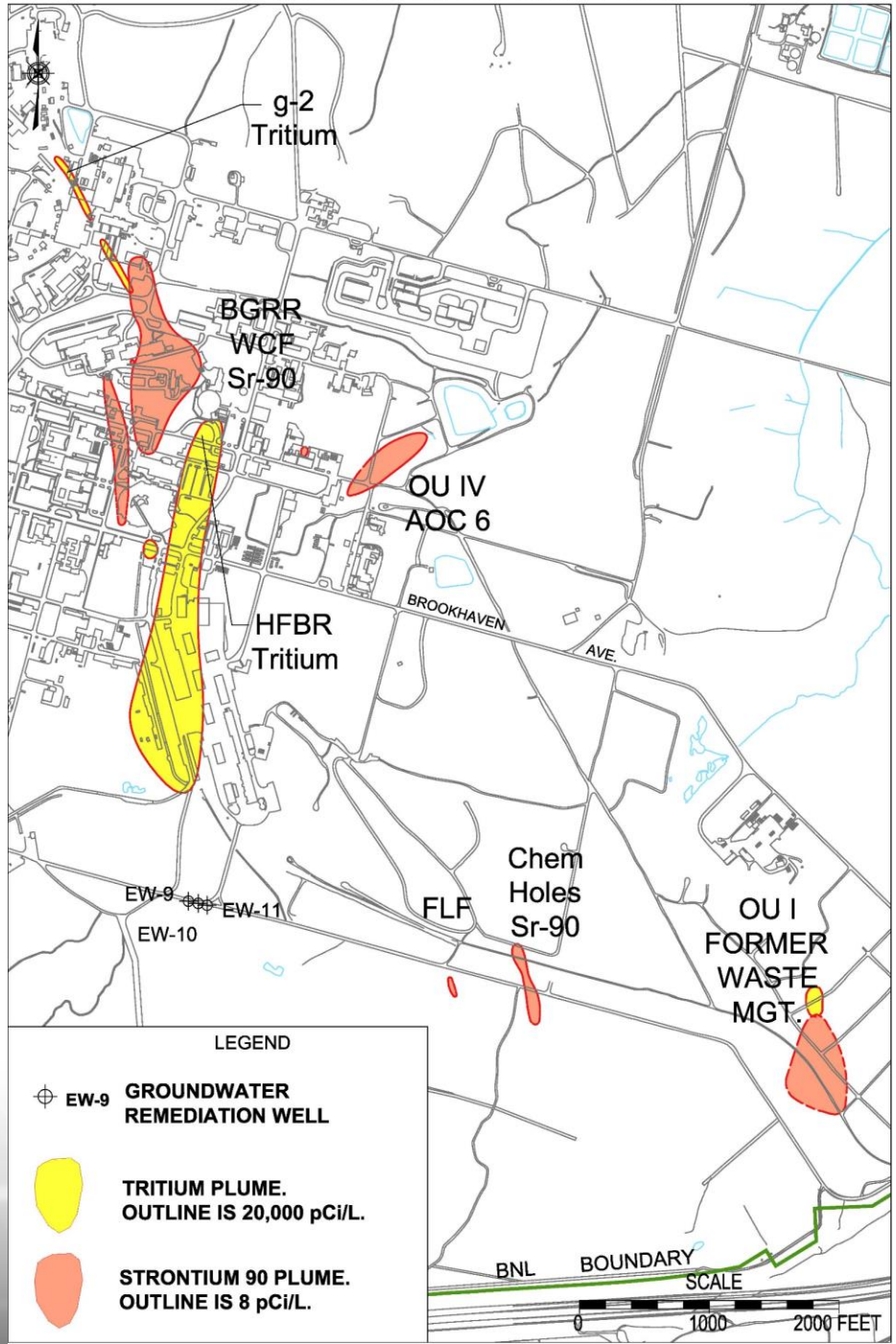
