



*a passion for discovery*

# Groundwater Update

## Review of Treatment System/Plume Status, Performance, and Proposed Modifications

*Presentation to CAC  
April 8, 2010*

Managed for the U.S. Department of Energy  
by Brookhaven Science Associates

**Bill Dorsch, Manager  
Groundwater Protection Group**



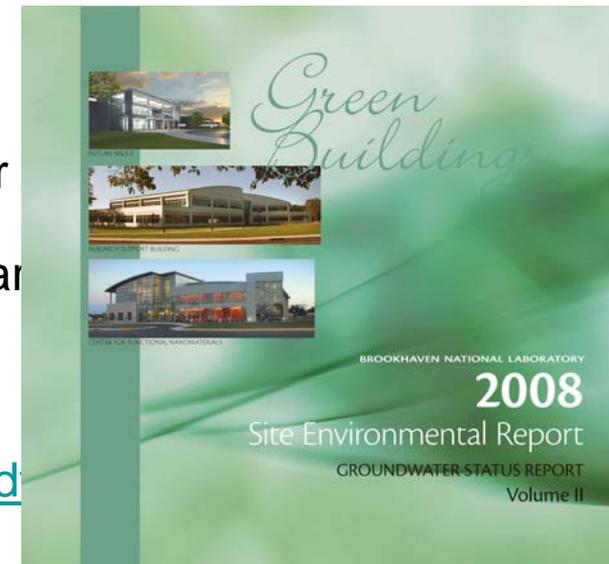
# Agenda

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- Remediation Progress
- Groundwater Monitoring and Issues Since Last Update
- Upcoming Work in 2010
- Discussion and Feedback

# Communication Processes

- Weekly IAG calls with regulators
- Quarterly System Operations Reports
- Annual Groundwater Status Reports
  - Volume II of Site Environmental Report, September 2009
  - Summary of operations and monitoring data for year
  - Recommendations for modifications to systems based on performance evaluation and plume data
  - Report on web at [http://www.bnl.gov/ltra/files/Annual\\_Reports/2008pdMain\\_text.pdf](http://www.bnl.gov/ltra/files/Annual_Reports/2008pdMain_text.pdf)
- CAC/BER Updates

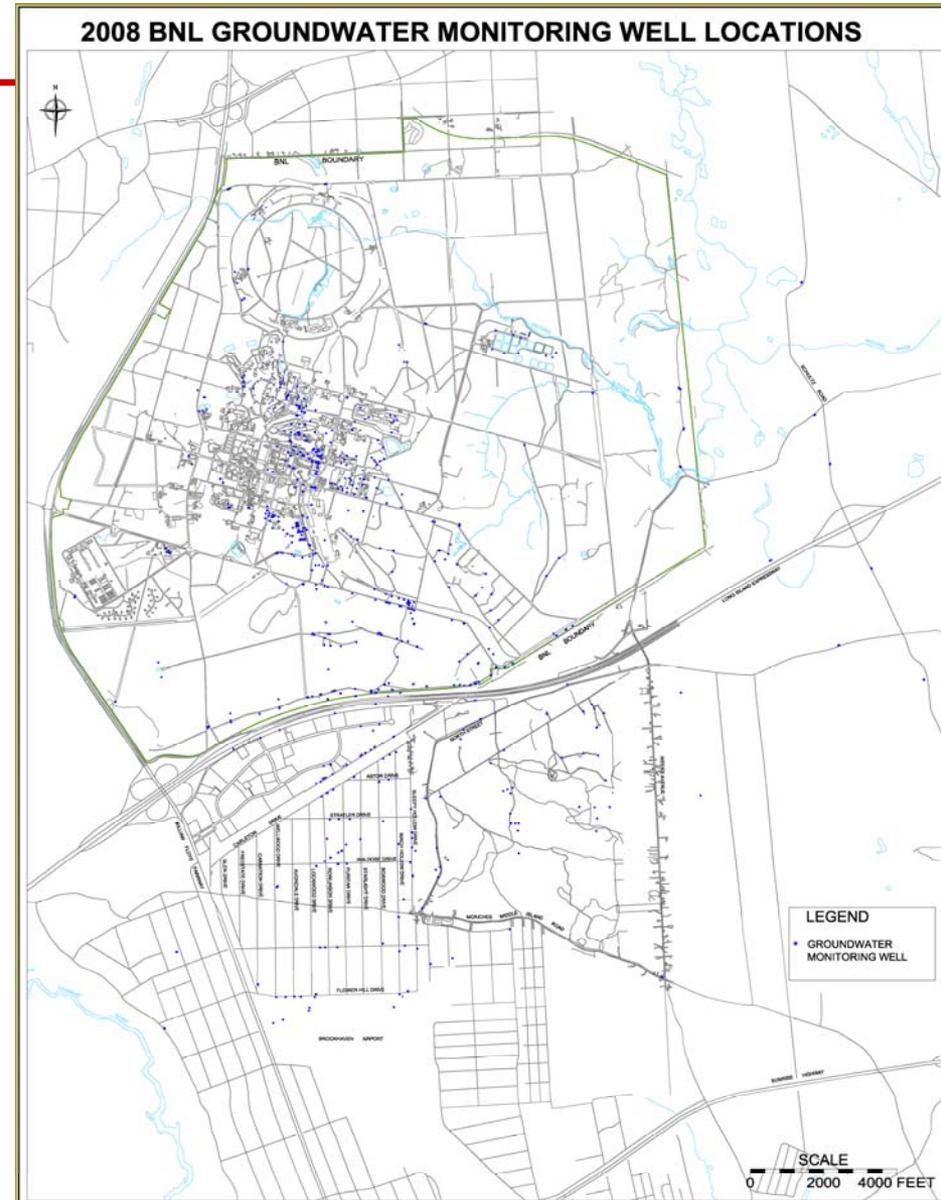


← Today's Presentation

# Groundwater Monitoring Program

## 2008 Stats:

- 735 permanent and 86 temporary wells used in restoration monitoring program
  - Total of 1,815 samples
  - Sample frequency quarterly to annually
- 125 permanent wells and 29 temporary wells used in facility monitoring program
  - Total of 240 sample events



# 16 Groundwater Treatment Systems

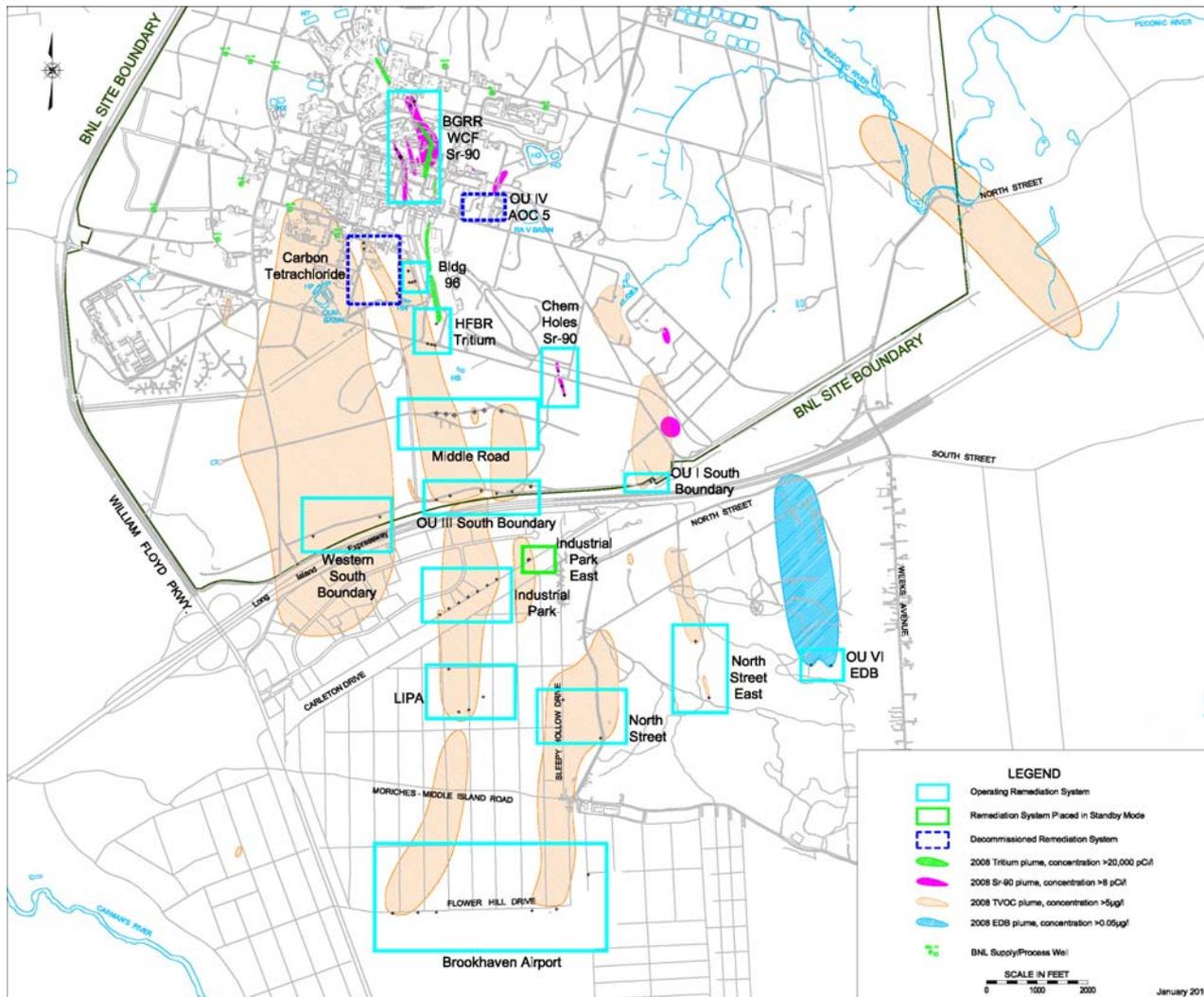
13 Volatile Organic Compound (VOC) Systems

