



# 2021 CERCLA Five Year Review, Update and Status of Groundwater Cleanup

Presentation to Community Advisory Council  
November 10, 2021

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Manager, Groundwater Protection Group



# Agenda

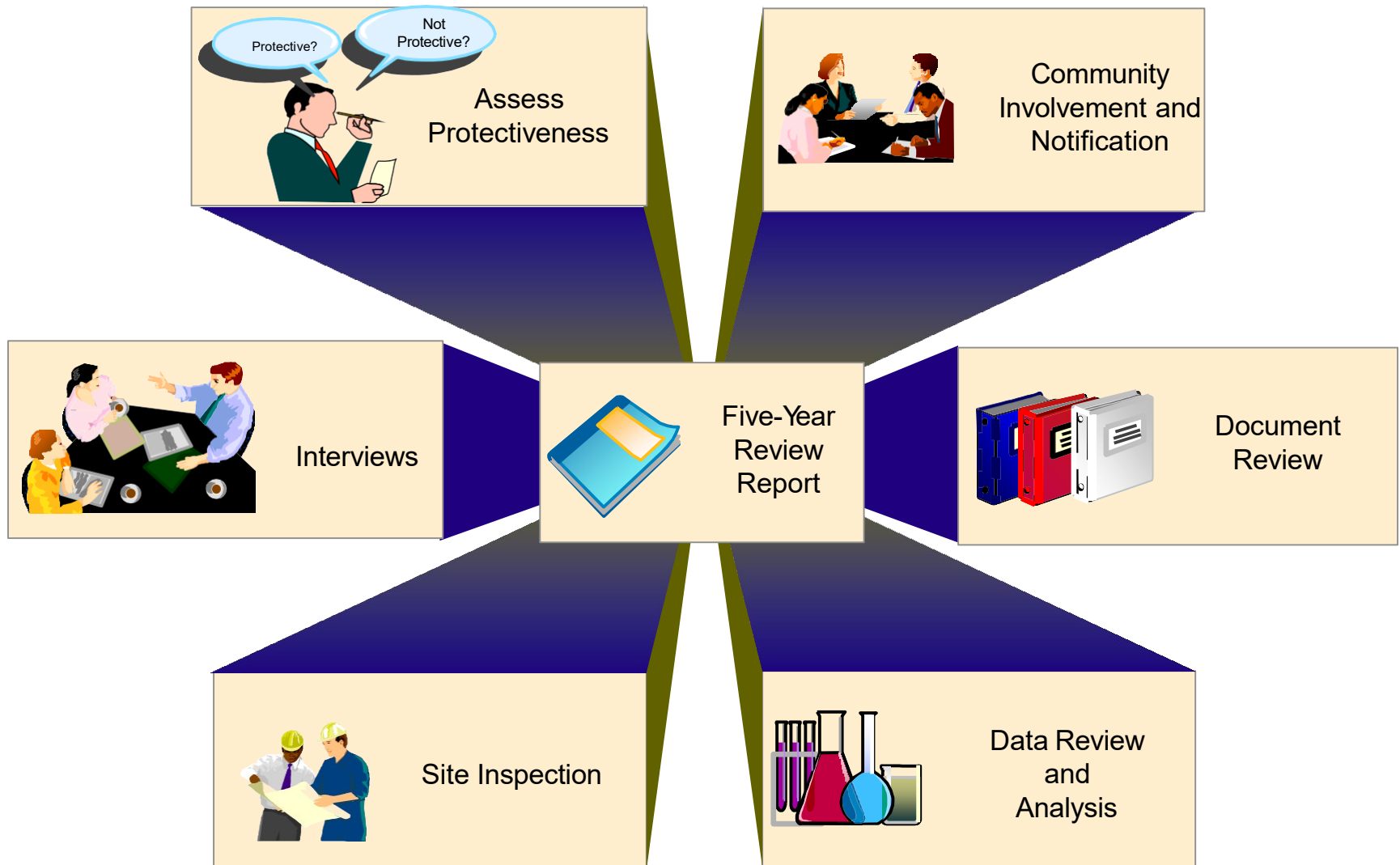
- 2021 CERCLA Five-Year Review
  - Definition
  - Schedule
  - Protectiveness Statements
  - Highlights
  - Recommended Actions
- Groundwater Treatment System Status and Progress
- VOC and Radiological Plume Status and Progress
- Next Steps

# 2021 CERCLA Five-Year Review

## What is the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Five-Year Review?

- Five-Year Reviews are required by CERCLA when hazardous substances remain on site above levels that permit unlimited use and unrestricted exposure
- Five Year Reviews provide an opportunity to evaluate the implementation and performance of a remedy to determine whether it remains protective of human health and the environment

