Welcome to the RAB Meeting!

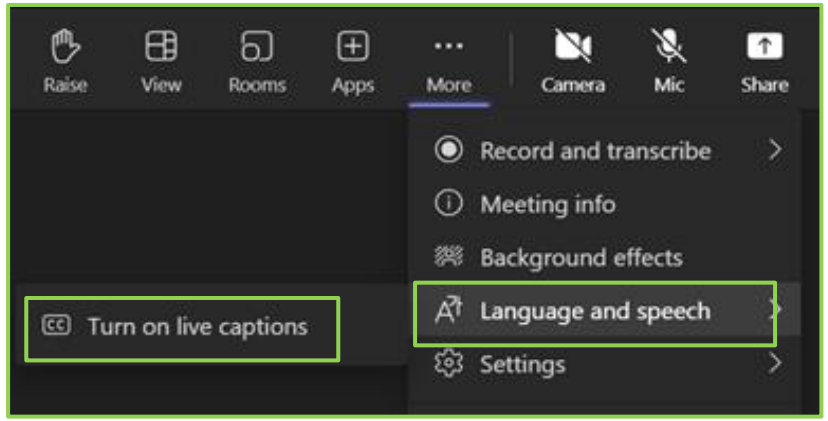
Thank you for joining the

Restoration Advisory Board Meeting For NASJRB Willow Grove And Biddle Air National Guard Base

The meeting will start at 6:00 p.m.

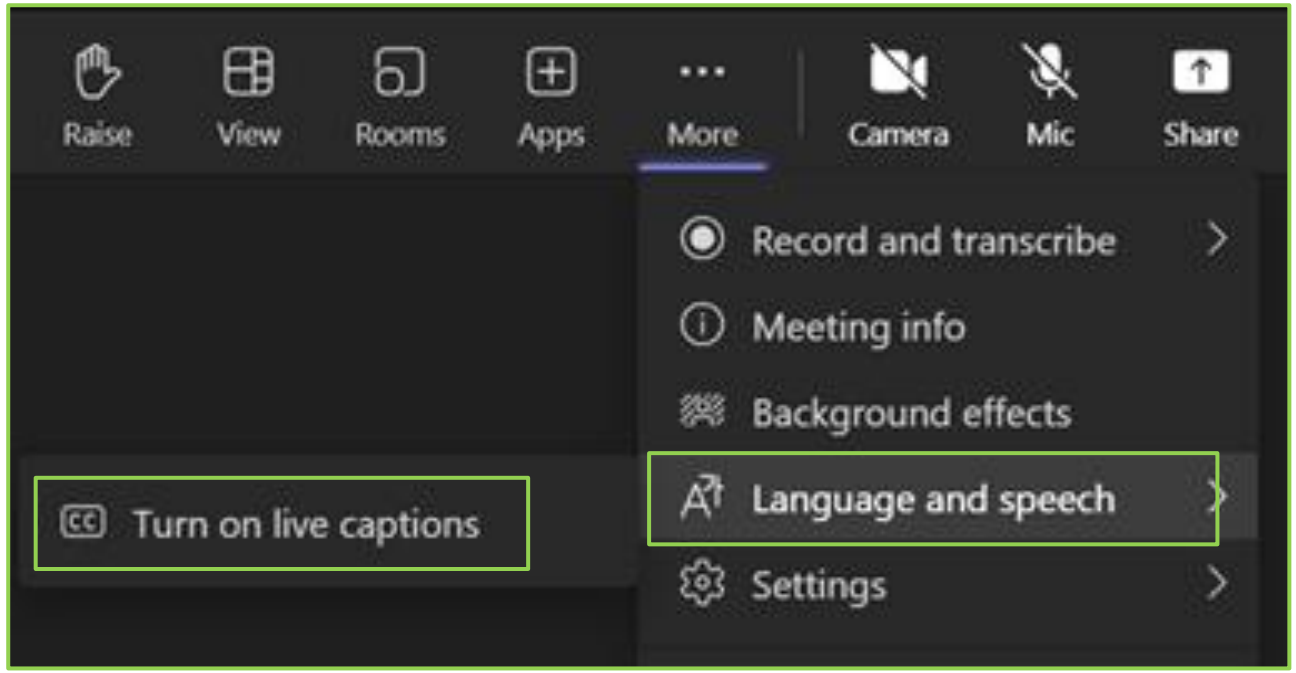
For captions:

- Click More ●●● on the screen
- Select ‘Language and Speech’
- Click ‘Turn on live captions’



Teams Tools

- **Closed Captioning**
  - Select More ●●●
  - Select “Language and speech”
  - Click “Turn on live captions”



- **Screen Layout**
  - To adjust the layout on your screen, select More ●●●
  - Choose the preferred view from available choices. Options include Full Screen, Gallery View, and Focus on Content

NASJRB Willow Grove Restoration Advisory Board (RAB) Meeting

March 28, 2024

Virtual Meeting Information

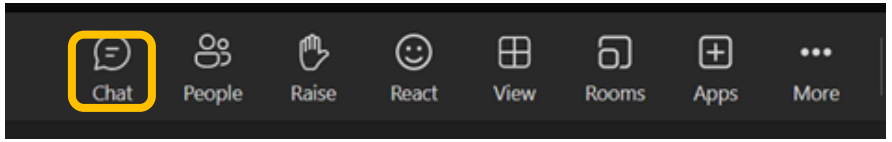
- This is a hybrid meeting with in-person and virtual attendees.
- The virtual meeting will show the presentations.
- The presenters and in-person attendees will be audio-only.
- The meeting is not being recorded; minutes will be prepared. Webinar and in-person sign-in names will be used for the minutes.
- Public notices were published on March 13 and March 20, posted on the Navy website, and provided to the mailing list.

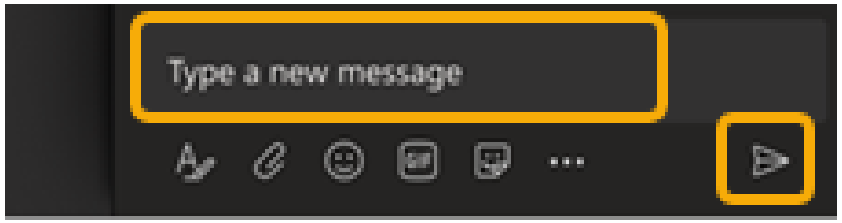
Outline / Agenda

- Welcome and Announcements
- Navy Drinking Water Update
- Navy PFAS Technology Update
- RAB Member or Community Comments/Questions
- Air National Guard Environmental Restoration Presentation
- Regulator Comments
- RAB Member or Community Comments/Questions
- Environmental Updates Conclude
- Meeting Conclusion

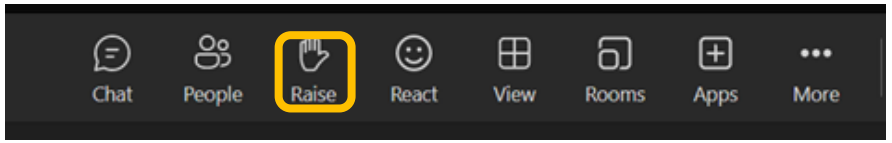
Virtual Attendee Questions

1) To ask a question, select ‘Chat’, type your question in the text box and then select Send.





2) Raise your hand to be recognized and have your microphone unmuted. Select ‘Raise your hand’ icon in the meeting controls.



3) Phone-only attendees can dial *6 to raise their hand and have the opportunity to ask a question.

RAB Background Information

- A Restoration Advisory Board (RAB) is a stakeholder group that meets on a regular basis to discuss environmental restoration at a specific property that is either currently or was formerly owned by Department of Defense (DoD), but where DoD oversees the environmental restoration process.
- RABs enable people interested in the environmental cleanup at a specific installation to exchange information with representatives of regulatory agencies, the installation, and the community. RABs may only address issues associated with environmental restoration activities.
- Mr. Bill Walker, Horsham Township Manager, is the RAB community co-chair.
- Health-related issues are not addressed by the RAB. Health agency professional contact information will be provided after the Navy and Air National Guard Environmental Restoration presentations.