2 Sr-90 Systems

1 Tritium Pump & Recharge System

Since 1996:

- 14.5 billion gallons of contaminated groundwater treated and recharged to the aquifer
- 6,100 lbs VOCs removed
- 20 mCi Sr-90 removed

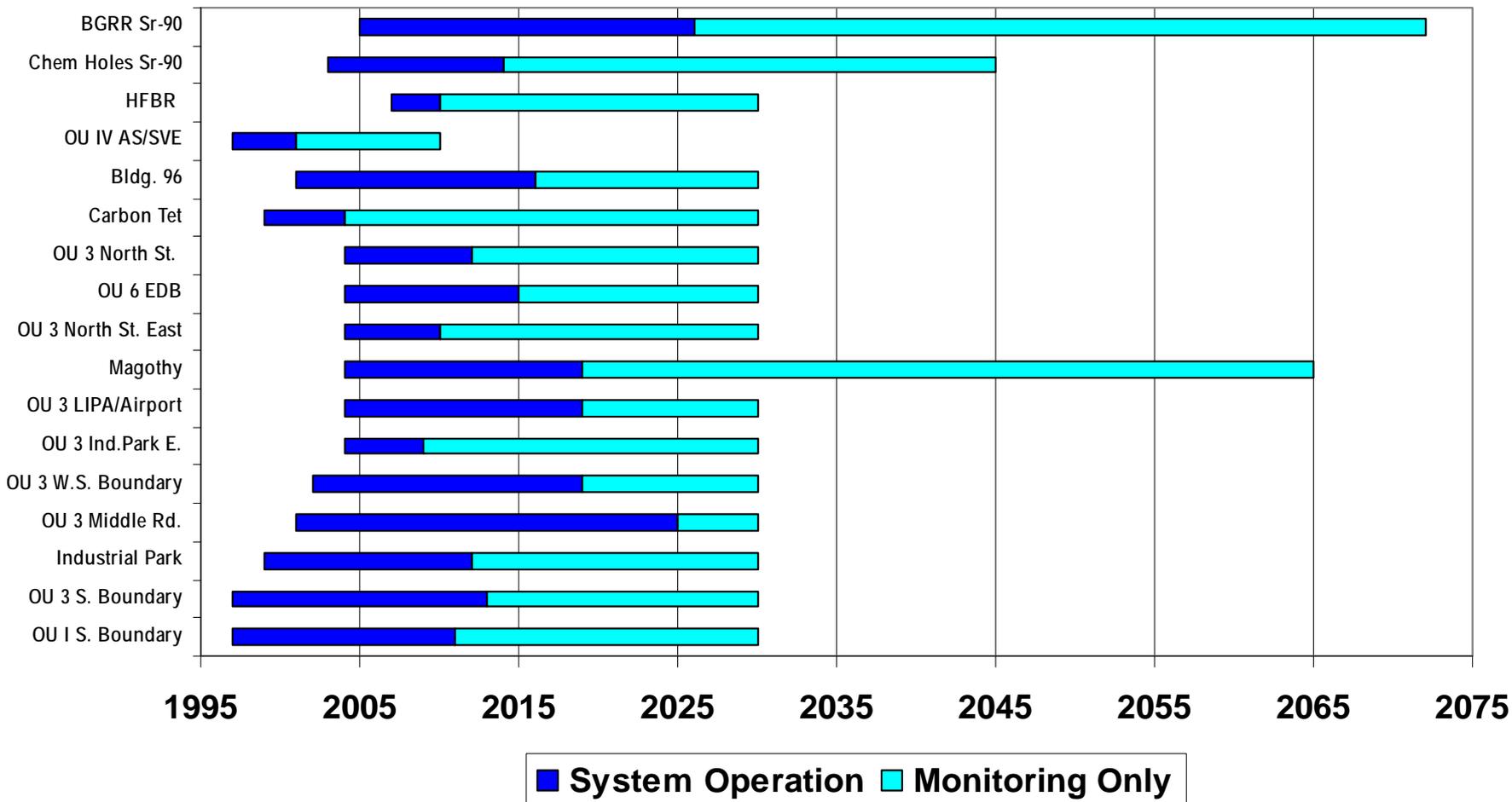


# Status of Groundwater Treatment Systems

- Systems operating, no changes planned
  - OU III South Boundary
  - OU I South Boundary
  - North Street East
  - Western South Boundary
  - Industrial Park
  - OU III Middle Road
  - OU III North Street
  - OU III LIPA
  - OU III Airport
  - OU VI EDB
  - Chemical Holes Sr-90
  - HFBR Pump & Recharge
- Systems Operating, modifications are planned
  - OU III Bldg. 96
  - BGRR/WCF Sr-90
- System Decommissioned
  - OU IV Air Sparge/Soil Vapor Extraction
  - Carbon Tetrachloride (Spring 2010)
- Systems in Shutdown Mode
  - Industrial Park East