# Five-Year Review Process





# 2021 CERCLA Five Year Review - Timeline

## June

- Report submitted to regulators
  - Briefed regulators on highlights/recommendations

## August

- Received EPA protectiveness determination letter and comments from NYSDEC/NYSDOH and SCDHS

## September

- Submitted responses to regulatory comments:
  - Characterize the full extent of PFAS and 1,4-dioxane in groundwater and soil and determine the need for further cleanup actions (new Operable Unit VIII Remedial Investigation and Feasibility Study)
  - NYSDEC requested continued on-site fish sampling of Peconic when river conditions/fish population and size allow. This will be determined by BNL annual assessments of the river.

## October

- Received EPA technical comments. BNL preparing responses.
  - None of the comments impact the overall protectiveness statements in their August letter. They are intended for clarification. Will be addressed in the addendum to the Five-Year Review.

# 2021 CERCLA Five Year Review

## Protectiveness Categories

- 1. Protective** - The remedy is functioning as intended and all human and ecological risks are currently under control and are anticipated to be under control in the future
- 2. Short-Term Protective** - Human and ecological exposures are currently under control and no unacceptable risks are occurring. However, the data and/or documentation review also raise issues that could impact future protectiveness or remedy performance but not current protectiveness.
- 3. Will Be Protective**
- 4. Protectiveness Deferred**
- 5. Not Protective**

# 2021 CERCLA Five Year Review

## EPA Protectiveness Determinations

### Protectiveness Determinations for BNL:

- Operable Unit I – Protective
- Operable Unit III – Short-Term Protective
- Operable Unit IV – Protective
- Operable Unit V – Short-Term Protective
- Operable Unit VI – Short-Term Protective
- BGRR – Protective
- g2/BLIP/USTs –Protective
- HFBR – Short-Term Protective

# 2021 CERCLA Five Year Review Highlights

- **Since the 2016 Five Year Review:**
  - Six new groundwater extraction wells installed to enhance plume capture
  - Four groundwater treatment systems approved for closure and two were shut down and placed in standby mode
  - Radiological-contaminated soil removed at former Waste Concentration Facility, and demolition of former Building 650

**Building 650 Demo**



**Building 650 Regrading**





# 2021 CERCLA Five Year Review

## Highlights - Continued

- **Since the 2016 Five Year Review:**
  - HFBR stack removed per Record of Decision (ROD), closeout report being prepared
  - New Areas of Concern and Operable Unit VIII identified to address PFOS/PFOA and 1,4-dioxane, significant groundwater characterization performed, and removal action initiated for PFAS-contaminated groundwater
  - Last area of mercury-contaminated sediment removed from the Peconic River, NYSDEC vegetation monitoring equivalency permit closed

### Stack Demo



**HFBR stack area soil excavation 2021**



**Peconic River PR-WC-06  
Post-Cleanup 2019**



# 2021 CERCLA Five Year Review

## Highlights - Continued

- **Since the 2016 Five Year Review:**
  - HFBR ROD requires removal of remaining activated structures/ components (reactor vessel, thermal and biological shields) following a safe storage decay period not to exceed 65 years (by 2074). Based on data collected and a technology evaluation recently performed, this timeframe cannot be accelerated.
  - Continued surveillance and maintenance of former BGRR and HFBR reactors and former soil cleanup areas. No significant issues identified.

HFBR Experimental Level During  
Operation



Current HFBR Experimental Level





# 2021 CERCLA Five Year Review

## Highlights - Continued

- **Since the 2016 Five Year Review:**
  - Continued implementation of institutional controls for all cleanup areas
  - Maintained access agreements with off-site property owners to allow continued operation of groundwater treatment systems