Source: 10 USC 2705 and DoD Restoration Advisory Board Rule Handbook
https://denix.osd.mil/rab/home/unassigned/rab-rule-handbook/

2024 RAB Meetings Planned

- Thursday, July 11, 2024 at 6:00 p.m.
- Thursday, November 14, 2024 at 1:00 p.m. (with Base Tour).

Environmental Restoration Program Update

Private Drinking Water Well Sampling for PFAS

- January 14, 2023: PA Maximum Contaminant Levels (MCLs) for PFOA and PFOS were published.
  - PFOA: 14 ppt
  - PFOS: 18 ppt
- Navy BRAC PMO evaluated historic drinking water data and identified locations where:
  - PFOA and/or PFOS concentrations were above the PA MCLs,
  - Laboratory detection limits were above the PA MCLs, or
  - Samples were more than three years old.

Private Drinking Water Well Sampling for PFAS *(Cont.)*

- May 2023:
  - Began offering bottled water to Navy-impacted locations above PA MCLs.
  - Began resampling of locations where laboratory detection limits were above PA MCLs or samples were more than 3 years old.
- September 2023:
  - Awarded modification to Cooperative Agreement with HWSA to address the PA MCLs.
- November 2023:
  - Began issuing offer letters for municipal water connections in HWSA service area for locations above Pennsylvania MCLs.

Private Drinking Water Well Sampling for PFAS (Cont.)

- The Navy has provided over $22 million to Horsham Water and Sewer Authority (HWSA) to address PFAS via a Cooperative Agreement:
  - Filtration systems at five HWSA municipal wells.
  - Over 100 public water connections for private wells.
  - Additional funding was provided to address the new PA MCLs.

Private well sampling summary	Current
PFOA/PFOS Concentrations above 70 ppt, not yet connected	2
PFOA or PFOS Concentrations above PA MCL and < 70 ppt	54
PFOA or PFOS Concentrations below PA MCL	73
PFOA or PFOS below PA MCL but detection limit over PA MCL	52

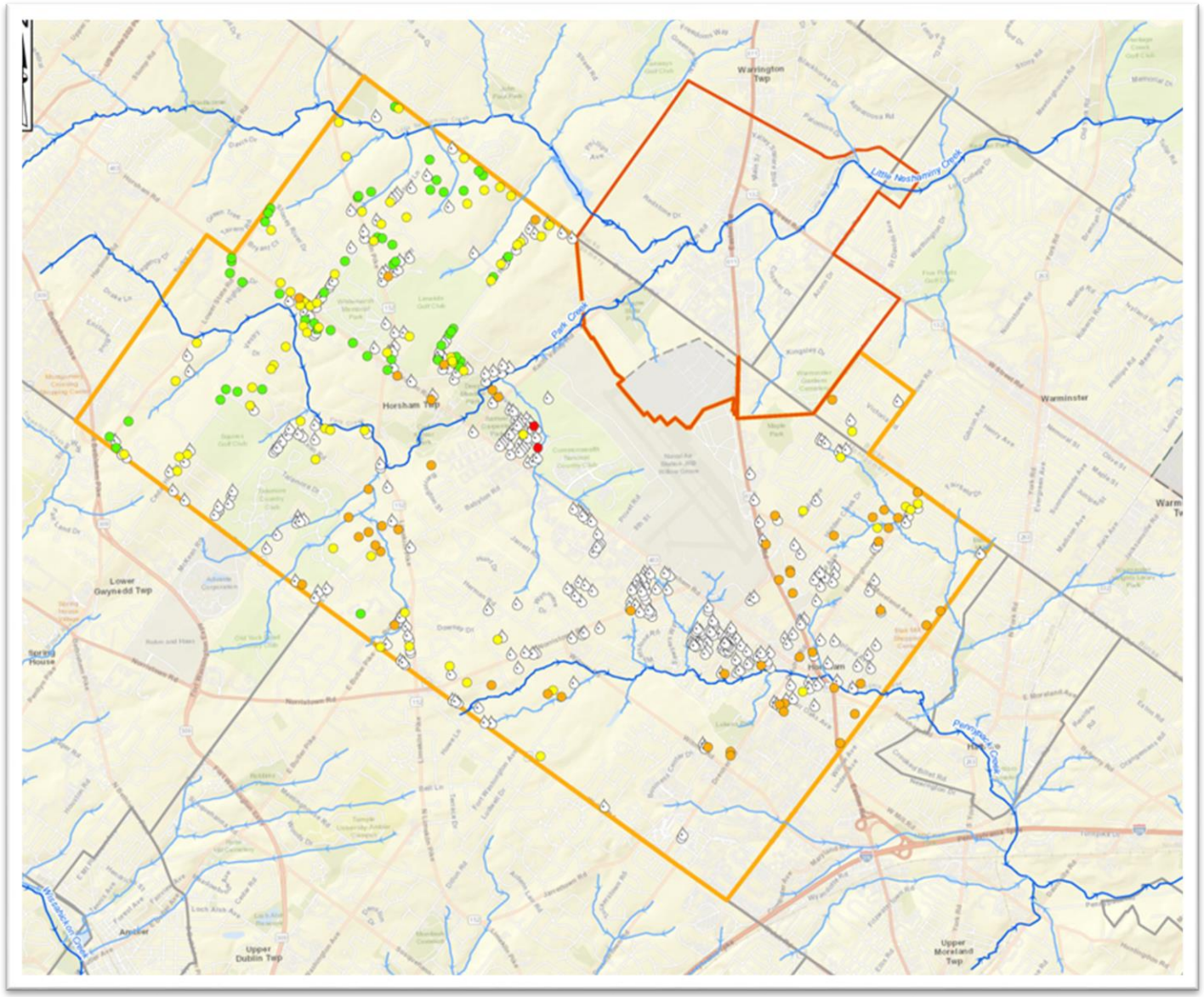
Private Drinking Water Well Sampling Area

Private drinking water well sampling for PFOA/PFOS and provision of bottled drinking water is being performed by Tetra Tech, a U.S. Navy contractor.

Point of contact is:
Sue Herbert
Tetra Tech Deputy Project Manager
E-mail: Sue.herbert@tetratech.com
Phone: (610) 382-1537

Legend

- PFOA or PFOS Concentrations above 70 ppt (2 Wells)
- PFOA or PFOS Concentrations above PADEP MCL and <70 ppt (54 Wells)
- PFOA and PFOS Concentrations less than PADEP MCL (73 Wells)
- PFOA and PFOS Concentrations below Detection Limit, but Detection Limit exceeds PADEP MCL (52 Wells)
- Public Water Connection (Some not by Navy)
- Township Boundary
- Biddle Air National Guard Base
- Former NASJRB Willow Grove
- Biddle Air National Guard Base Sampling Area
- Former NASJRB Willow Grove Sampling Area



Private Drinking Water Well Sampling for PFAS *(Cont.)*

- March 14, 2023: EPA announced the proposed draft National Primary Drinking Water Regulation (NPDWR) for 6 PFAS, including PFOA and PFOS, for public comment.
  - Proposed MCL PFOA: 4 ppt
  - Proposed MCL PFOS: 4 ppt
- Navy BRAC PMO continues to review our existing data and conduct additional sampling, where necessary, in preparation to incorporate EPA's final drinking water standards.

Final EE/CA Comment Period

- The EE/CA considers system location, treatment, and discharge alternatives for PFAS-impacted groundwater.
- EE/CA-recommended alternatives include:
  - PFAS treatment using granular activated carbon and ion exchange resin.
  - One GWTS building at North Ramp & manifold building at IR Site 5.
  - Discharge to Park Creek via a new piping system.
- Agency review / comments have been received and addressed.
- A public comment period will be held for the Final EE/CA:
  - The EE/CA will soon be available for review on the Navy BRAC website for a 45-day comment period.

Action Summary Since Previous RAB Meeting

- Continued private water well sampling to assess PFAS concentrations.
- Continued bottled water service for locations with PFAS ≥ PA MCLs.
- Continued issuing offer letters for municipal water connections in HWSA service area where PFAS concentrations found ≥ MCLs.
- Prepared the 2023 Private Well Summary Report.
- Continued to monitor the bioremediation of Site 5 groundwater and prepared the Year 8 Annual Report on remedy progress.
- Continued Site 5 & Hangar 680 PFAS treatment pilot test operations.
- Prepared the Final Engineering Evaluation / Cost Analysis (EE/CA) identifying a recommended alternative for groundwater remediation.