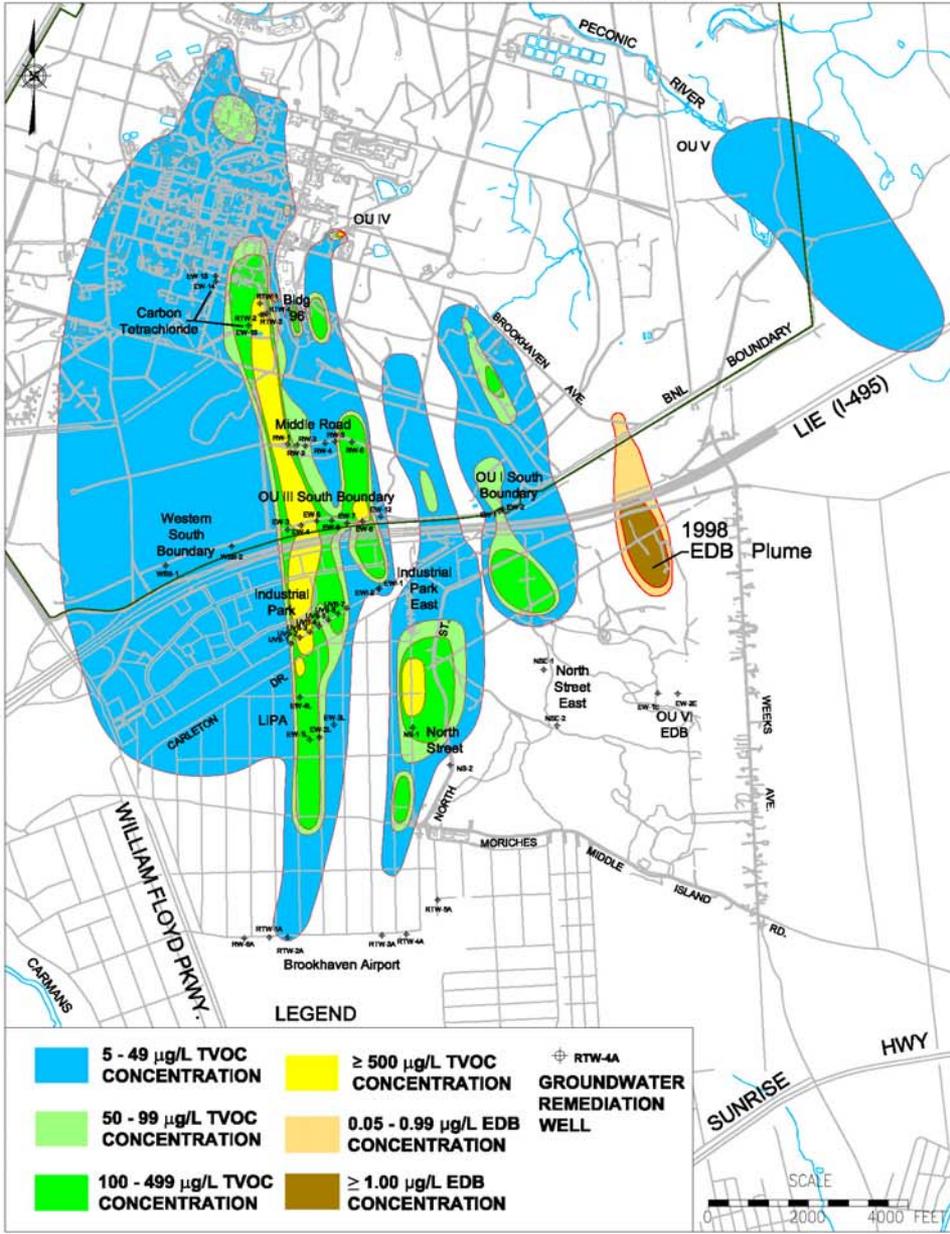


## Treatment System Timelines

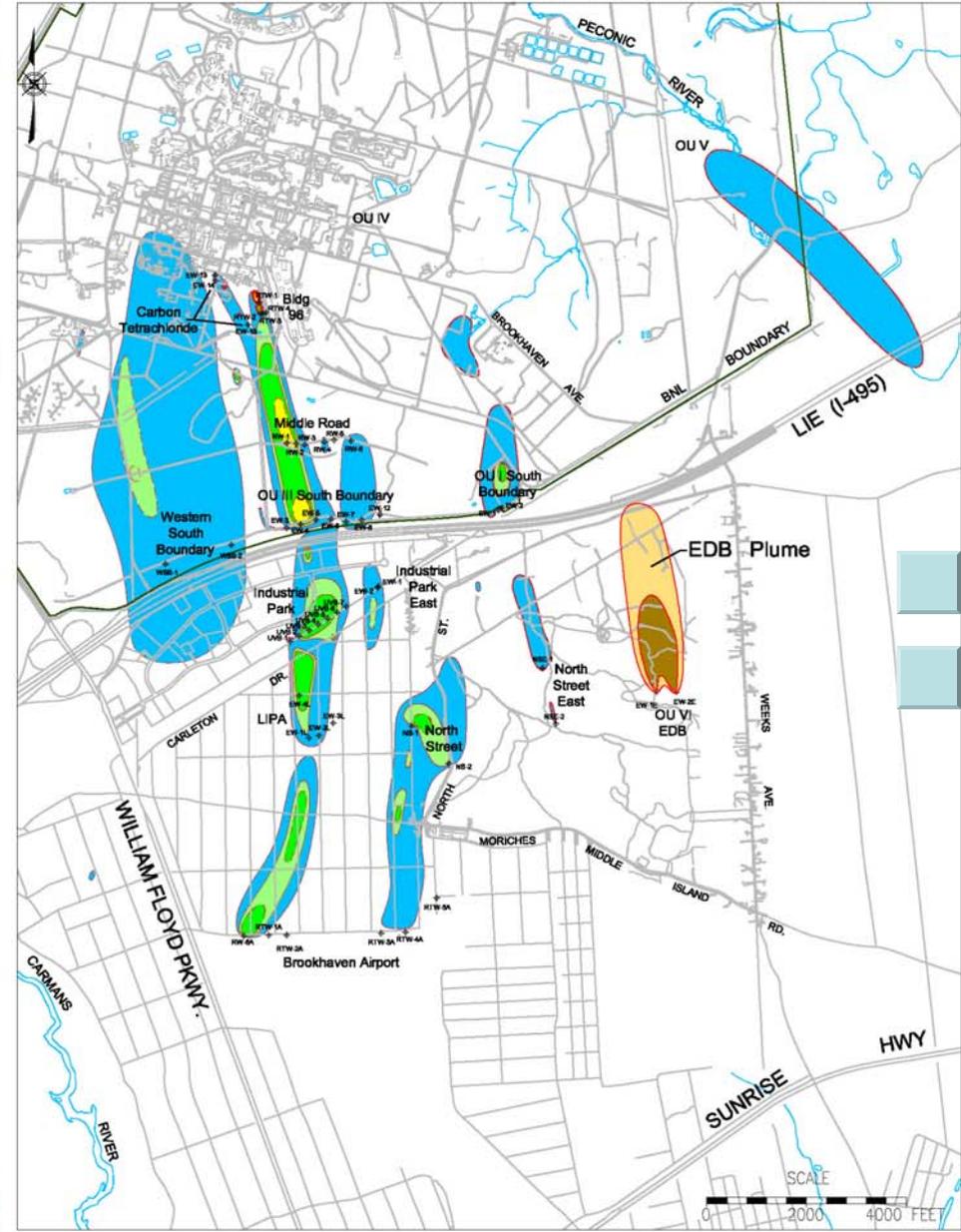


# Cleanup Progress 1997 to 2008

## 1997 TVOC/EDB PLUME DISTRIBUTION



## 2008 TVOC/EDB PLUME DISTRIBUTION



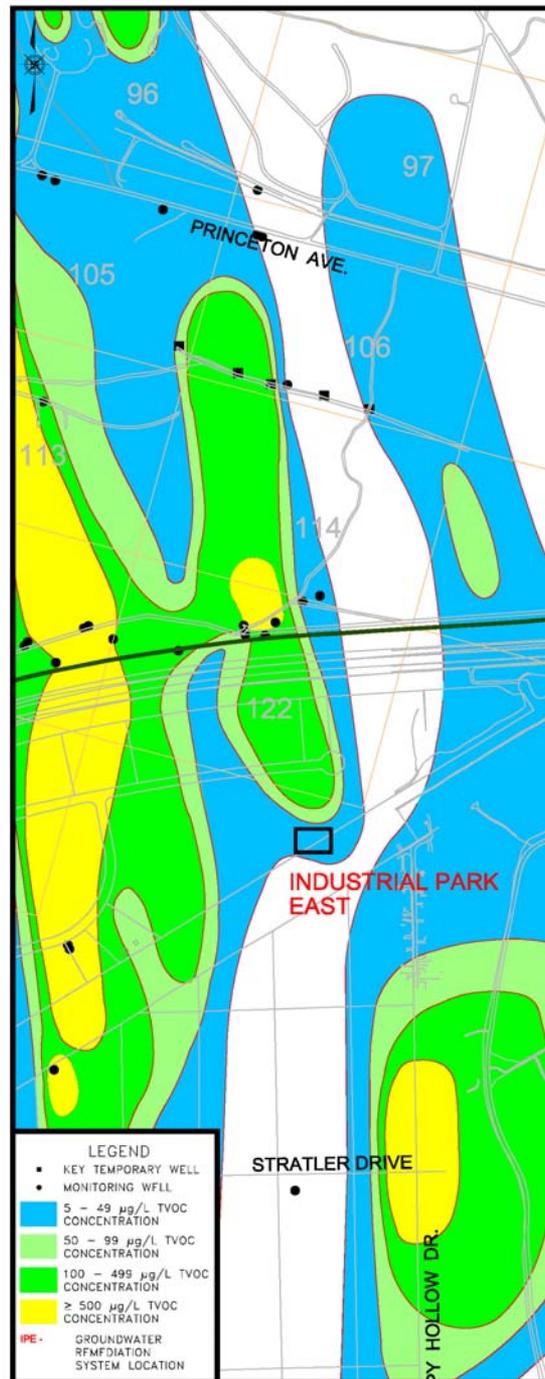
# Cleanup Progress:

## Industrial Park East System

- Recommendation for Shutdown in 2008 Groundwater Status Report
- System operated 2004-2009
- Regulators Approved Petition for Shutdown
- Continued monitoring of Magothy portion of plume until cleanup goals met.
- Will install sentinel monitoring wells to the south of plume remnants.