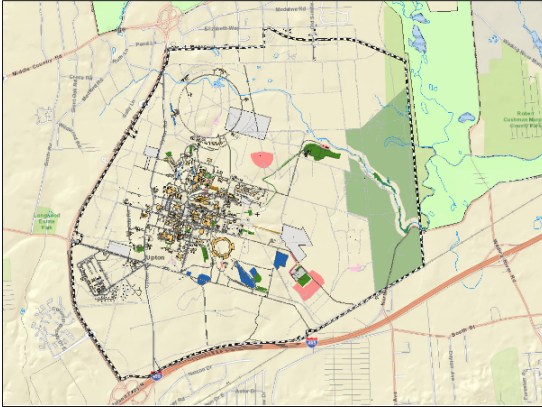
### BNL LAND USE INSTITUTIONAL CONTROLS

**BROOKHAVEN**  
NATIONAL LABORATORY

HOME MAPS FACTSHEETS LAND USE CONTROLS GLOSSARY USER GUIDE LINKS CONTACTS

Home

#### LAND USE INSTITUTIONAL CONTROLS



*(Click the Map to Continue)*

Welcome to the Brookhaven National Laboratory Land Use and Institutional Controls website. The purpose of this website is to provide centralized, integrated access to information pertaining to BNL remediation areas that are subject to land use and institutional controls. It includes brief information on each of the BNL contaminated sites and facilities, their cleanup status, contaminants of concern, and maps depicting land use and land use restrictions. It defines the scope of activities intended within each contaminated area, so that stewards and stakeholders have a clear understanding of restrictions and stewardship responsibilities. This website replaces what was informally referred to at BNL as the "soil contamination map".

The [Land Use Controls Management Plan](#) describes in detail the Department of Energy's commitment to prevent exposure to environmental contamination and to ensure the long-term effectiveness of the remedies conducted at BNL through land use planning and other controls.

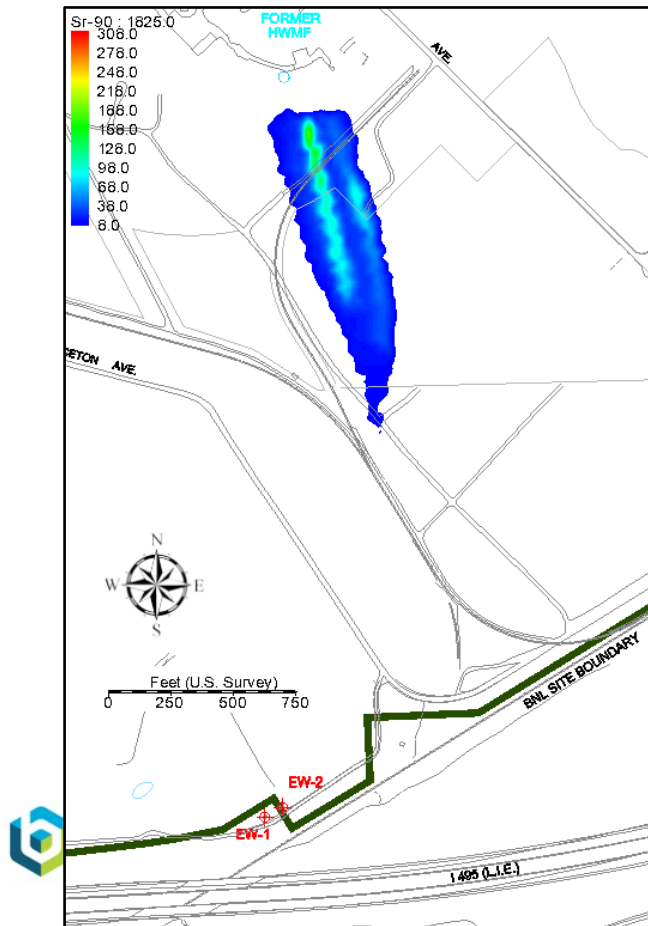
BNL Login Console

# 2021 CERCLA Five Year Review

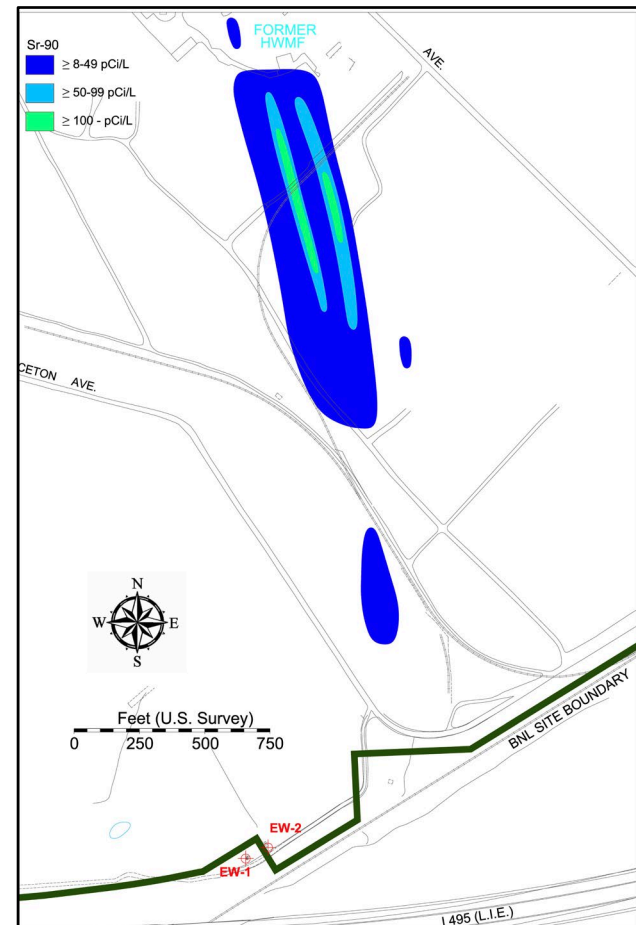
## Highlights - Continued

- Since the 2016 Five Year Review:
  - Former Hazardous Waste Management Facility Sr-90 Plume attenuating as per 2016 model predictions
  - Installed three new source area monitoring wells

