Update: Emerging Contaminants of Concern in Groundwater at Brookhaven National Laboratory

Community Advisory Council Meeting
March 11, 2021
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Agenda

• Update on potable water supply well monitoring and treatment systems
• Current understanding of extent of Per- and Polyfluoroalkyl Substances (PFAS) and 1,4-dioxane in groundwater
• Planned installation of two PFAS treatment systems
• Integration of PFAS and 1,4-dioxane remedial actions into the ongoing CERCLA program
Emerging Contaminants of Concern

PFAS

- From 1966-2008, BNL used firefighting foam that contained PFAS for training and fire suppression systems
  - PFAS can persist in soils and groundwater for long periods of time
  - PFAS contaminated water can be effectively treated by using standard granular activated carbon filters or ion exchange resins

1,4-Dioxane

- 1,4-Dioxane was used as a stabilizing chemical for the solvent 1,1,1-Trichloroethane (TCA)
  - TCA has impacted groundwater quality at BNL and is being actively remediated
  - 1,4-Dioxane contaminated groundwater is difficult and expensive to treat
  - BNL’s existing treatment systems are not effective for 1,4-dioxane
NYS Drinking Water Standards for PFAS and 1,4-Dioxane

- In August 2020, NYS established drinking water standards for:
  - PFOS (perfluorooctane sulfonate) at 10 ng/L (nanograms per liter or parts per trillion)
  - PFOA (perfluorooctanoic acid) at 10 ng/L
  - 1,4-Dioxane at 1 µg/L (micrograms per liter or parts per billion)
In March 2017, Suffolk County tested water samples from BNL’s five operating potable water wells for PFAS.

PFAS were detected in three wells (BNL-6, BNL-10 and BNL-11):

- PFOS detected at concentrations up to 23 ng/L
Status of BNL Water Supply Wells

- BNL is now testing the supply wells for PFAS and 1,4-dioxane on a quarterly basis
  - PFOS concentrations are above 10 ng/L in supply wells BNL-6, BNL-10 and BNL-11
  - In June 2018, BNL placed restrictions on use of BNL-6 because the combined PFOS and PFOA concentrations were almost 70 ng/L*
  - BNL-4 will no longer be used due to its proximity to current firehouse PFAS source area and plume
  - 1,4-Dioxane is not impacting the wells
- 2019 – BNL started work to return to service granular activated carbon filters to remove PFOS and PFOA
  - Filters at BNL-11 were back in service in late 2020
  - Filters at BNL-10 will be back in service June 2021
    - NYSDOH granted a temporary “deferral” from the new standards while the work on the carbon filters continues. BNL must follow public notification and reporting requirements
  - BNL-12 will be back in service by October 2021

*EPA Health Advisory Level is 70 ng/L for combined concentrations of PFOS and PFOA
Understanding the Extent of PFAS and 1,4-Dioxane Contamination in Groundwater

• Phase 4 Project:
  • During 2020, BNL completed a comprehensive testing program for PFAS and 1,4-dioxane:
    • Sampled 360 on-site and off-site monitoring wells
    • Selected from a network of approximately 1,200 wells
    • Sampled on-site and off-site groundwater extraction wells and treatment system influent and effluent
    • Sampled Sewage Treatment Plant influent and effluent

• Phase 5/Time Critical Removal Action (TCRA) Project:
  • From July 2020-January 2021, BNL completed a detailed characterization of areas downgradient of the current and former firehouse facilities where high levels of PFAS are present
  • Results are being used to design two groundwater treatment systems
PFOS/PFOA and 1,4-Dioxane (Northern/Background Area)

- Several low-level detections of PFOS and PFOA (<5 ng/L)
  - Data gap in north-central area
- No detections of 1,4-dioxane
PFOS/PFOA (West-Central Area)

- Numerous detections of PFOS or PFOA >10 ng/L
  - Associated with firefighting foam training areas and foam releases from fire suppression systems
  - Yellow outlines represent estimated extent of PFOS or PFOA >10 ng/L
  - Additional characterization is required in several areas
- High concentration areas downgradient of the current and former firehouse facilities were characterized in more detail during the Phase 5/TCRA project
- Several off-site detections may be due to other sources
PFOS/PFOA (Eastern Area)