1997 TVOC PLUME DISTRIBUTION



2008 TVOC PLUME DISTRIBUTION

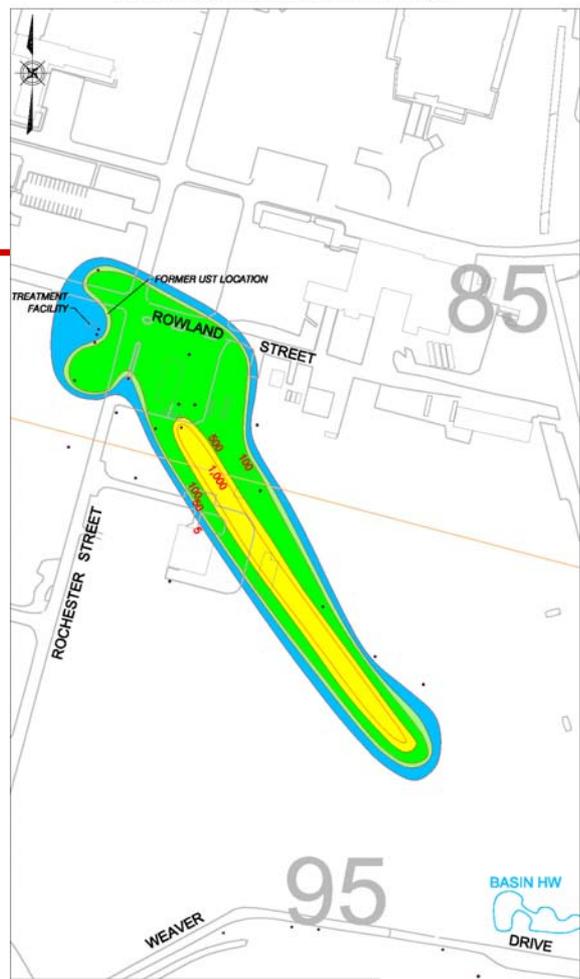


# Cleanup Progress:

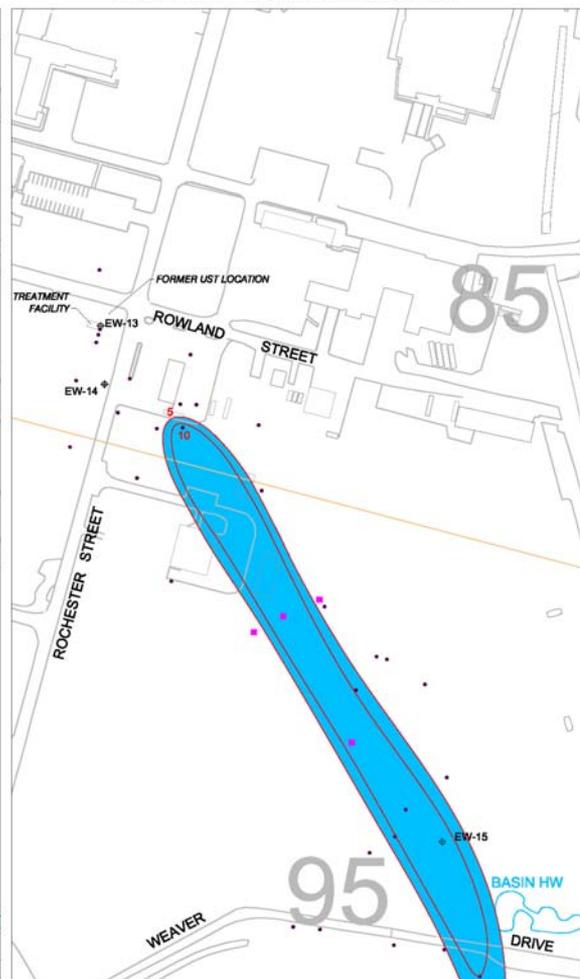
## Carbon Tetrachloride System

- System Closure Recommended in 2008 GW Status Report
- System operated 1999-2004
- Regulators Approved Petition for Closure Continued monitoring of plumes until cleanup goals are met.
- Plume attenuating as predicted
- Remnants captured by Middle Rd. System

2000 CCL4 PLUME DISTRIBUTION



2008 CCL4 PLUME DISTRIBUTION



**LEGEND**

- MONITORING WELL ID
- ◆ TEMPORARY WELL LOCATION
- 5 - 49 µg/L CARBON TETRACHLORIDE CONCENTRATION
- 50 - 99 µg/L CARBON TETRACHLORIDE CONCENTRATION
- 100 - 499 µg/L CARBON TETRACHLORIDE CONCENTRATION
- ≥ 500 µg/L CARBON TETRACHLORIDE CONCENTRATION
- ⊕ EW-14 GROUNDWATER REMEDIATION WELL
- 95 BNL GRID NUMBER