2016 Sr-90 plume model prediction for 2021



2021 actual Sr-90 Plume





# 2021 CERCLA Five Year Review

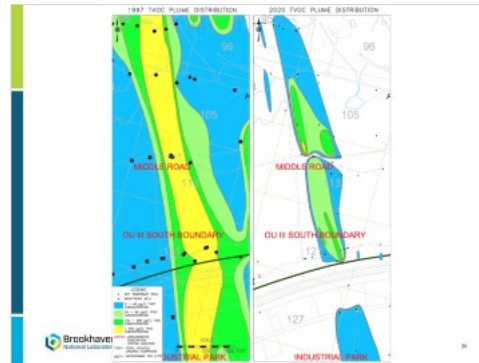
## Recommended Actions

- Need to optimize VOC groundwater treatment systems to ensure the cleanup goals are met (reach drinking water standards by 2030)
  - Three systems need additional extraction and monitoring wells
  - Evaluate/implement liquid carbon with zero-valent iron in-situ soil treatment to enhance the groundwater cleanup at Building 96 source area
- Complete invasive species monitoring/removal at last area of Peconic River sediment cleanup, perform annual on-site fish population assessment and sample if criteria are met
- Complete construction and begin operation of PFAS groundwater treatment systems at firehouse source areas, and prepare RI/FS Work Plan for OU VIII

# Five Year Review Groundwater Treatment System Recommended Actions

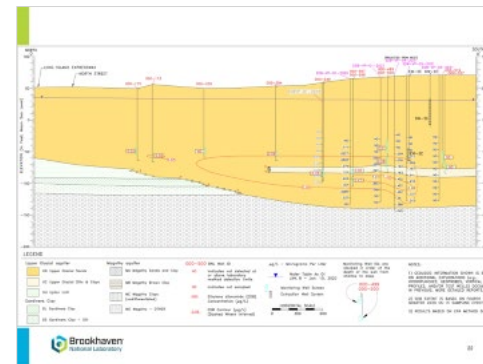
## OU III Middle Road/South Boundary

- Conduct pre-design VOC characterization using temporary vertical profile wells
- Install new extraction well(s) based on plume data and groundwater modeling to meet 2030 ROD cleanup goal