Action Summary Since Previous RAB Meeting (cont.)

- Continued planning for the EE/CA-recommended remedy:
  - Prepared a draft Action Plan describing GWETS implementation.
  - Continued to conduct preliminary design activities.
  - Developed NPDES permit application for the future GWETS.
- Revised Site 12 Groundwater Tech Memo based on EPA comments.
- Updated Surface Water & Sediment SAP for PFAS Method 1633.
- Completed Round 18 surface water sampling event (January 2024).
- Finalized Dec 2022 & Mar 2023 Surface Water & Sediment Reports.
- Submitted Final FOST-1 Maple Ave Soil Tech Memo to EPA/PADEP.

NAVFAC Naval Facilities Engineering Systems Command

Actions Anticipated to be Completed by Next RAB

- Continue private water well sampling and bottled water service.
- Continue issuing connection offer letters where PFAS exceeds PA MCLs within the HWSA service area.
- Continue Hangar 680 and Site 5 PFAS treatment system pilot test operations.
- Conduct testing for PFAS destruction on pilot test media using Super Critical Water Oxidation (SCWO).
- Complete the EE/CA public comment period.
- Finalize the Action Memo for the future GWETS and continue system design.

Actions Anticipated to be Completed by Next RAB (Cont.)

- Respond to agency comments on the hydrogeologic conceptual site model for the area north and west of Park Creek.
- Prepare a revised Northern Ponding Area Sampling & Analysis Plan (SAP) and On-Base Groundwater SAP.
- Finalize Site 12 Groundwater tech memo based on EPA comments.
- Prepare revised Site 5 and off-Base well packer test tech memos.
- Submit revised Westbay Well System demonstration tech memo.
- Complete lysimeter installation and soil pore water sampling.
- Perform surface water sampling Round 19 and submit the technical memorandum reporting Round 17 sampling results.

Update DoD Research and Development on Former NAS JRB Willow Grove and Biddle ANG

Jason Speicher
NAVFAC Atlantic

Former NAS JRB Willow Grove/Biddle ANG RAB Meeting

March 28, 2024

Quick General Disclaimer

The views expressed in this presentation are those of the author and do not necessarily reflect the official policy or position of the Department of Navy, Department of Defense, or the U.S. Government.

I am an employee of the U.S. Government. This work was prepared as part of my official duties. Title 17, U.S.C., §105 provides that copyright protection under this title is not available for any work of the U.S. Government. Title 17, U.S.C., §101 defines a U.S. Government work as a work prepared by a military Service member or employee of the U.S. Government as part of that person's official duties

First *Special Thanks* to the Following Contributors and Collaborators!!!

- **Individuals involved with the SERDP/ESTCP Programs that contributed**

  - Dr. Andrea Leeson – SERDP/ESTCP Environmental Restoration Program Manager
  - Dr. Richard (Hunter) Anderson – AFCEC – Air Force liaison to SERDP/ESTCP and member of PFAS Technical Advisory Committee
  - Cara Patton – Noblis – Contractor to SERDP/ESTCP – Project Manager, Environmental Restoration

- All good research needs its on-site supporters and collaborators

  - NAVFAC BRAC – Brian Helland, Jon Harris, Jim Rugh and entire WG BRAC Team
  - Biddle ANG – Bill Myer, Lee DePersia, and ANG Team

Presentation Overview

During the course of this presentation we will cover:

- Recap of DoD's SERDP/ESTCP – R&D Programs
- What is a Technology Readiness Level (TRL)?
- Overview of SERDP/ESTCP's PFAS related research and how it fits into these TRLs
- Brief Intro to Other Transaction Authority (OTA) Mechanisms and how they are being used to stimulate commercial transition of PFAS remediation technologies
- Overview of FY2023 DIU PFAS Projects
  - Focus on those being conducted at NAS JRB Willow Grove and Biddle ANG Base
- Questions

DOD's Environmental Technology Programs

Science and Technology

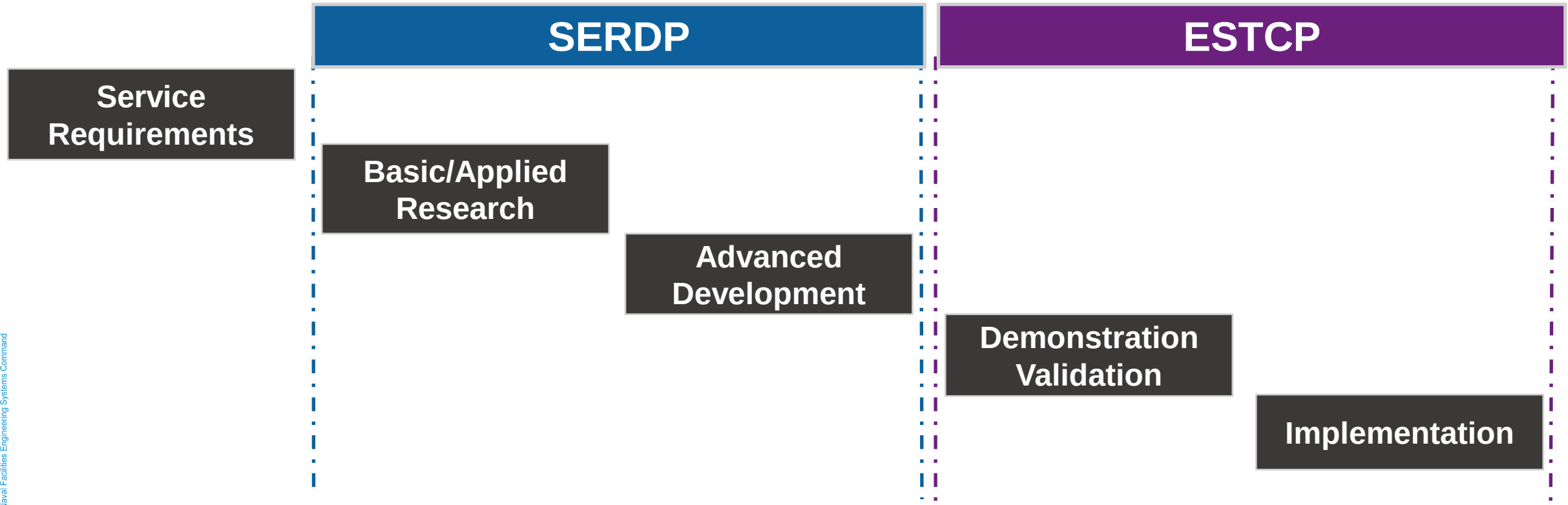
- Statutory program established 1991
- DoD, DOE, EPA partnership
  - ♦ Advanced technology development to address near-term needs
  - ♦ Fundamental research to impact real world environmental management