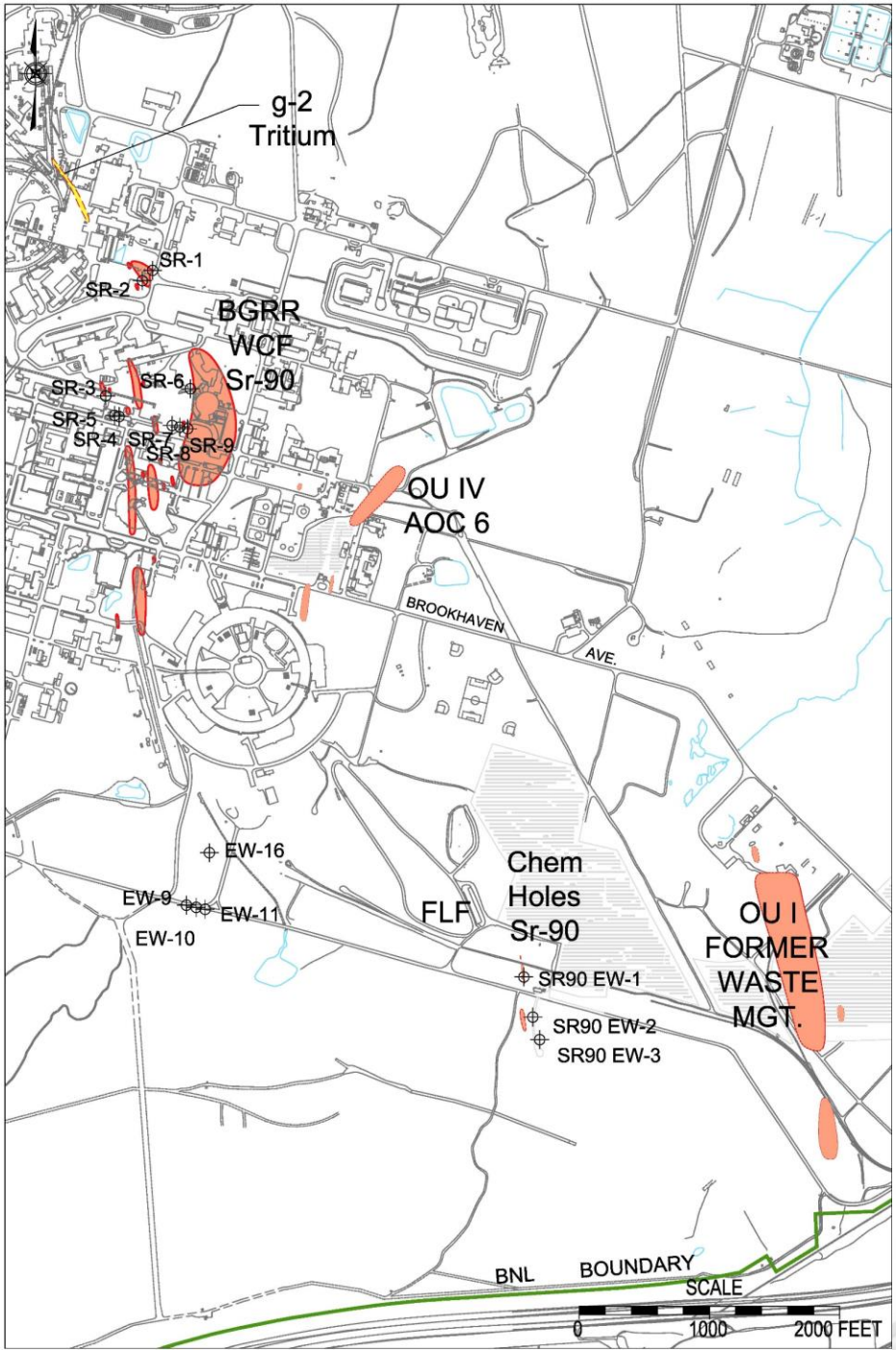
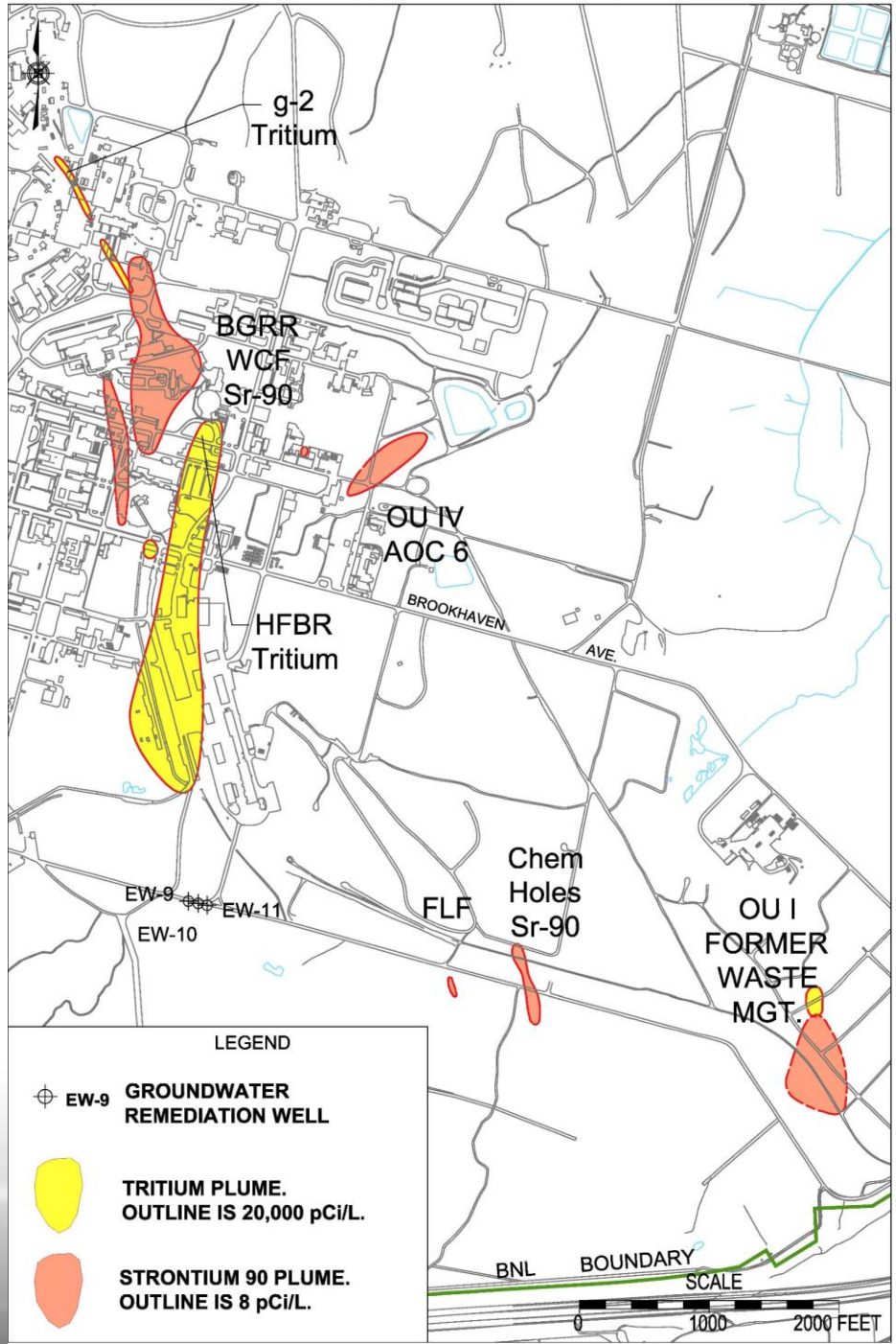
2002 RAD PLUME DISTRIBUTION