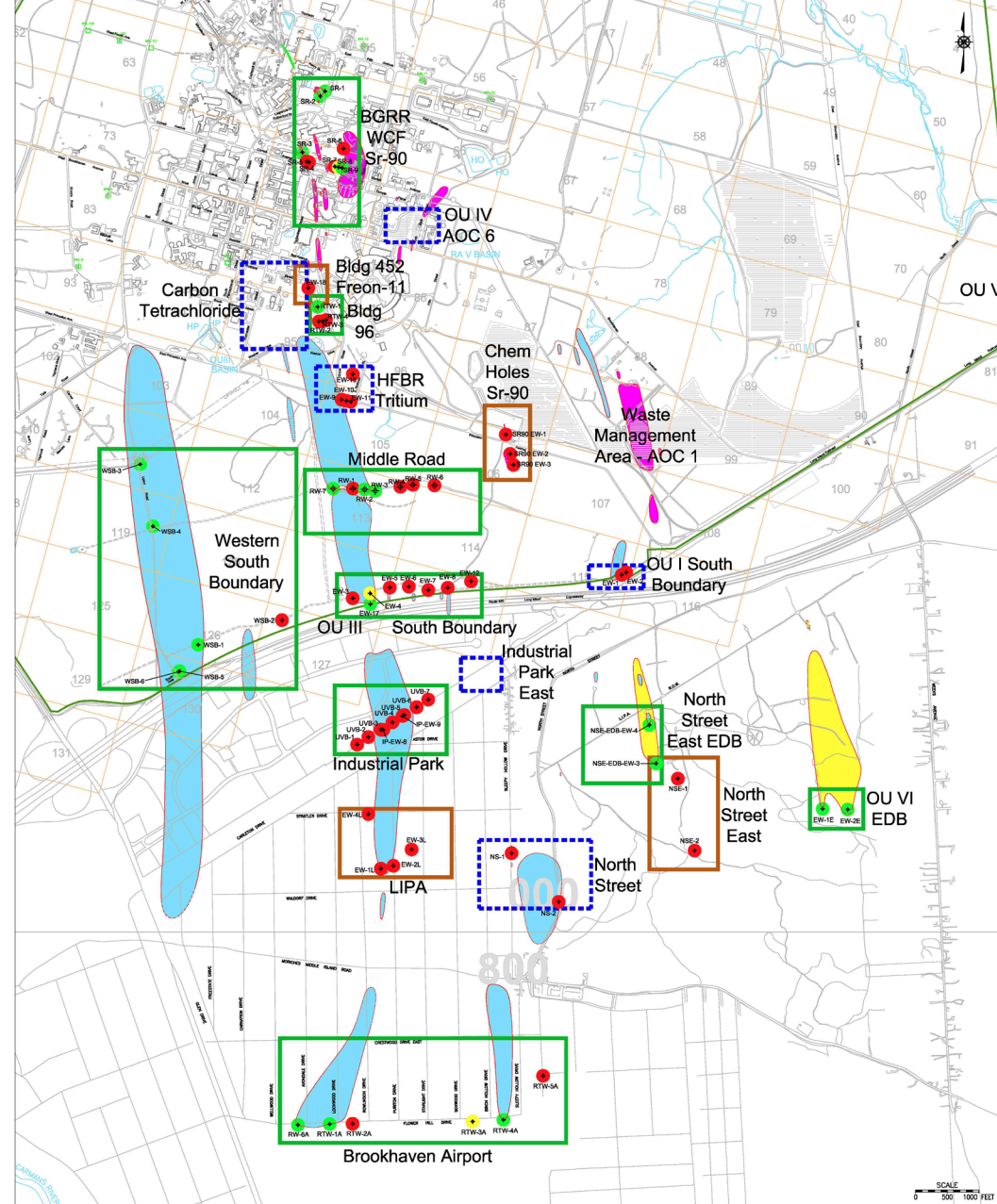
## OU VI Ethylene Dibromide (EDB)

- Conduct pre-design EDB characterization using temporary vertical profile wells
- Update regional groundwater model geology
- Install new extraction wells to remediate deeper EDB to meet 2030 ROD cleanup goal



# Groundwater Treatment System Status/Overview

- OU III North Street Treatment System was approved for closure in 2020
- Industrial Park VOC Treatment system nearing shutdown phase
- LIPA VOC Treatment System nearing closure phase
- Chemical Holes Sr-90 Treatment System nearing closure phase