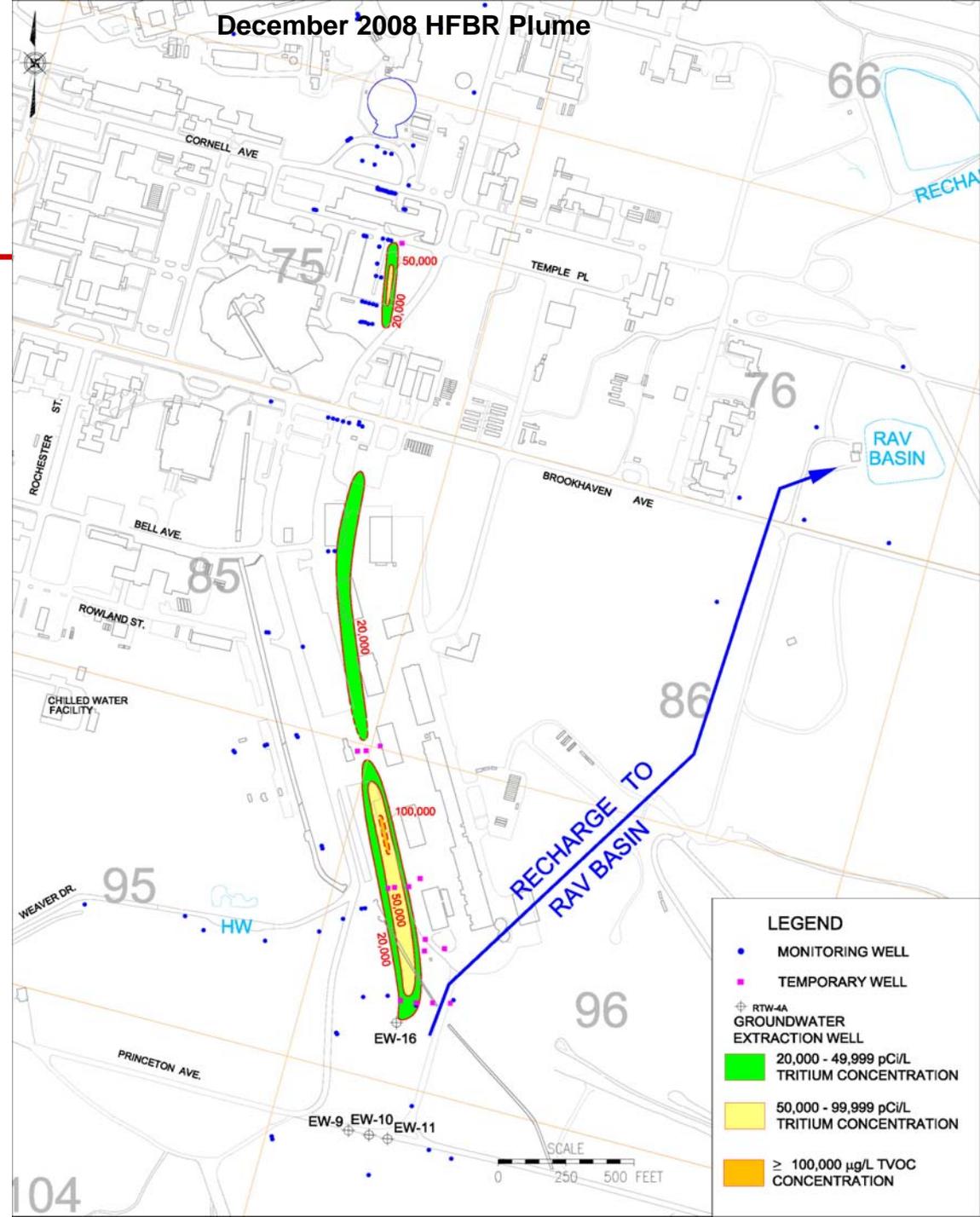
SCALE 0 100 200 FEET



# Cleanup Progress:

## HFBR Pump and Recharge

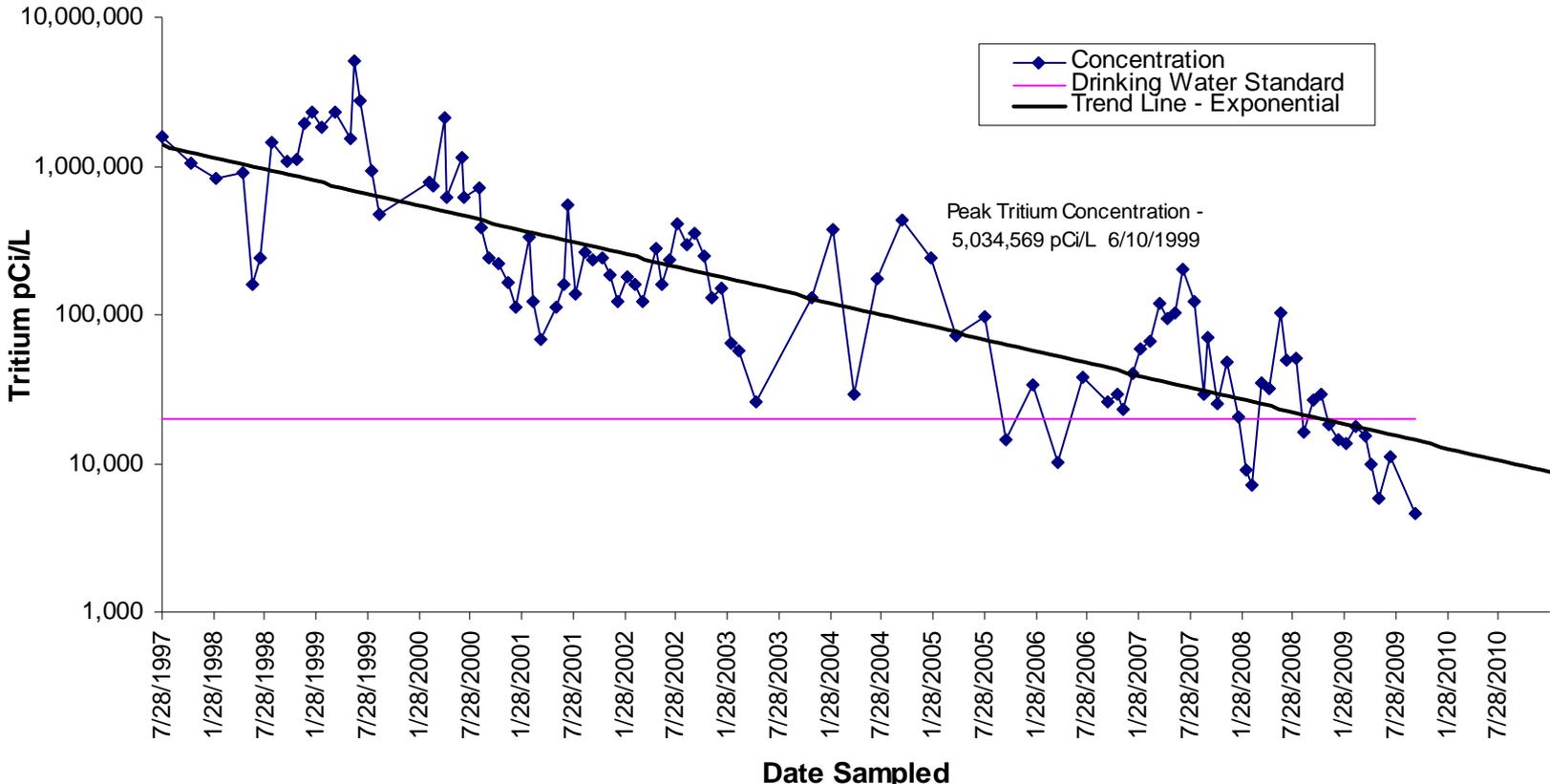
- Leading edge of plume hot spot being captured at EW-16 (began operation 11/07)
- Maximum tritium concentrations in EW-16 is  $< 3,000$  pCi/L
- Concentrations immediately downgradient of HFBR continue to decline (see graph)
- Continued monitoring of plume until cleanup goals met.