Demonstration and Validation

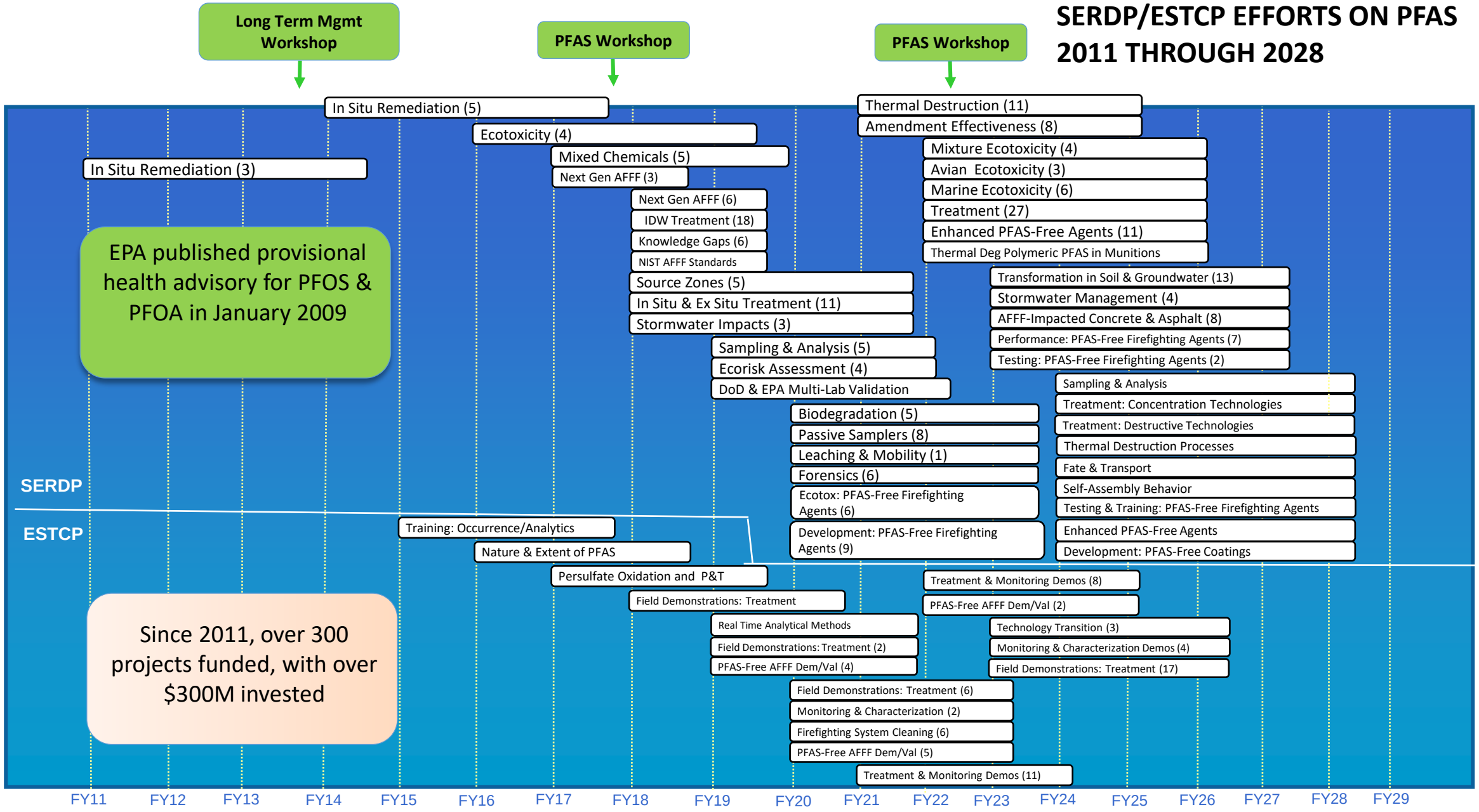
- Demonstrate innovative cost-effective environmental and energy technologies
  - ♦ Transition technology out of the lab
  - ♦ Establish cost and performance
  - ♦ Partner with end user and regulator
  - ♦ Technology transfer
    - ▪ Accelerate commercialization or broader adoption
    - ▪ Direct technology insertion

Further Overview at SERDP/ESTCP Homepage

Environmental Technology Development Process



SERDP/ESTCP EFFORTS ON PFAS 2011 THROUGH 2028

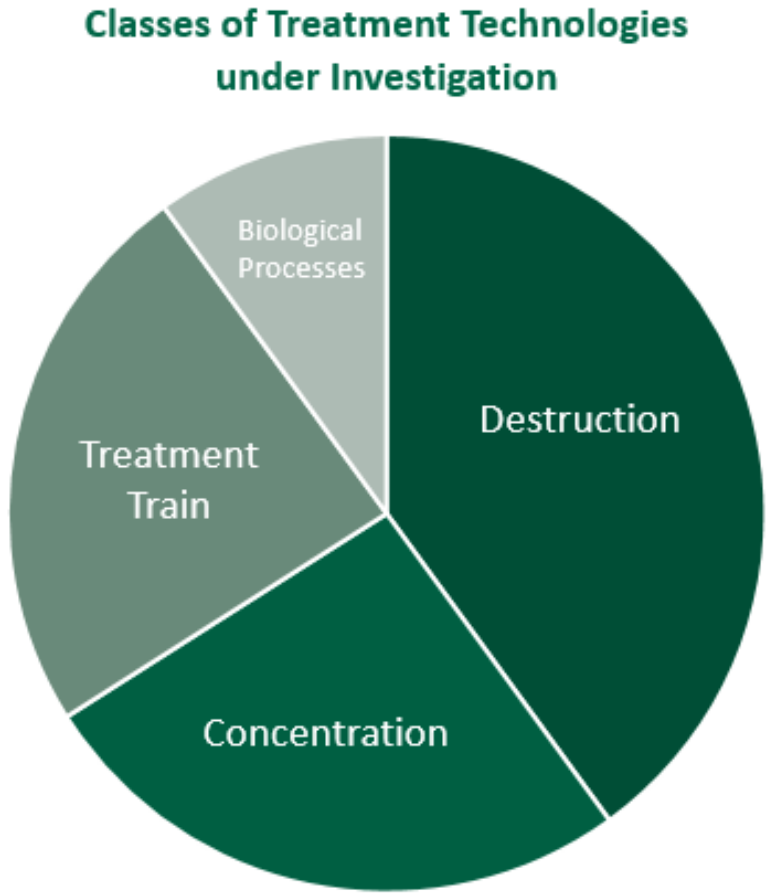


Research Impetus – As it Relates to PFAS

- Develop, validate, and commercialize technologies to improve management and treatment of PFAS in the environment
- Successful projects implement cost-effective and efficient approaches

QR Code Link to SERDP/ESTCP PFAS/AFFF Research Page

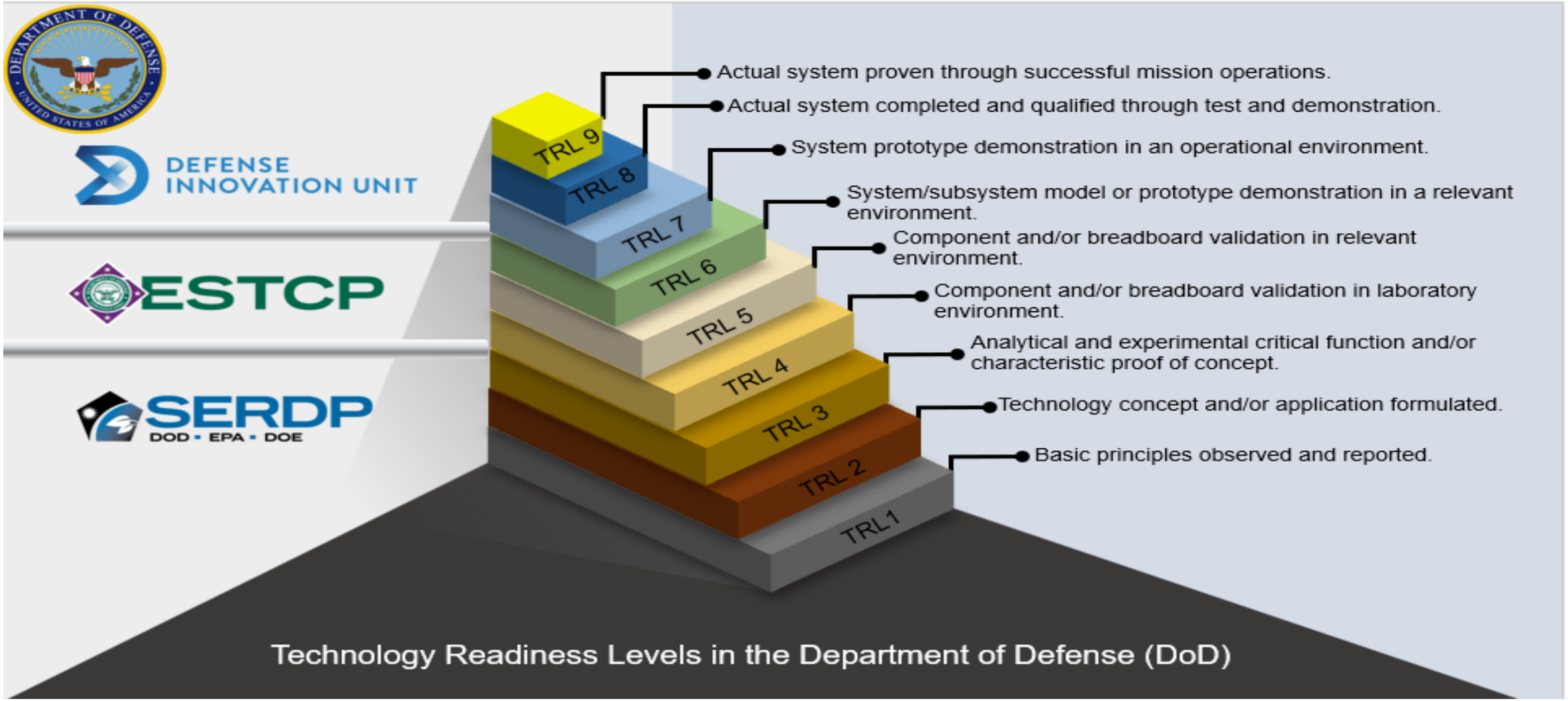
Summary of SERDP/ESTCP PFAS Treatment Projects