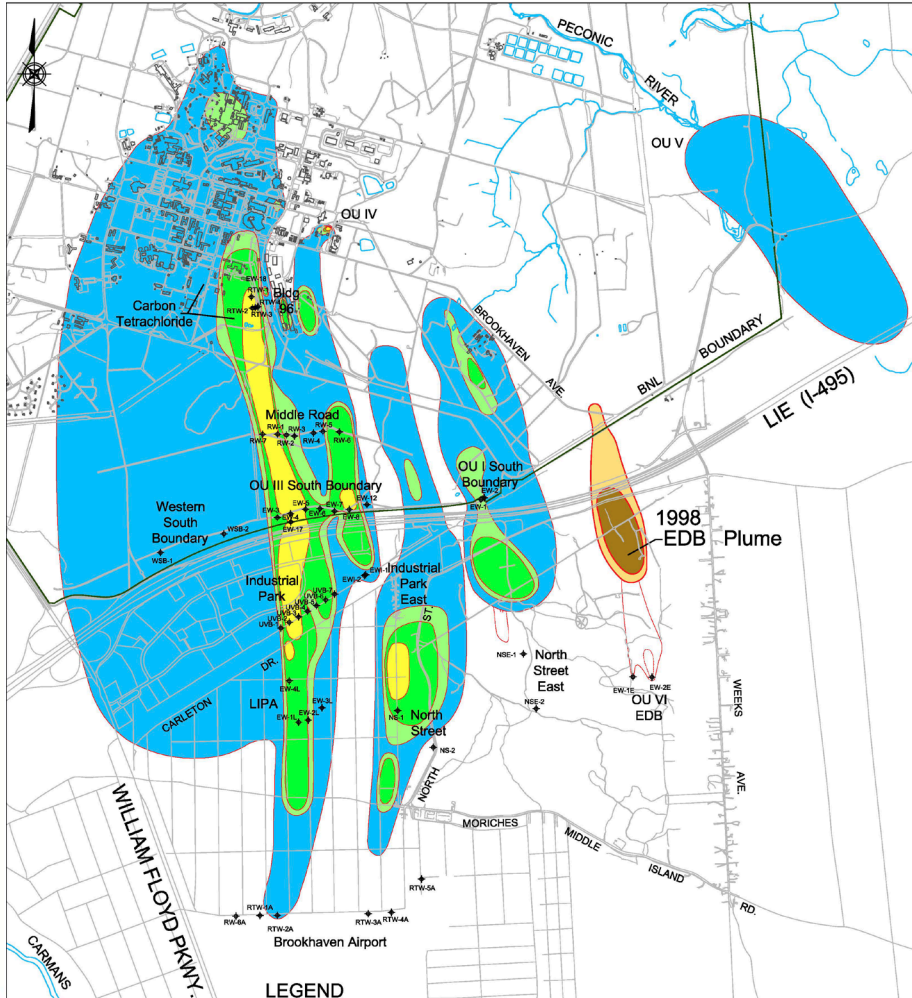
<b>LEGEND</b> BNL GRID NUMBER BNL REMEDIATION WELL BNL SUPPLY / PROCESS WELL RECHARGE BASIN OR OTHER SURFACE WATER FEATURE		OPERATING REMEDIATION SYSTEMS REMEDIATION SYSTEM PLACED IN SHUTDOWN MODE DECOMMISSIONED REMEDIATION SYSTEM		REMEDIATION WELL STATUS (AS OF DECEMBER 2020) ON FULL TIME PULSED PUMPING STANDBY-OFF		2020 TIVOC PLUME UNLESS SPECIFIED. CONCENTRATION AS INDICATED. (DASHED WHERE INFERRED) 2020 TRITIUM PLUME. OUTLINE IS 20,000 pCi/L. 2020 STRONTIUM-90 PLUME. OUTLINE IS 8 µCi/L.		2020 NORTH STREET EAST AND OU VI EDB PLUMES. OUTLINE IS 0.05 µg/L. Notes: Treatment system status and plume colors represent December 2020 conditions/data. µg/L - micrograms per liter pCi/L - picocuries per liter EDB - ethylene dibromide TIVOCs - total volatile organic compounds	
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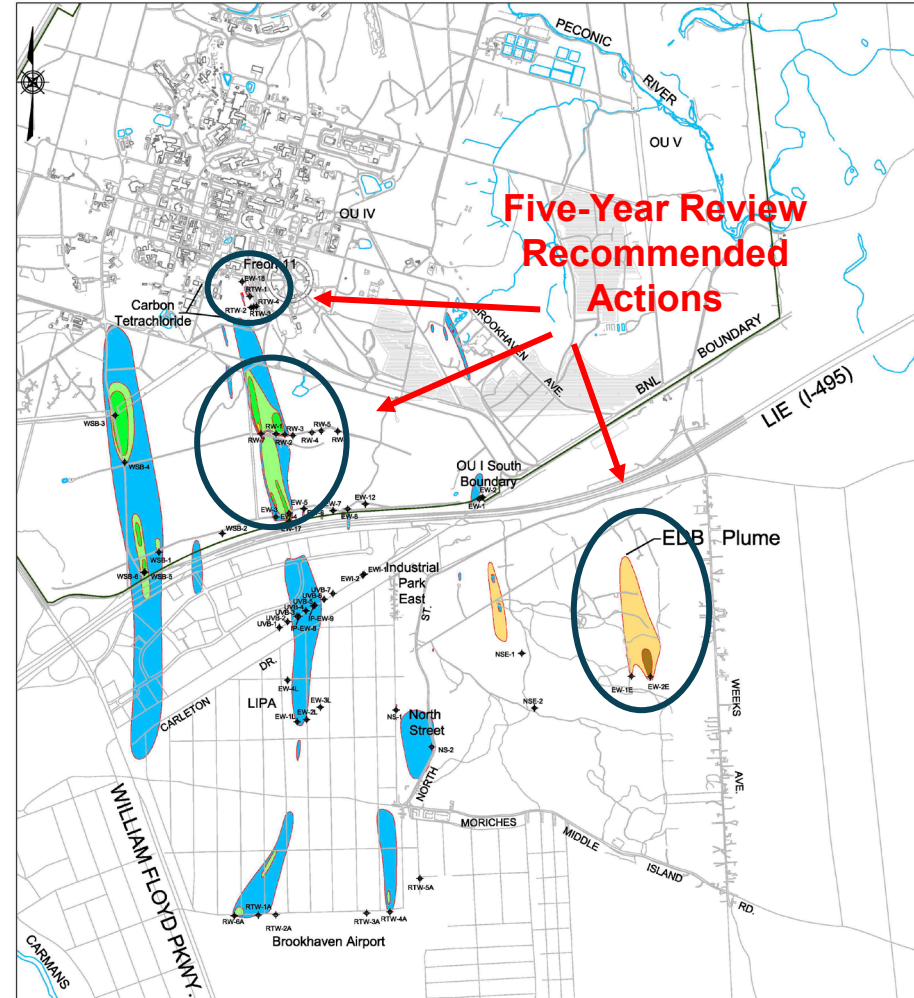