# Cleanup Progress:

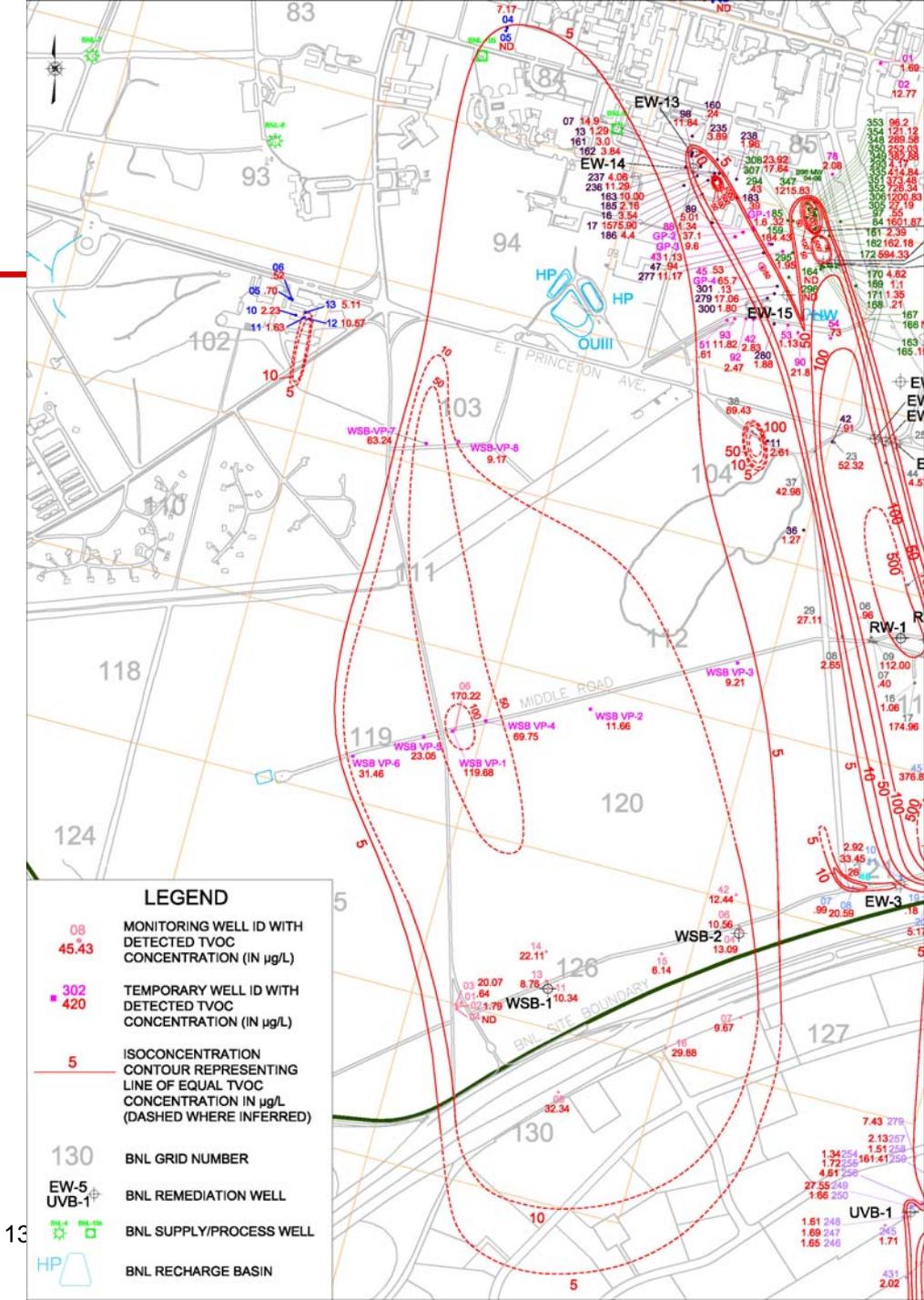
## HFBR Source Area

HFBR Peak Tritium Concentrations in Groundwater  
HFBR to Cornell Avenue



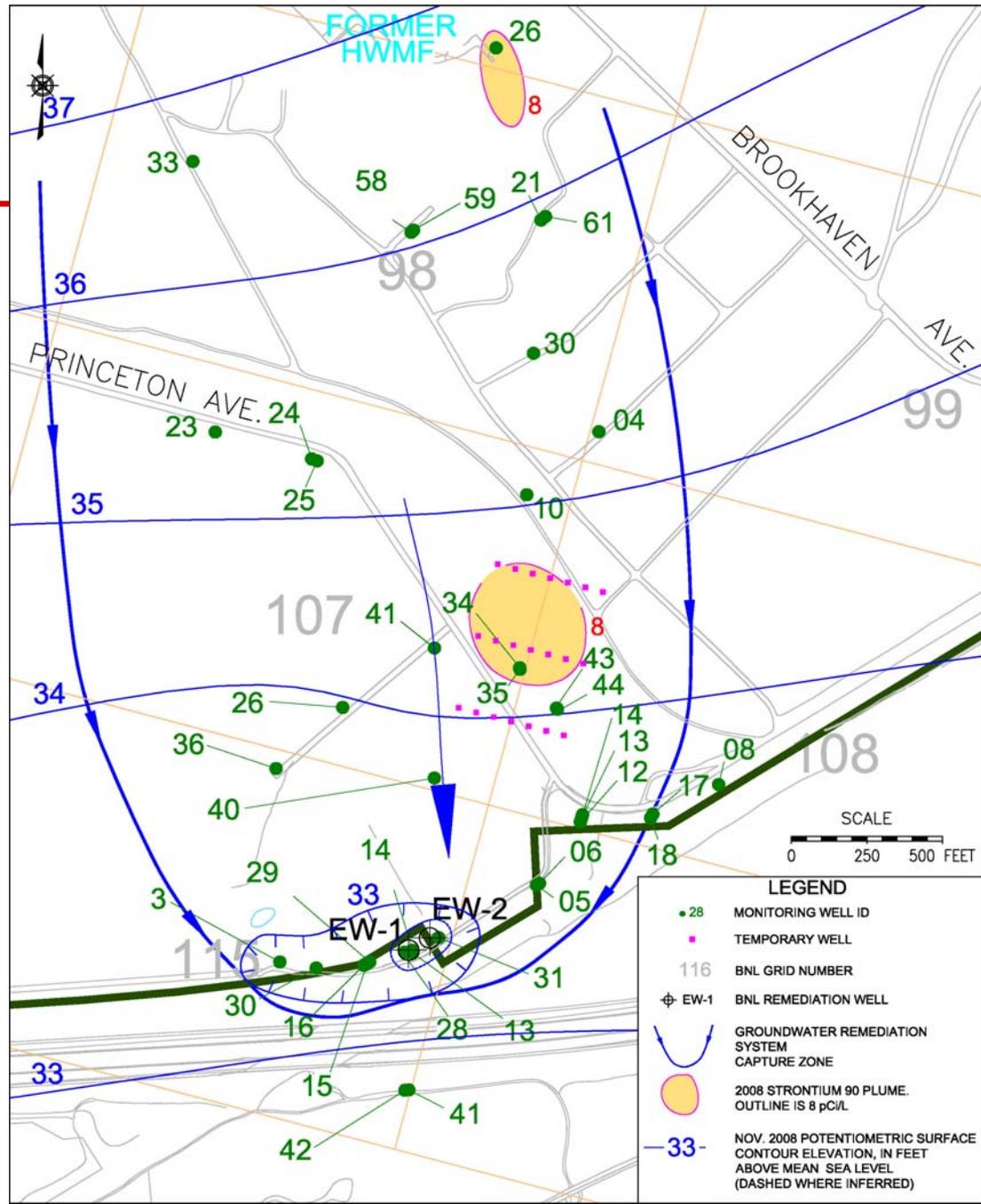
# Issues since last update: OU III WSB

- Identified higher than expected TCA/dichlorodifluoromethane (Freon-12) during 2008 Characterization.
- TCA concentrations recently increasing in extraction well WSB-1 at site Boundary.
- System operation extended from 2014 to 2019 to ensure capture of high TCA area.
- Will continue monitoring.



# Issues since last update: OU I Sr-90

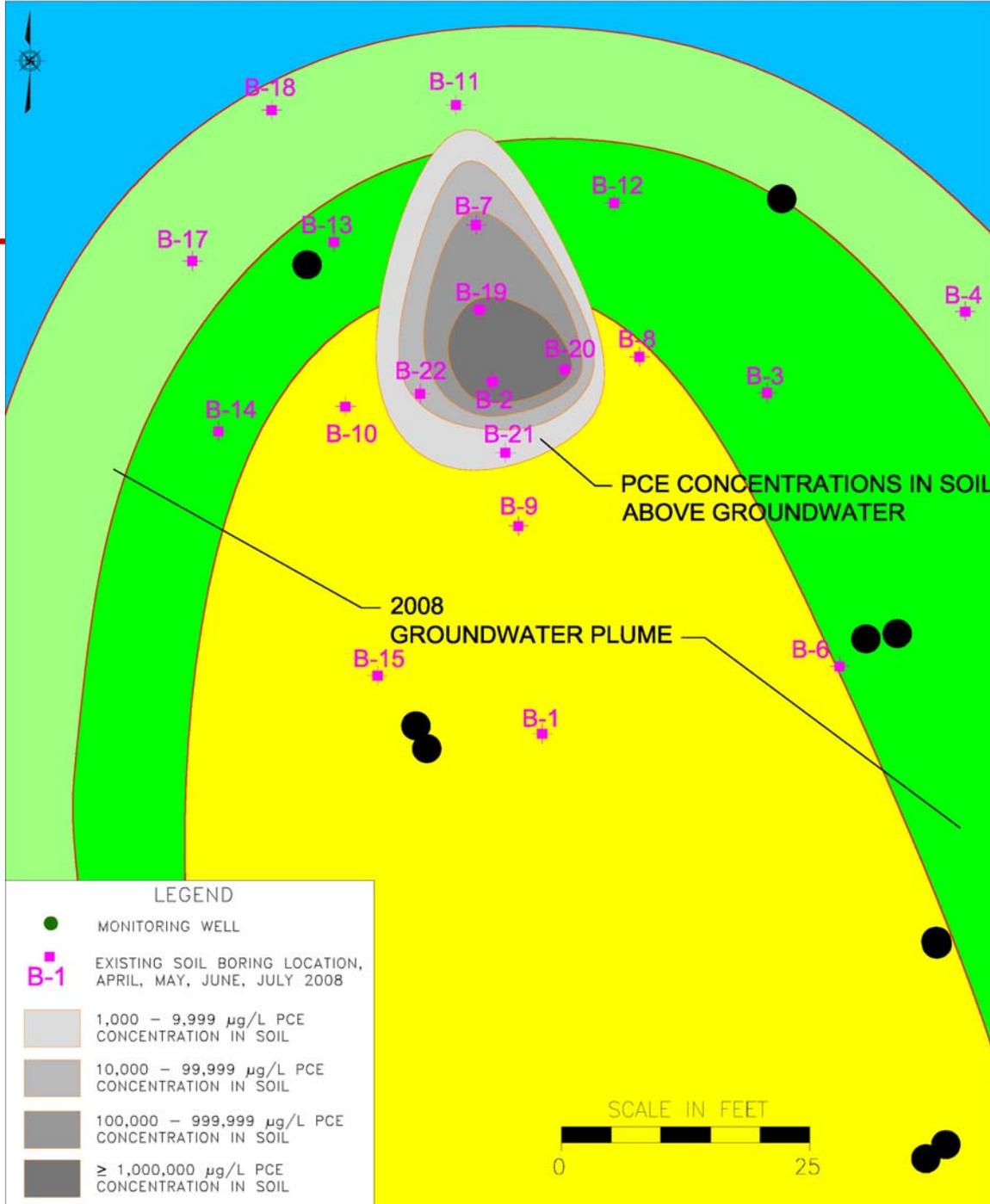
- Sr-90 concentrations in sentinel monitoring well 107-35 increased from ND in 2004 to 17 pCi/l in 2009.
- Leading edge of plume ~ 900' from site boundary and extraction wells.
- Currently characterizing area of Sr-90 contamination using temporary wells as per 2008 Groundwater Status Report recommendation.