*More than one project possible for some technologies.

- Over 50 PFAS treatment technologies have passed proof of concept & are further in development and/or demonstration phase.
- All treatment projects are ultimately designed to reduce the amount of PFAS impacted material that must be handled via other traditional disposal methods (e.g., landfilling).
- Treatment projects are discussed in terms of the four categories shown.

What are Technology Readiness Levels (TRLs)?



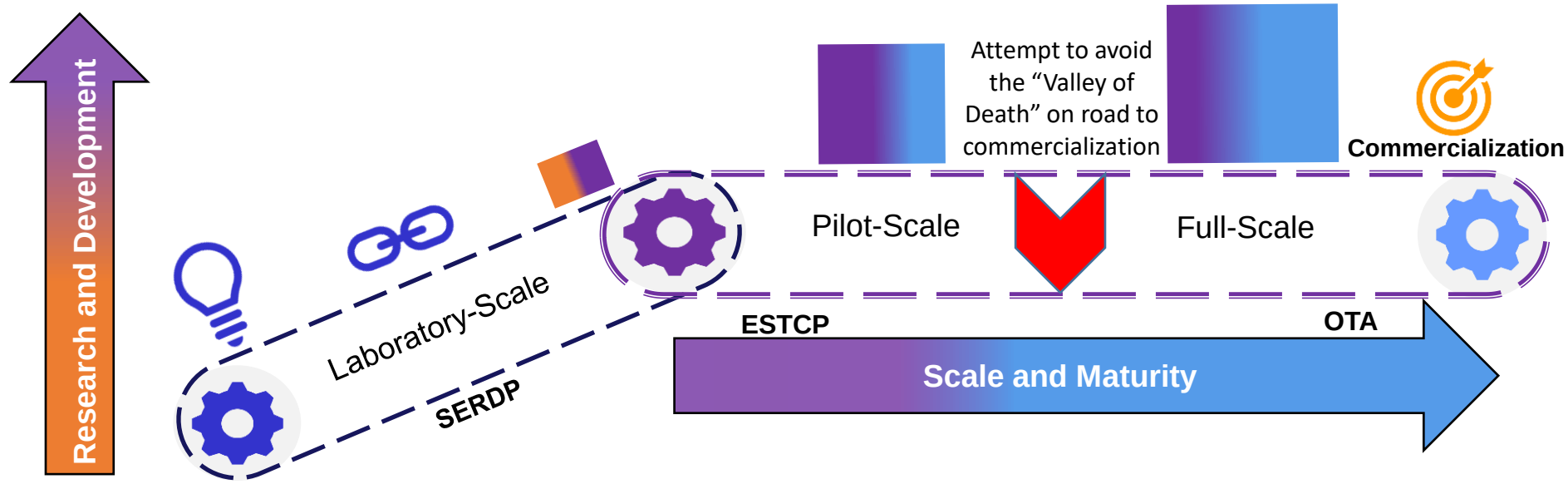
Approach for Systematic Efforts for PFAS Management

SERDP is the DoD's environmental and resilience science and technology program, planned and executed in partnership with the DOE and the EPA, with participation by numerous other federal and non-federal organizations. SERDP invests across a broad spectrum of basic and applied research, as well as advanced development.

ESTCP is the DoD's environmental, resilience, and installation energy and water technology demonstration and validation program. ESTCP demonstrations collect cost and performance data to overcome the barriers to employ an innovative technology because of concerns regarding technical or programmatic risk, the so-called "Valley of Death."

Other Transaction Authority

Other Transaction Authority (OTA) refers to the authority of the DoD to carry out certain prototype, research and production projects. This authority was created to give DoD the flexibility necessary to adopt and incorporate business practices that reflect commercial industry standards and best practices into its award instruments. The OTA is a legal instrument issued by the federal government that is authorized by 10 U.S.C. 4021.



Other Transaction Authority (OTA)

- Defense Innovation Unit (DIU)

➢ DIU is a DoD organization focused exclusively on fielding and scaling commercial technology across the U.S. military at commercial speeds.

➢ Area of Interest (AOI): Treatment of PFAS-impacted media, including soils, groundwater, investigative derived waste (IDW) at DoD selected sites.

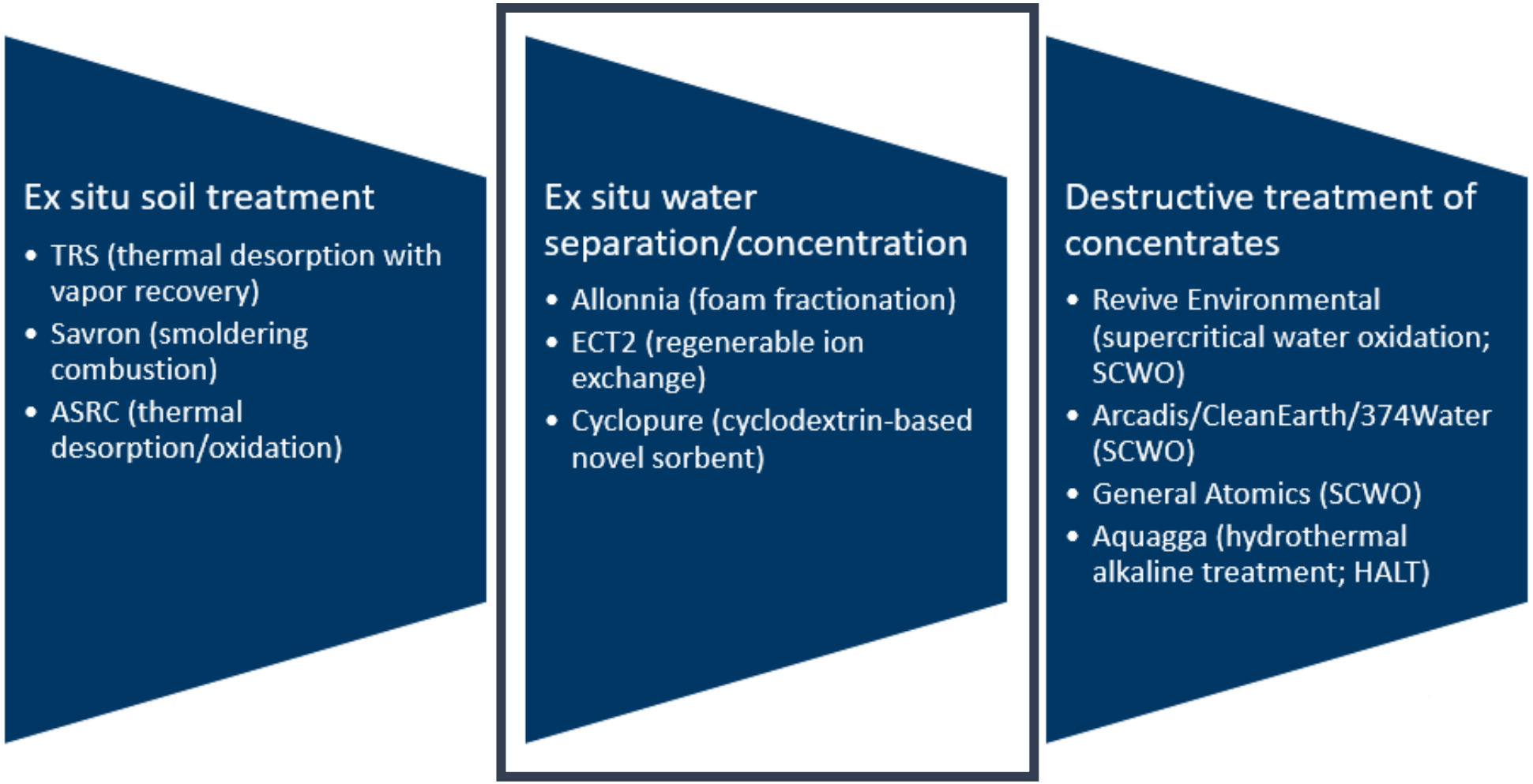
Defense Innovation Unit (DIU)