- PFAS were detected in several areas not used for firefighter training
  - Current Landfill
    - PFOA up to 45 ng/L
  - Former STP filter bed area
    - PFOS up to 154 ng/L
  - Former OU V VOC monitoring area
    - Site boundary - PFOS up to 109 ng/L
    - Off-site – PFOS up to 28 ng/L. PFOA up to 41 ng/L
- PFAS discharged to the sanitary system impacted groundwater at the STP and downgradient areas
  - Potable water that contained PFAS was used for sanitation.
  - Possible foam discharges to floor drains at the current firehouse
  - PFOS and PFOA in STP effluent is currently <10 ng/L
1,4-Dioxane
(West-Central Area)

- 1,4-Dioxane detected >1.0 µg/L in many wells, from the south-central area of the site to the Airport treatment system
  - Yellow outlines represent estimated extent of 1,4-dioxane >1.0 µg/L
  - There are data gaps that need to be filled during future work
- Concentrations generally <10 µg/L. Highest was ~25 µg/L in a Western South Boundary monitoring well
- Concentrations >1 µg/L in on-site and off-site groundwater extraction wells and treatment system effluent
  - Effluent is discharged to basins or injection wells
  - Possible impacts from these discharges detected at several basins
1,4-Dioxane (Eastern Area)

- 1,4-Dioxane detected in areas previously impacted by TCA releases:
  - Current Landfill and former Waste Management Facility, downgradient to North Street East area
    - Detected up to ~12 µg/L
    - Detected in extraction wells and system effluent up to ~3 µg/L
  - Detected in groundwater downgradient of former research agricultural fields up to ~2 µg/L
  - STP and downgradient areas
    - Not detected in groundwater near the STP
    - Site boundary and off-site detected up to ~7 µg/L
Current and Former Firehouse PFAS Plumes

- DOE has provided $10.9M in funding to install remediation systems for the high concentration plume segments associated with the two source areas
  - BNL conducted detailed characterization of high concentration portions of the plumes (July 2020 – January 2021)
- Currently preparing design documents for the treatment systems
  - Contaminated groundwater will be pumped out of the ground using a series of new extraction wells
  - Water will be treated using granular activated carbon filters
    - BNL will reuse infrastructure for several inactive groundwater treatment systems. Will result in significant time and cost savings
  - Treated water will be discharged into two existing recharge basin areas
Current Firehouse Foam Release Areas (1986-2008)

Groundwater flow

Temporary wells Installed in 2018

300 ft
Current Firehouse Plume Characterization and Treatment System Design

- Installed 38 temporary wells to characterize the high concentration areas of the PFAS plume
  - 360 sample intervals
- Treatment system design
  - Establish a capture goal of 100 ng/L for PFOS or PFOA
  - Planning to install up to eight extraction wells
  - Groundwater modeling will be used to determine final extraction well locations, depths and pumping rates
    - Complicated area of the site due to operations of water supply wells and water recharge basins

PFOS / PFOA Concentrations

12,200 / 240 ng/L (Phase 2 Data)
3,360 / 602 ng/L
1,740 / 62 ng/L
755 / 23 ng/L
Former Firehouse Foam Release Areas (1966-1985)

Temporary wells Installed in 2018

Groundwater flow

500 ft
Former Firehouse Plume Characterization and Treatment System Design

- Installed 37 temporary wells to characterize the high concentration portions of the PFAS plume
  - 390 sample intervals
- Treatment System Design
  - Establish a capture goal of 100 ng/L for PFOS or PFOA
  - Planning to install three extraction wells
  - Groundwater modeling will be used to determine final extraction well locations, depths and pumping rates
Integrate response to PFAS and 1,4-Dioxane into CERCLA program

• Under the Federal Facilities Agreement, DOE is under a continuing obligation to notify EPA and NYSDEC of any additional potential Areas of Concern which DOE becomes aware

• DOE and BSA are working with EPA and NYSDEC to integrate future investigations and remedial responses into the CERCLA program
  • Including the planned remediation of the current firehouse and former firehouse PFAS plumes as a Time Critical Removal Action
BSA/DOE Recommendations

- Establish Operable Unit (OU VIII) that covers PFOS, PFOA and 1,4-dioxane remedial investigation and remedial actions
- Establish new Areas of Concern 33 and 34
  - AOC 33 – PFOS and PFOA with 9 sub-areas (33a through 33i)
  - AOC 34 – 1,4-Dioxane
Next Steps

• DOE recently submitted the recommendations to the regulatory agencies to incorporate the new OU and AOCs
  • Also provide target dates for submittal of the TCRA documents for the current firehouse and former firehouse plumes
    • Characterization report
    • Treatment system design plans
• New carbon filters for the current firehouse plume remediation system were delivered to BNL and will be installed in March
• Expect to start construction work on the treatment systems by early summer (e.g., install extraction wells and piping)