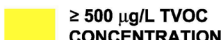

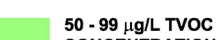
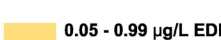
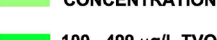
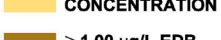
# VOC Plume Cleanup Progress

1997



2020



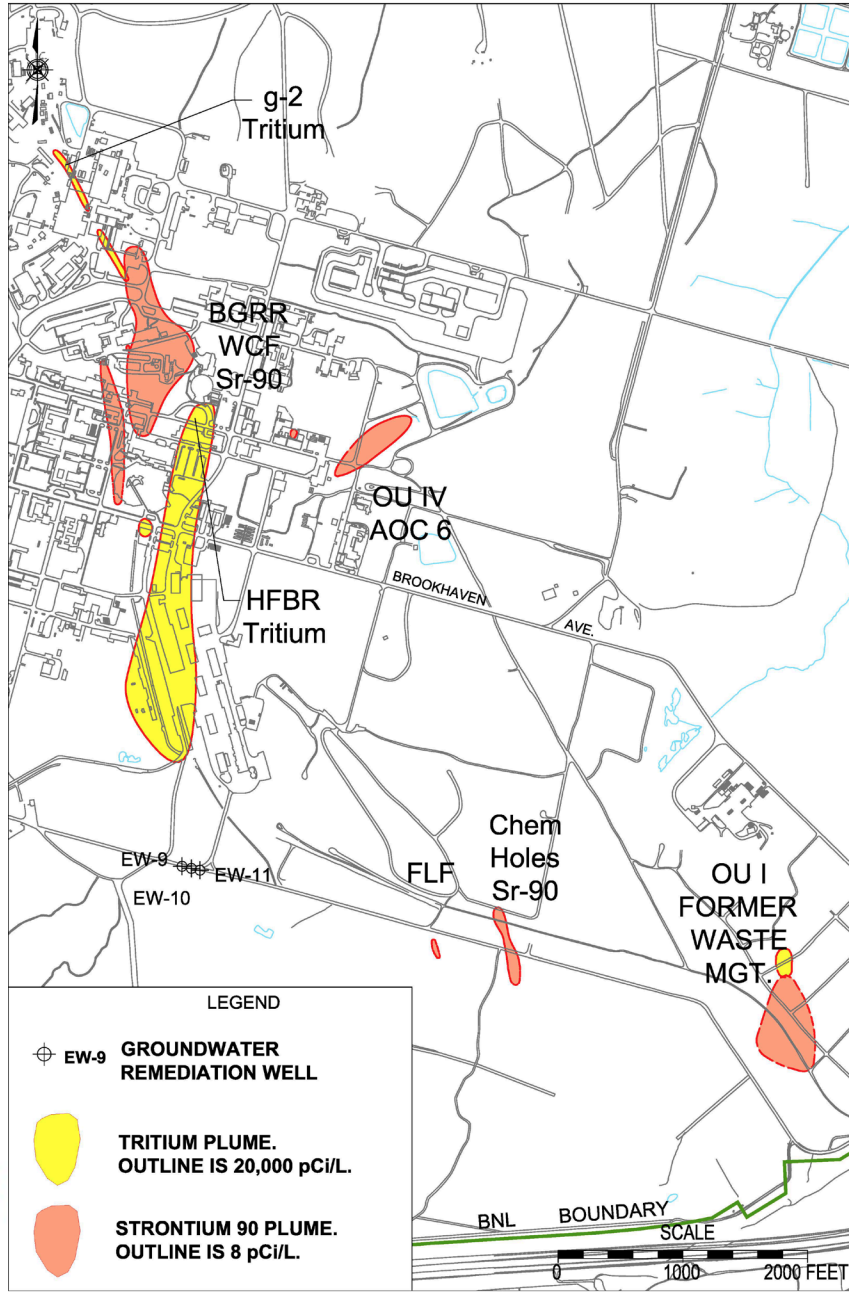
	5 - 49 µg/L TVOC CONCENTRATION		≥ 500 µg/L TVOC CONCENTRATION		RTW-4A GROUNDWATER REMEDIATION WELL
	50 - 99 µg/L TVOC CONCENTRATION		0.05 - 0.99 µg/L EDB CONCENTRATION		
	100 - 499 µg/L TVOC CONCENTRATION		≥ 1.00 µg/L EDB CONCENTRATION		