- Other transactional authority (OTA)
  - ESTCP-funded through FY2023 NDAA
- Competitive three-step process
- Focused on TRLs ≥ 8
- Provides capital investment for prototyping
- Focus on cost and performance
- "Successful" vendors that are able to validate their technology will get contractual vehicle for future use at other DoD or other Federal Facilities.

QR Code to DIU Homepage

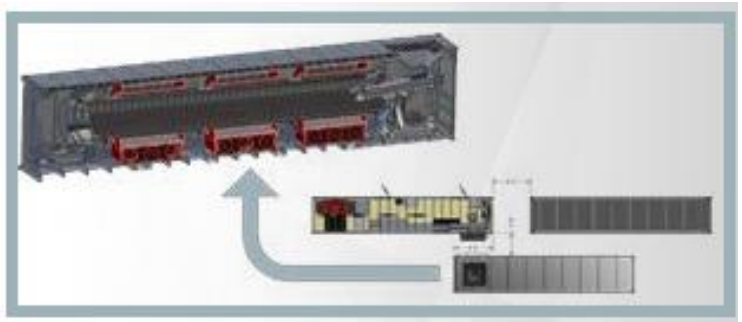
2023 ESTCP/DIU Treatment Technologies Selected

Projects to be Demonstrated at NAS JRB Willow Grove/Biddle ANG Base



QR Link to ESTCP Press Release

Ex Situ Soil Treatment Projects



Photos from ARCS Energy and their Thermal Desorption Unit (TDU) and Thermal Oxidation Unit (TOU)

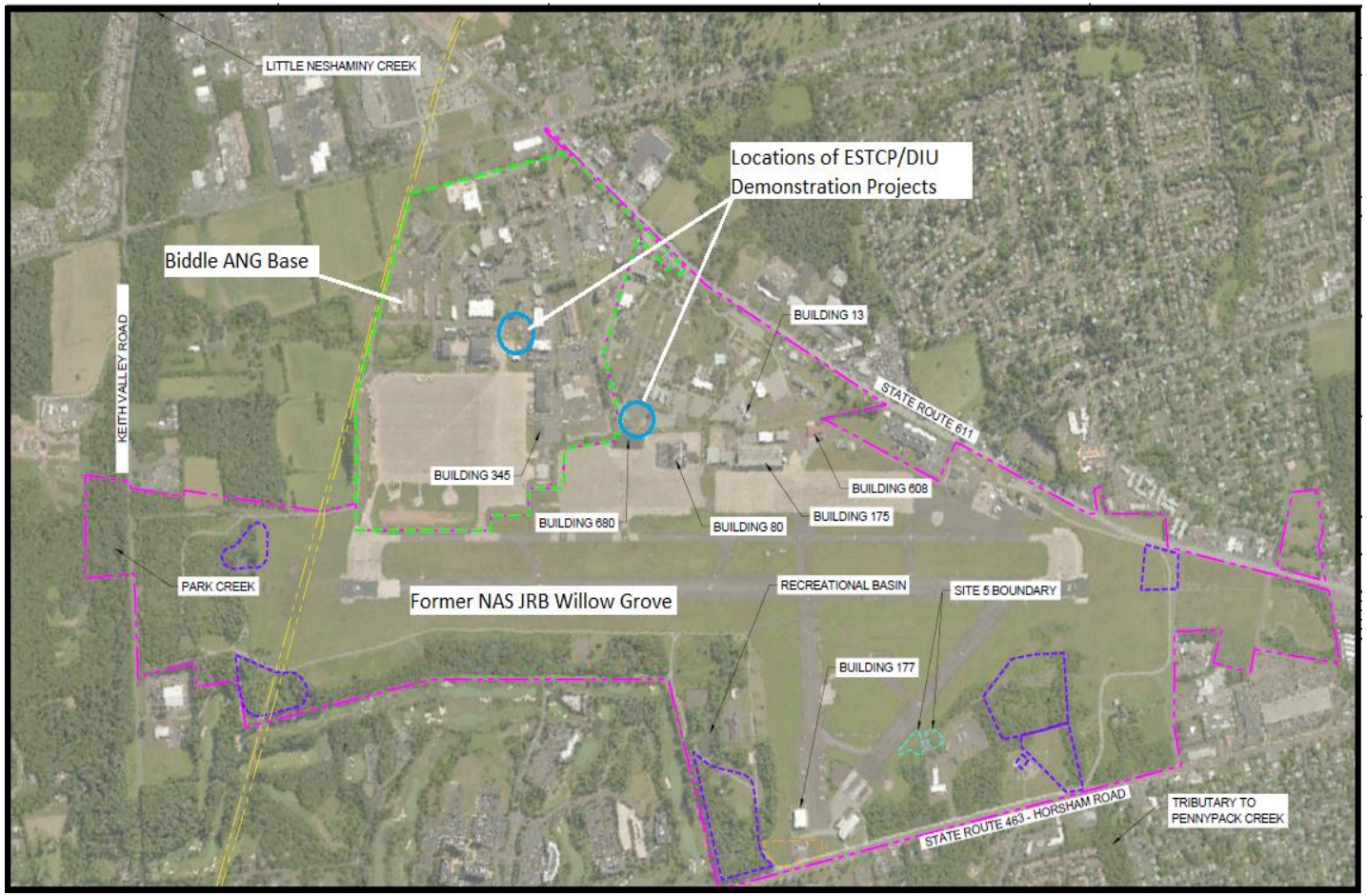
Photo from Savron's of their Ex Situ Soil Smoldering Combustion Platform

ESTCP/DIU Soil Treatment Technologies

- Demonstration site: Joint-Base Elmendorf Richardson (JBER)
- Approx 6,000 CYs of PFAS-impacted soil stockpiled from construction project
- Stockpile required relocation from Cherry Hill to ESTCP/DIU project site
- >$1M in electrical utility upgrades
- Planning and Implementation Ongoing
  - Projects to commence during calendar year 2024
- NEPA considerations
  - Categorical exclusion approved

Ex Situ Water Separation/Concentration Projects Planned for Former NAS JRB Willow Grove or Biddle ANG

Introduction to ESTCP/DIU Concentration Projects



- Demonstration sites: Former Naval Air Station Joint Reserve Base (NAS JRB) Willow Grove and neighboring Biddle Air National Guard (ANG) Base
- Leveraging existing pilot projects at each facility to support all three demonstrations.
  - Limits upgrades to utilities and other infrastructure
- Projects combined will treat >14 million gallons of impacted groundwater during demonstration.
- Will produce concentrated PFAS waste streams.
  - Treatment to be leveraged with destruction projects (to be discussed later)