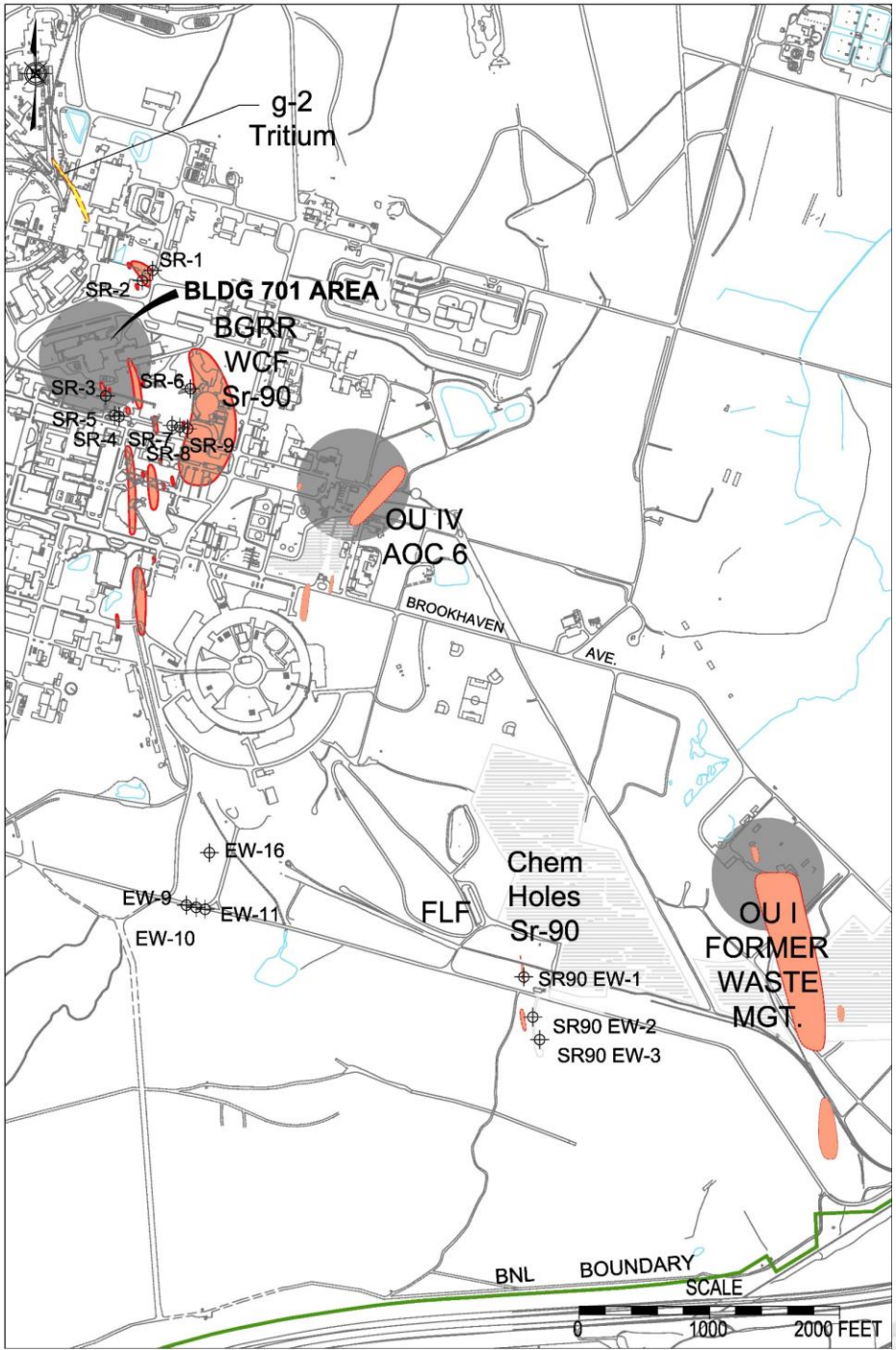
2019 RAD PLUME DISTRIBUTION



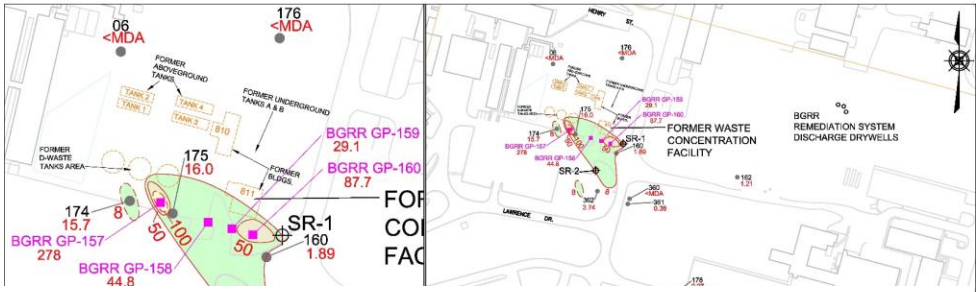
2002 RAD PLUME DISTRIBUTION



2019 RAD PLUME DISTRIBUTION



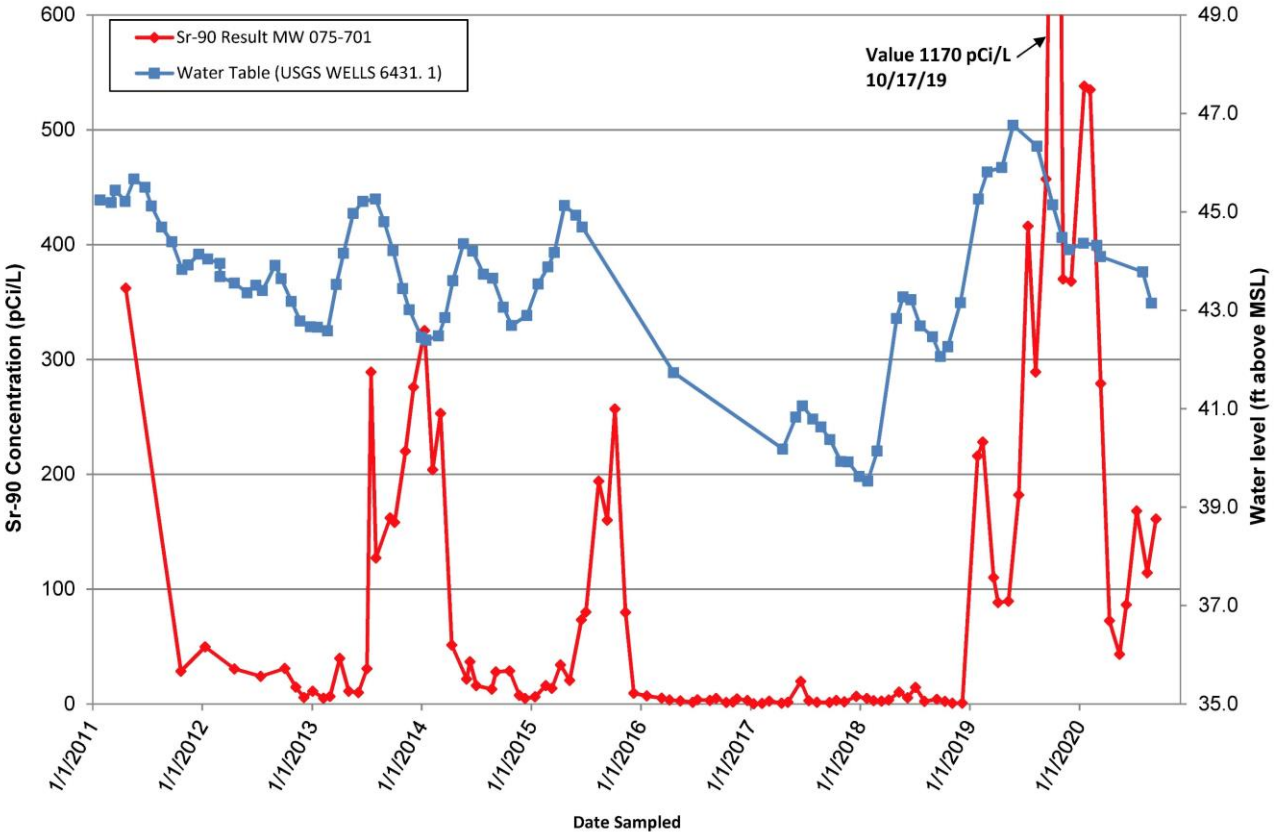
OU 3 BGRR, Waste Concentration Facility (WCF), Pile Fan Sump, Building 801 Sr-90



- Monitoring the effects of water table elevation on Sr-90 in groundwater immediately downgradient of the BGRR (Building 701) and Building 801 source areas
- Installed new sentinel well in 2020 to monitor the leading edge of the BGRR Sr-90 plume

Figure 3.2.14-6
OU III BGRR/WCF Monitoring Well 075-701
Sr-90 Concentration Comparison to Water Table Elevation