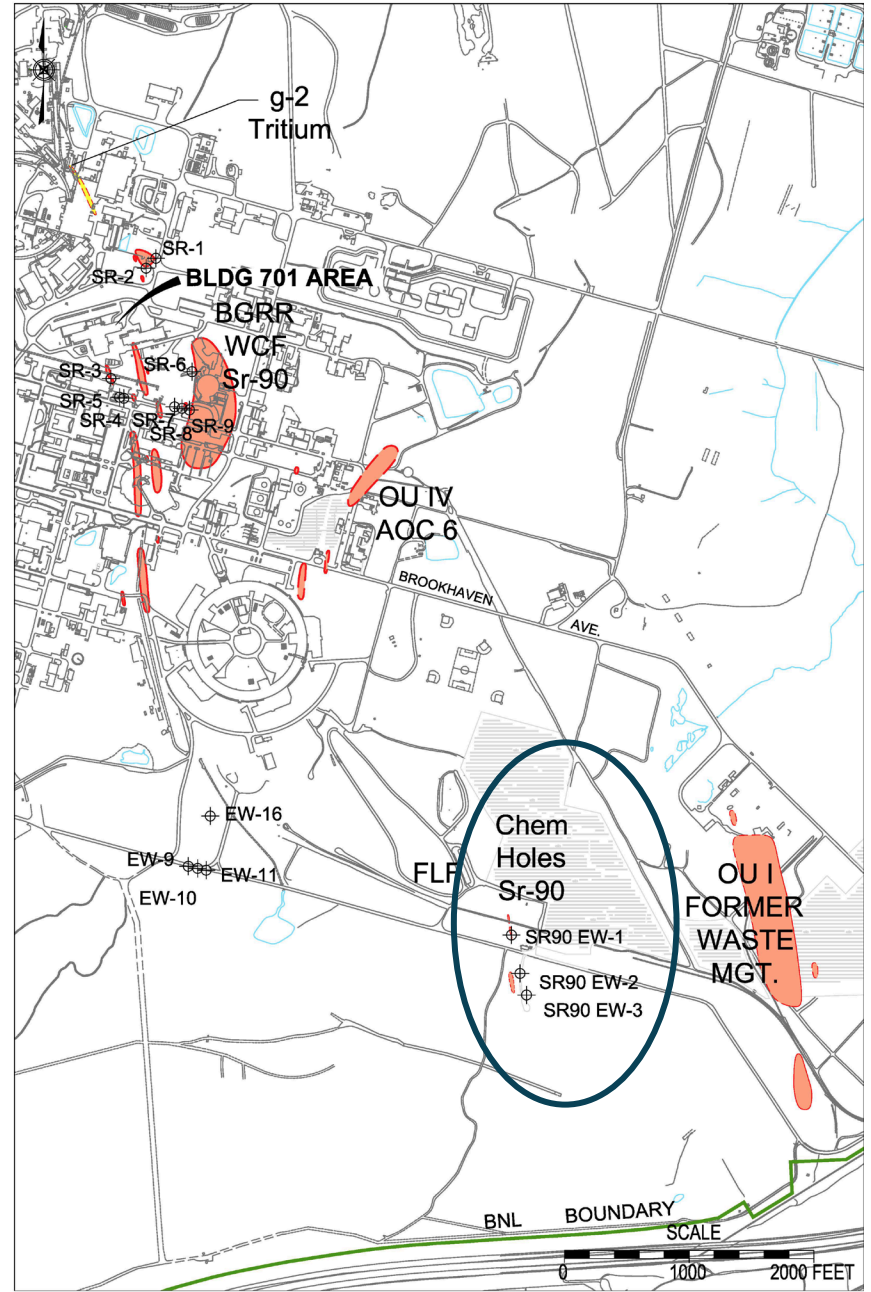


# Radiological Plume Cleanup Progress

## 2002 RAD PLUME DISTRIBUTION



## 2020 RAD PLUME DISTRIBUTION



# Next Steps

- Five-Year Review
  - Fall - submit addendum (including responses to regulator comments) to regulators
  - Winter - public availability of June 2021 Five Year Review and Addendum
- Continue PFAS source area remediation construction work
- Spring update on groundwater cleanup

# Extra Slides

1997 TVOC PLUME DISTRIBUTION

2020 TVOC PLUME DISTRIBUTION