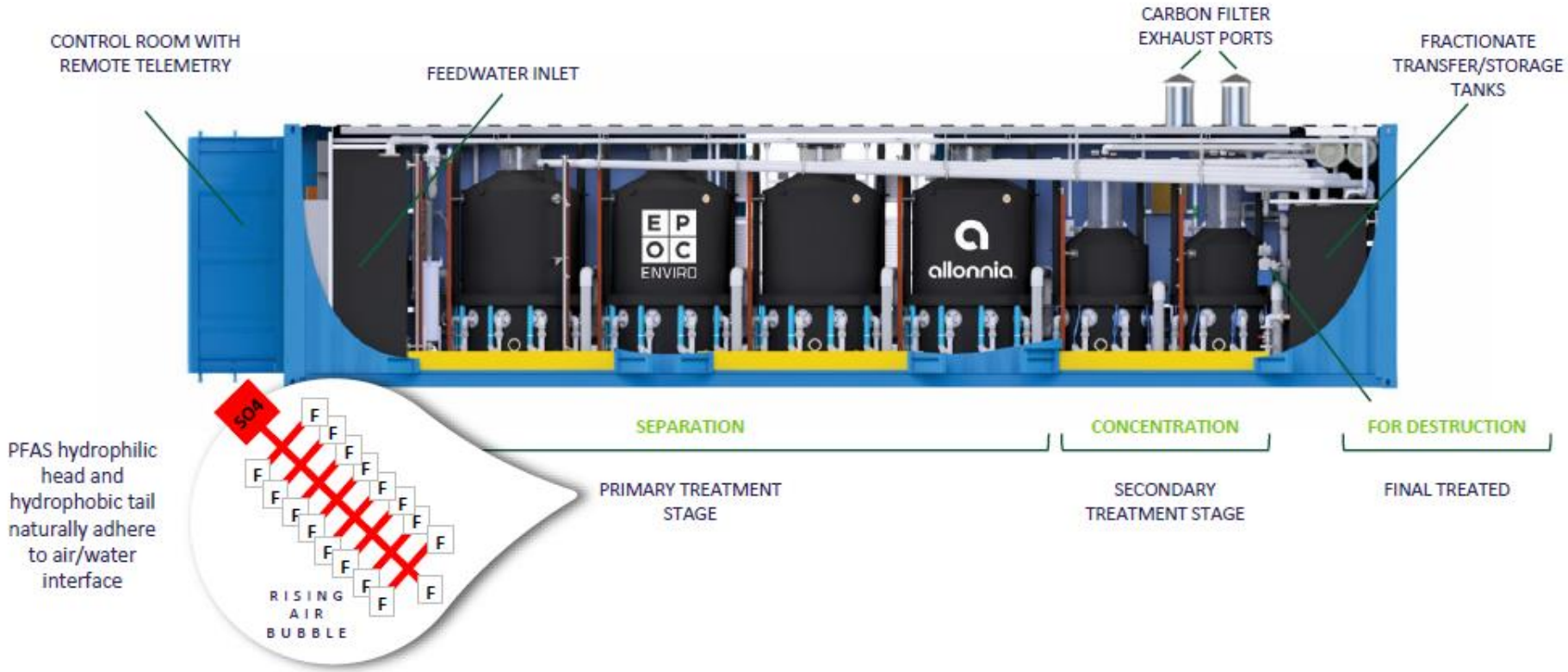
ESTCP/DIU at Biddle ANG Base

Aerial from Google Earth

Picture of SAFF40 Unit courtesy of K. Sorenson - Allonnia

- Allonnia will demonstrate their foam fractionation technology (aka SAFF40) to treat impacted groundwater.
- Demonstration will utilize existing extraction wells installed and used by the ANG for a pilot treatment demonstration they conducted at end of 2023.
- Utility upgrades (e.g., electrical) to support being planned by ANG
- Overview of Demonstration
  - Demonstration will be performed for 6 months
  - Will treat ~10 million gallons of impacted groundwater based on estimated flow rate of 40 gpm.
  - Will operate with both secondary and tertiary fractionation treatment to demonstrate degree of concentration capabilities.
- Discharge will occur under planned NPDES temporary permit
  - Application submitted in February to PADEP by Biddle ANG

ESTCP/DIU at Biddle ANG Base



Schematic of SAFF40 System – Provided by Allonnia

Figure 3: Primary fractionation foaming post-Spuma addition

Treatability Study Picture from Allonnia for Biddle Groundwater

ESTCP/DIU at Former NAS JRB Willow Grove

Location of Hangar 680 treatment system

Photo from May 2023 RAB Meeting

- Cyclopure and ECT2 will demonstrate their technologies using slipstream flows from Navy's existing Building 680 Pilot Treatment System
- Building 680 Pilot System has been utilized for five other SERDP/ESTCP, ACOE, and NAVFAC EXWC demonstration projects in a similar manner.
- Will be first time that two projects operate simultaneously
- Minor utility upgrades (e.g., electric, process piping, etc.) are expected and will likely be required.
- Discharge will occur under existing NPDES discharge equivalency permit
  - Treated water from two projects will still be polished by existing Navy treatment system.

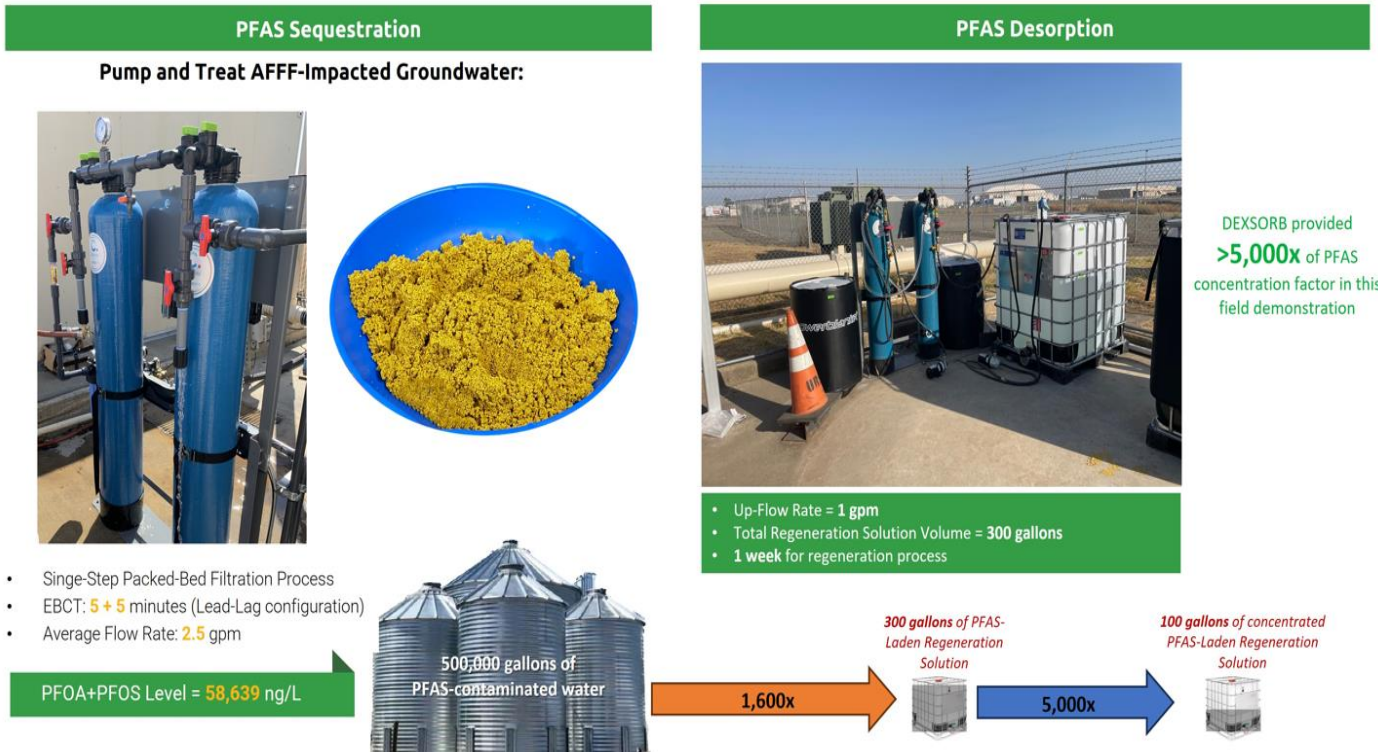
ESTCP/DIU Project 1 at Former NAS JRB Willow Grove

Picture of example ECT2 Example Groundwater Treatment with Resin Regeneration System courtesy of E. Houtz – ECT2 (A Montrose Company)