2019 BNL Groundwater Status Report



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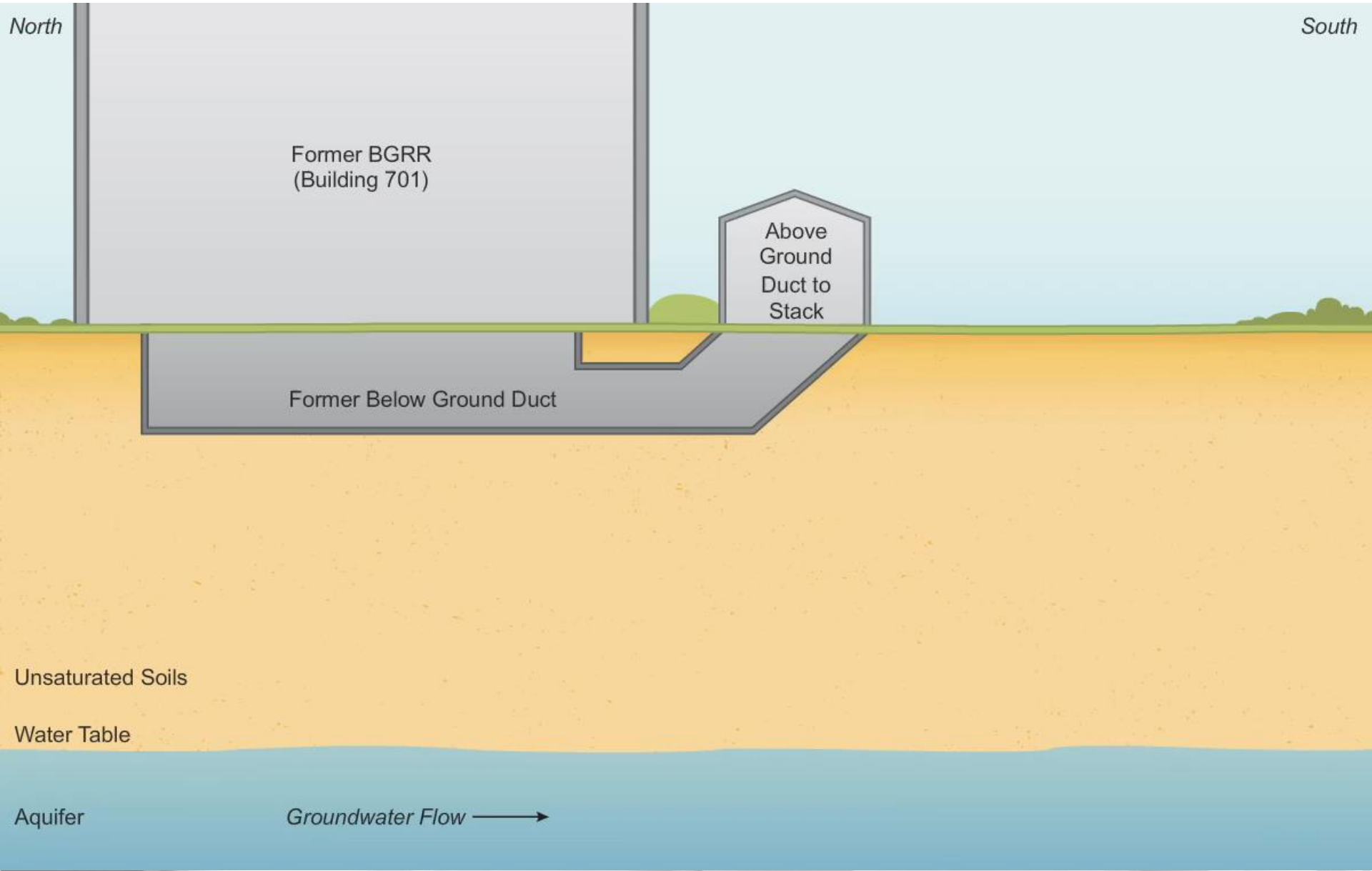