# Upcoming work in 2010

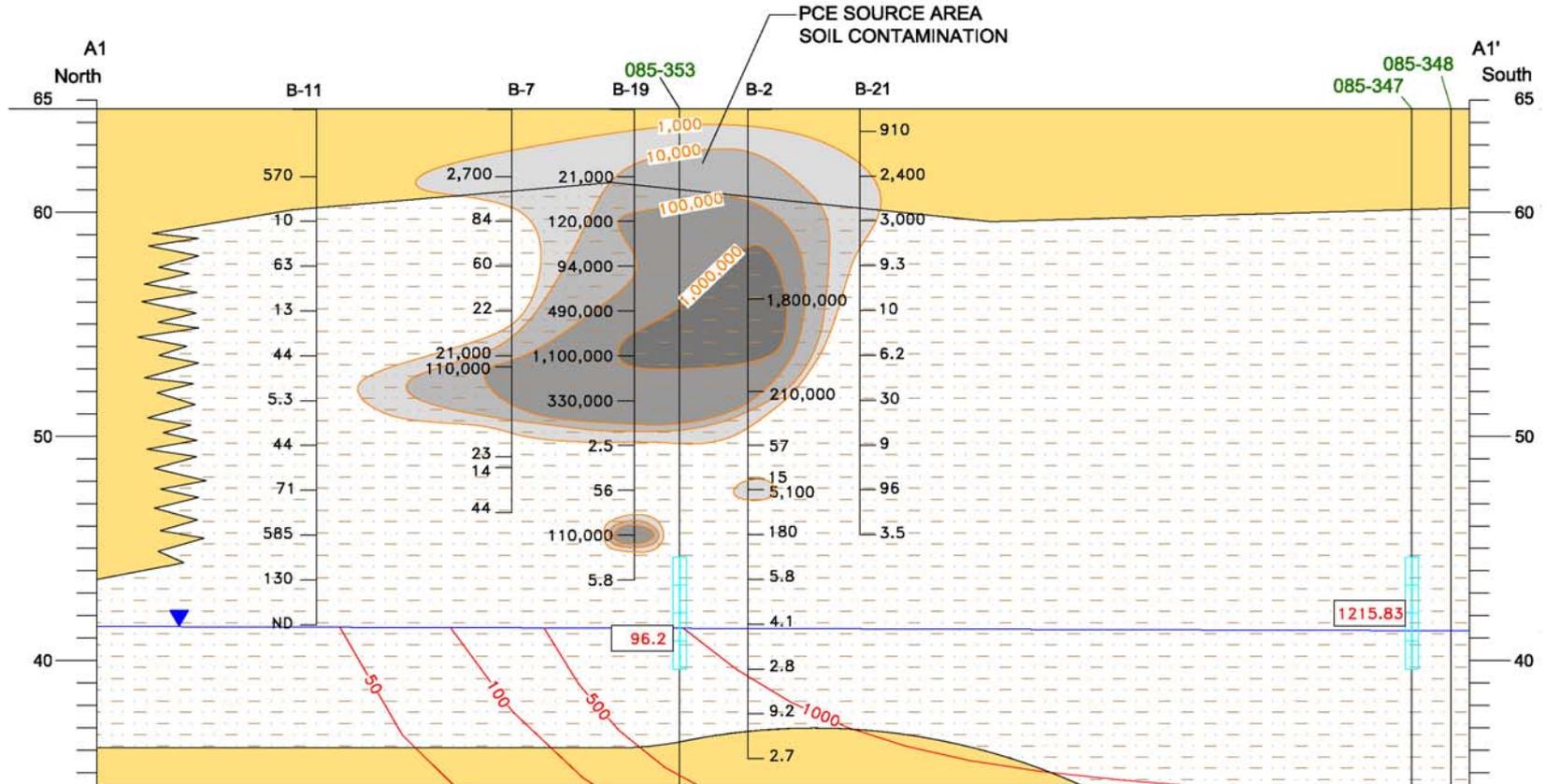
## Bldg. 96 Source Area Cleanup

- ESD signed Aug. 09
- Submitted excavation work plan to regulators 9/09
- Plan to begin work in 2010
- Excavation and off-site disposal of PCE contaminated soils.
- Groundwater treatment system expected to run until 2014.



# Upcoming work in 2010

## Bldg. 96 Source Area Cleanup



### LEGEND

Upper Glacial aquifer

-  Fine to coarse sand, trace to little silt and/or fine to medium gravel.
-  Very fine sand and/or silt, with silt and sand lenses interbedded.
-  Isoconcentration Contour representing line of equal PCE concentration in ( $\mu\text{g}/\text{kg}$ ) in soil.

- 085-85 BNL Monitoring Well ID
- 104.94 TVOC Concentration ( $\mu\text{g}/\text{L}$ ) in Groundwater
- 50- TVOC Contour ( $\mu\text{g}/\text{L}$ ) (Dashed Where Inferred)
- B-11  
-37-  
-38-
- Soil Borings with PCE results ( $\mu\text{g}/\text{kg}$ )
-  Monitoring Well Screen

-  Water Table As Of November 17-21, 2008
- TVOC - Total Volatile Organic Compound
- $\mu\text{g}/\text{kg}$  - Micrograms Per Kilogram
- PCE - Tetrachloroethylene
- HORIZONTAL SCALE**
- 
- 0 15 FEET