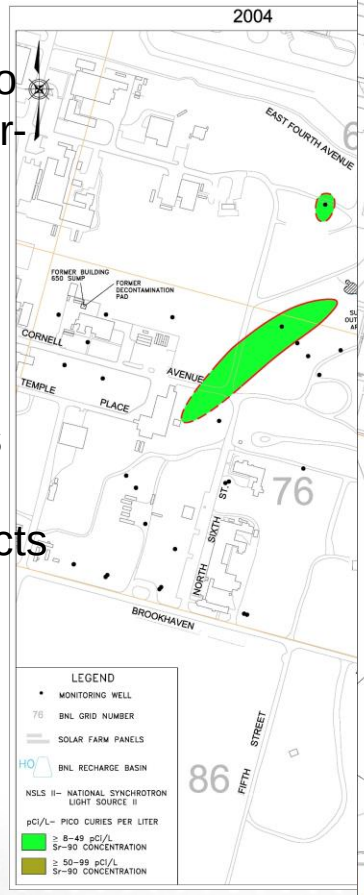
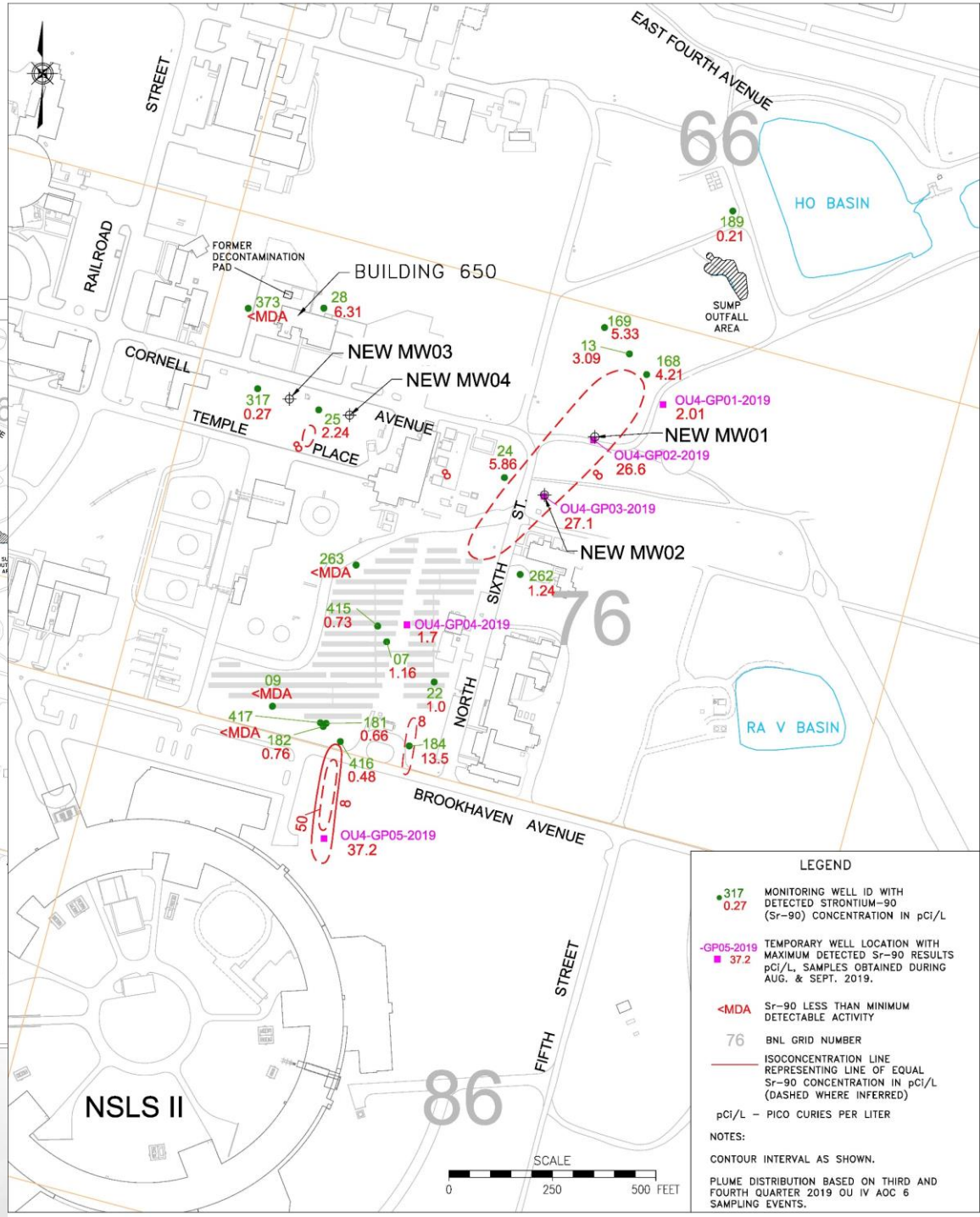
OU 3 BGRR Building 701 Source Area Sr-90