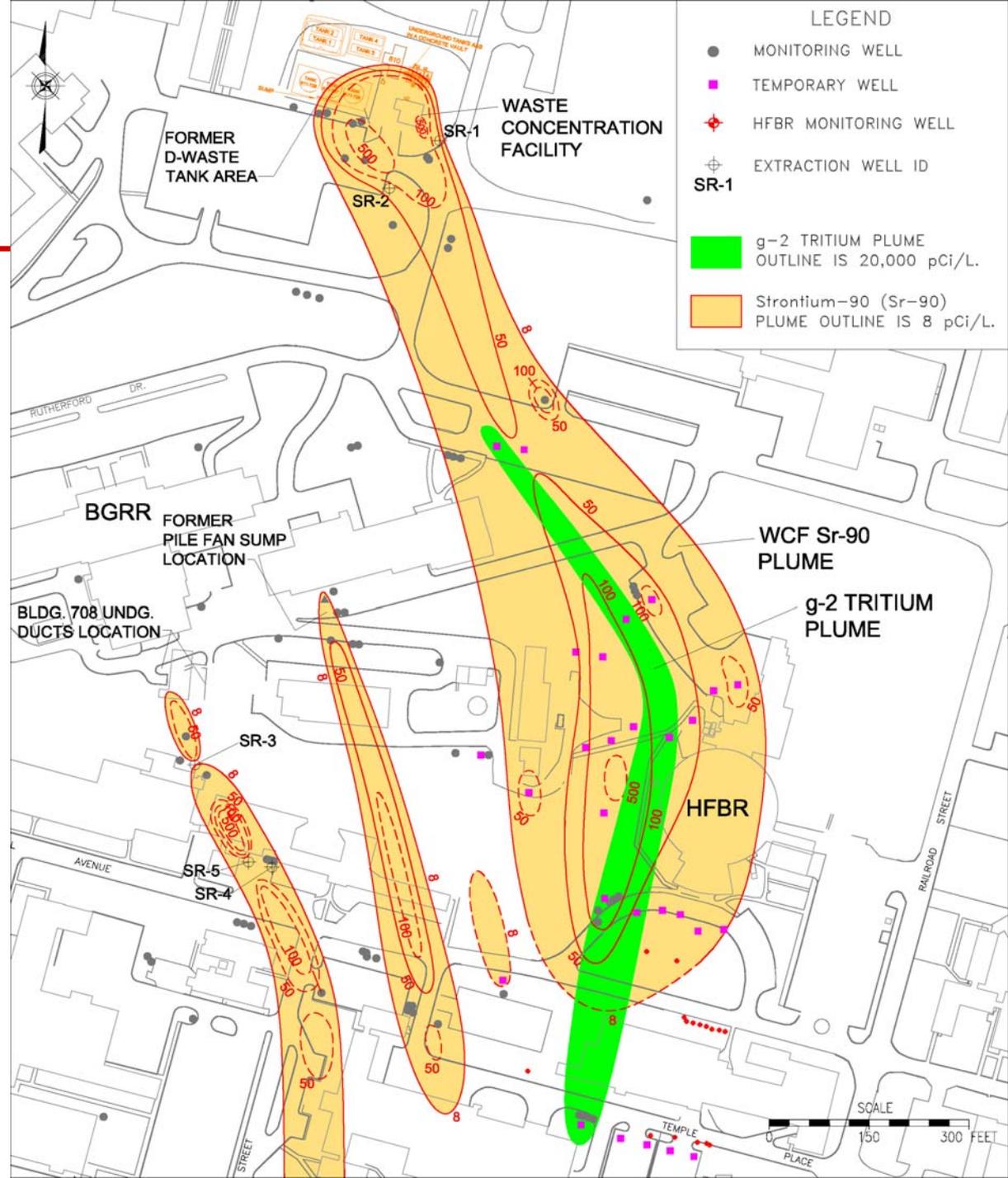
### NOTES:

- 1) GEOLOGIC INFORMATION SHOWN IS BASED ON LITHOLOGIC DATA COLLECTED JUNE 2004 FOR GP BORING DESIGNATIONS AND NOV. 2004 FOR S BORING DESIGNATIONS SUPPLEMENTED WITH GEOLOGIC DATA FROM 2008 SOIL BORINGS.
- 2) GROUNDWATER PLUME DISTRIBUTION BASED ON THIRD AND FOURTH QUARTER 2008 BLDG 96 SAMPLING EVENT.
- 3) CONTOUR INTERVAL IS AS SHOWN.
- 4) BNL WELL ID COLOR CORRESPONDS TO LONG-TERM MONITORING PROGRAM WELL LOCATION MAP.

# Upcoming work in 2010

## WCF Sr-90 System Modification

- New temporary well data in 2007 revealed higher Sr-90 concentrations than expected
- Preliminary modeling indicates system modification needed to achieve cleanup goal.
- g-2 tritium plume segment moving through same area
- Currently performing groundwater modeling to support system modification design.
- System modification to begin 2010.



# Summary

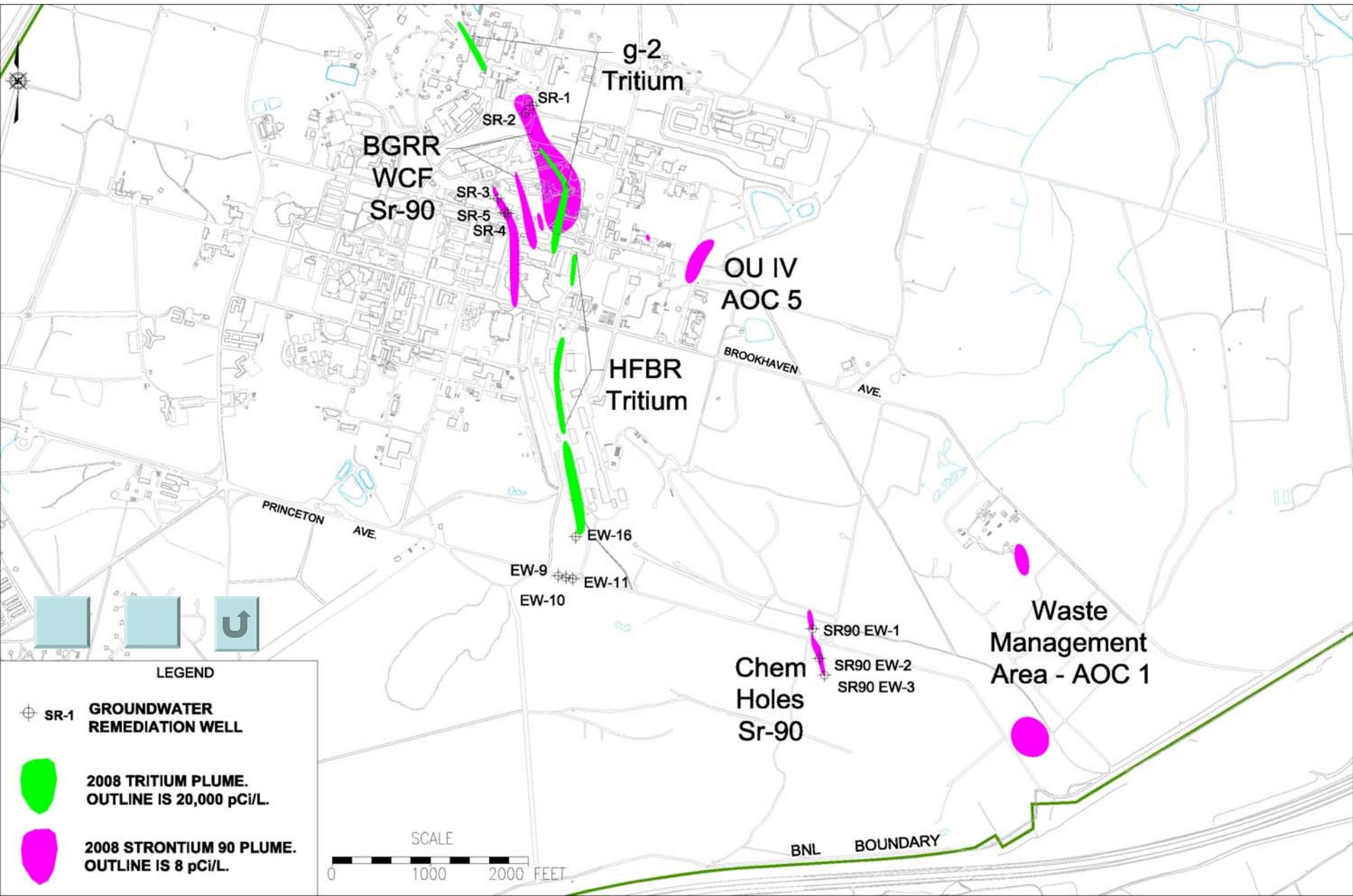
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- Continued progress in remediating groundwater both on- and off-site
- Plume remediation is a dynamic process
  - In some cases, new extraction wells may be needed or existing locations may require repositioning
- Modifications and proposed changes are reviewed by the regulatory agencies
- Keep community stakeholders informed about cleanup progress and proposed changes

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# Q & A

# Radiological Plumes/Treatment Systems



## LEGEND

-  **SR-1 GROUNDWATER REMEDIATION WELL**
-  **2008 TRITIUM PLUME. OUTLINE IS 20,000 pCi/L.**
-  **2008 STRONTIUM 90 PLUME. OUTLINE IS 8 pCi/L.**



# USGS 405149072532201 S 5517.1



----- Provisional Data Subject to Revision -----