OU 4 Building 650 Sr-90

- Installed four temporary wells and two permanent monitoring wells to compensate for Sr-90 plume shift to southeast
- Installed two new monitoring wells downgradient of Building 650. This will allow us to monitor any impacts to groundwater resulting from the Building 650 D&D work





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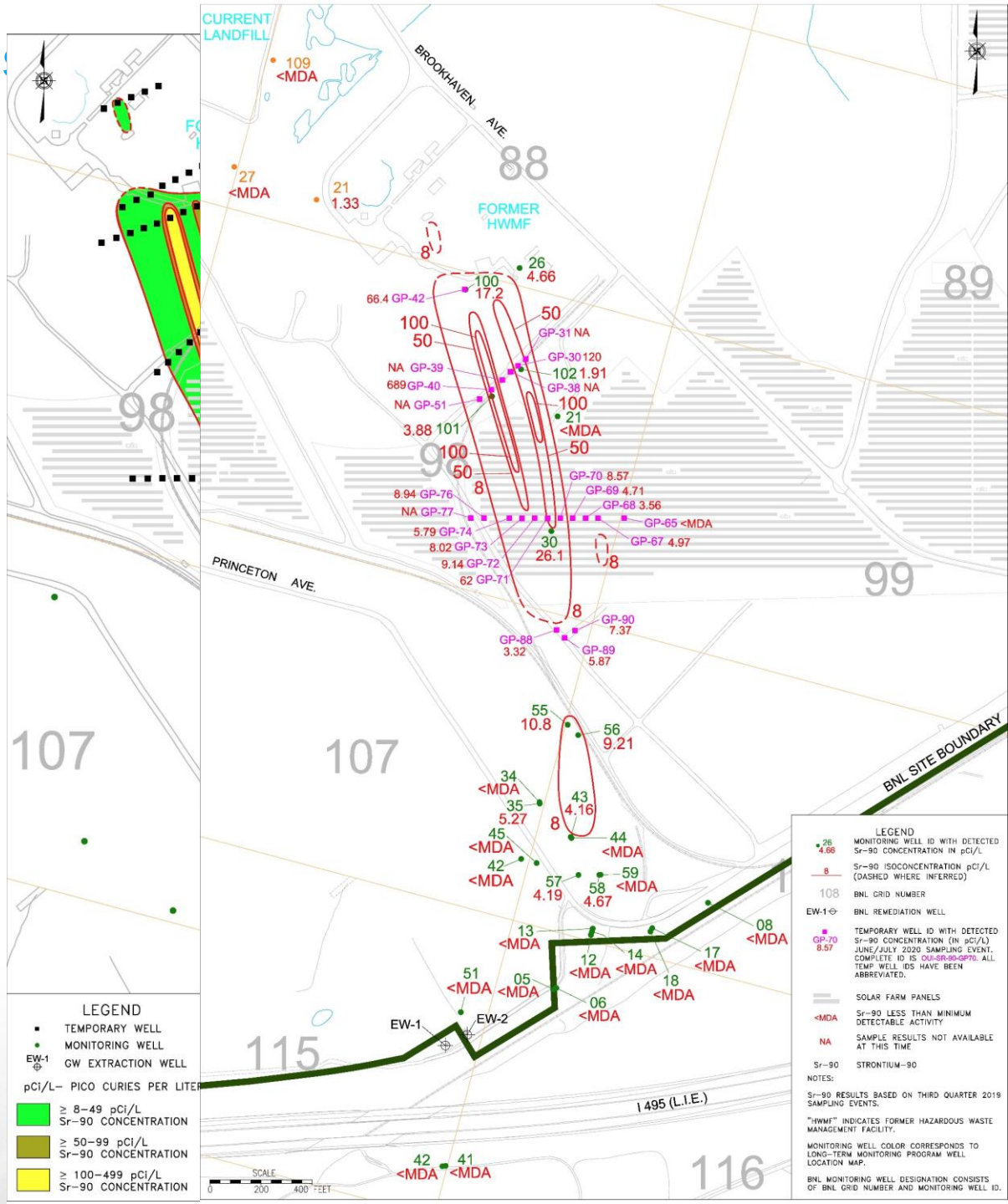
OU I Former Hazardous Waste Management Facility Sr-90 Plume

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

- 15 temporary wells were installed in 2020 to supplement the monitoring well network
- Three temporary profile wells were installed to assess depth and location of wells 098-100, 098-101, and 098-102
  - After evaluating temporary well data, two replacement wells were installed at locations 098-101 and 098-102
  - Sr-90 concentrations in the temporary profile wells were 689 pCi/L and 120 pCi/L, respectively
- Perform natural attenuation simulation for Five-Year Review



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Remediation of Current and Former Firehouse PFAS Plumes

- DOE provided $10.9M to conduct detailed characterization and remediation of the high concentration plume segments
  - Since July 2020, BNL has installed 66 temporary monitoring wells
    - Samples for PFAS analysis collected from 660 depth intervals
    - Samples for 1,4-dioxane analysis collected from 250 depth intervals
      - Need to determine whether 1,4-dioxane is present at concentrations that could impact planned remediation systems
  - Working with consulting engineer on treatment system requirements and design
    - Plan to reuse two currently inactive groundwater treatment systems. Will result in significant time and cost savings
  - BNL is currently reviewing the characterization data. Data will be used for:
    - Determination of the extent and depths of the plumes
    - Groundwater modeling and treatment system engineering
    - Determining number, locations, depths, and pumping rates for the groundwater extraction wells
    - Filter system design (expect to use granular activated carbon and/or ion exchange resins)
    - Determining where permanent monitoring wells are needed for long-term surveillance of the source areas and plumes
  - Data summary reports and remediation plans will be submitted to the regulatory agencies for review

Final Messages

- Groundwater Cleanup Program continues to show significant groundwater quality improvements
- Groundwater cleanup program is continually optimized based on analysis and review of data.
  - New temporary and permanent monitoring wells installed in 2019/2020 for:
    - OU 4 Building 650 Sr-90
    - OU 3 BGRR
    - OU I former Hazardous Waste Management Facility Sr-90
    - OU 6 EDB
  - Two new extraction wells for EDB at North Street East System
  - Modified pumping at Building 96 to capture western edge of plume
- Evaluating groundwater cleanup progress for all systems as part of CERCLA Five-Year Review, including:
  - Building 96
  - OU 3 Middle Road
  - OU 3 South Boundary
  - OU 6 EDB

Final Messages (Continued)

- BNL continued to implement actions to understand and address the Emerging Contaminants issue
  - Sampled 364 existing monitoring wells on and off-site for emerging contaminants
  - Performed a detailed groundwater characterization of PFAS high concentration areas downgradient of the current and former firehouse source areas
  - Began work on design of source area groundwater remediation


Questions?