***NOTE: Demonstration Pilot at Willow Grove will be smaller in size to this example**

- ECT2 will demonstrate their regenerable IX resin and regeneration technology system to treat and concentrate PFAS from impacted groundwater.
  - Larger version of Willow Grove Site 5 Pilot
- Overview of demonstration
  - Demonstration will be performed over 8 months
  - Will be treating entire flow from EW2I at ~8-10 gpm
    - >3 million gallons of impacted groundwater to be treated
  - As monitoring dictates, will regenerate resin several times during course of demonstration.
    - Process will generate highly concentrated PFAS containing liquid know as still bottoms

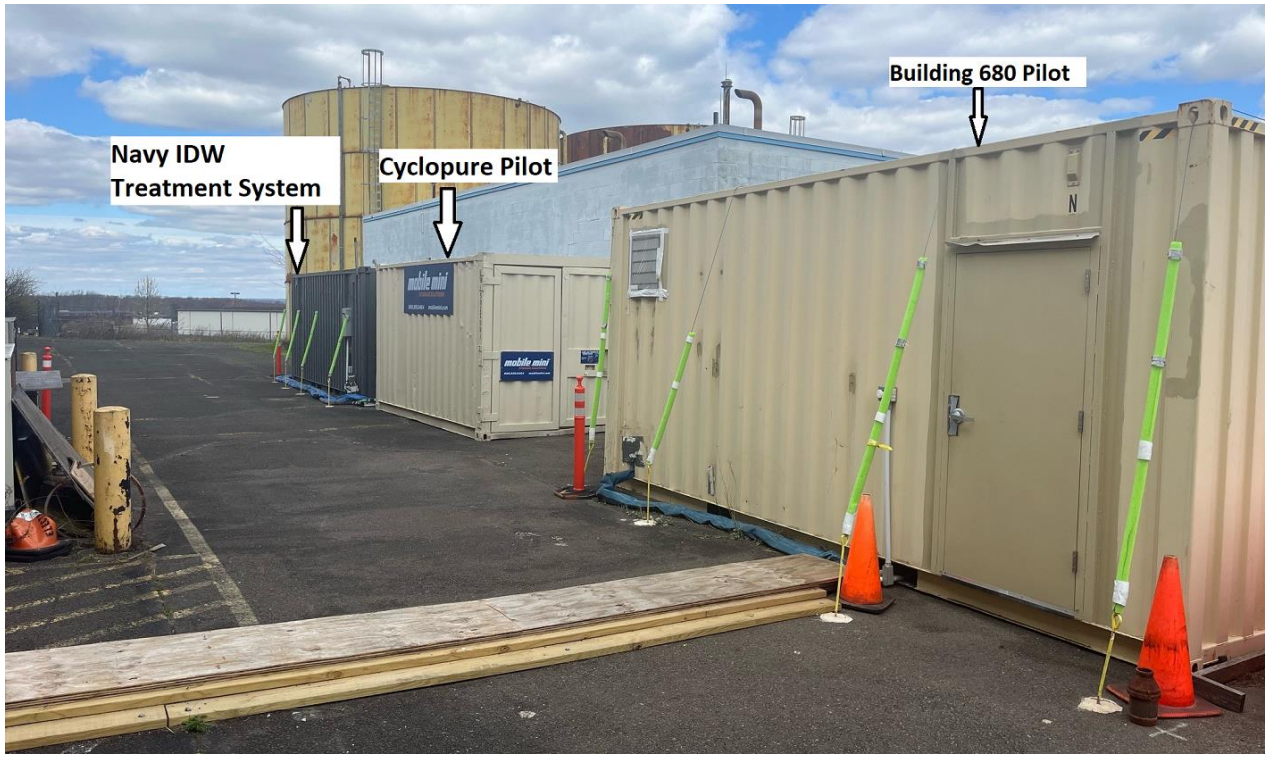
ESTCP/DIU Project 2 at Former NAS JRB Willow Grove



Graphic courtesy of Frank Cassou – Cyclopure

- Cyclopure will demonstrate their novel absorbent, DEXSORB, for removal of PFAS from impacted groundwater and will regenerate and concentrate PFAS waste at the end of the demonstration.
- Overview of demonstration
  - Demonstration planned to be performed over 6 months (March to October).
  - Will be treating combined flow slipstream of Building 680 Pilot at up to 2.5 gpm = ~500,000 gallons of impacted grounded water.
  - At termination of demonstration project, or potentially at mid-point, the spent absorbent will be regenerated and PFAS waste concentrated.

Cyclopure Demonstration Pilot Underway



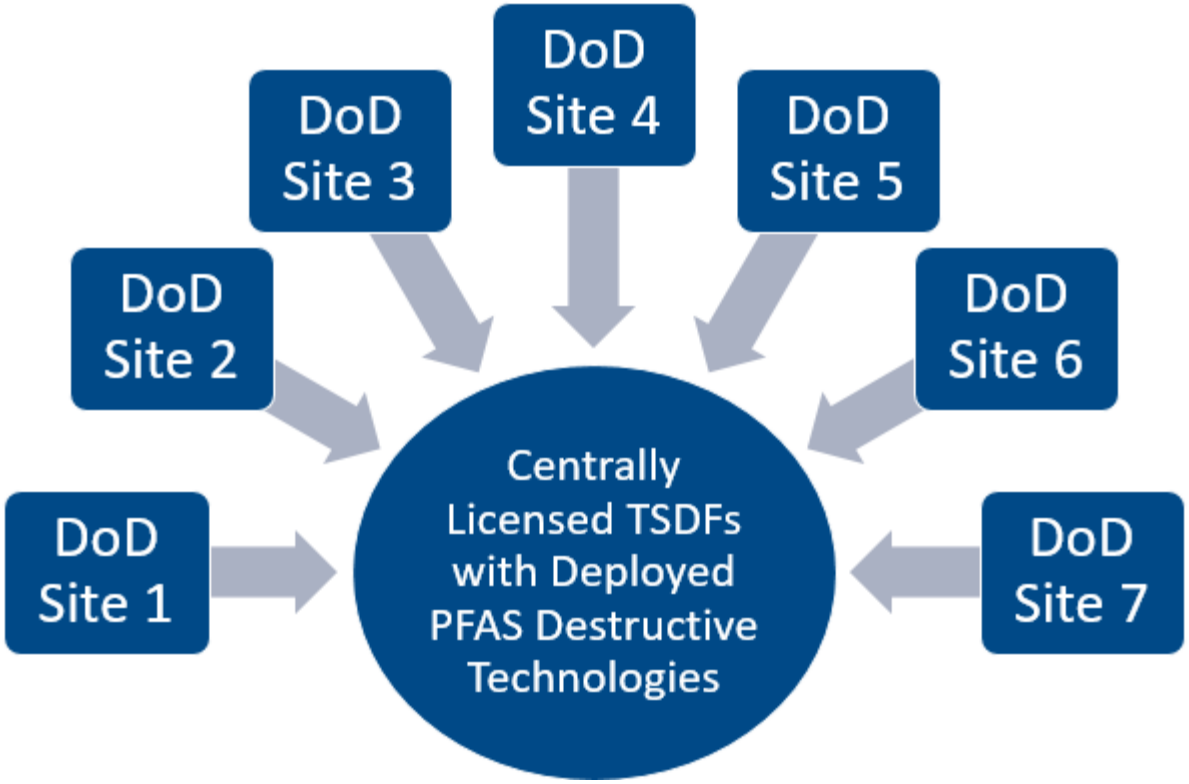
Picture of Current Layout

- Started up week of March 11th
- After 1 week of operation >15,000 gallons treated
- Discharge from Cyclopure Pilot treated again by 680 Pilot System prior to discharge

Picture of Inside of Pilot System

Ex Situ Destruction Projects

Introduction to ESTCP/DIU Destruction Projects



Conceptual Hub and Spoke Diagram for Deployment of Commercially Demonstrated PFAS Destructive Technologies

- Demonstration site/s: Third-Party Commercial Partner that will host demonstrations at up to two of their commercially licensed TSDFs
- Demonstration of four developing destructive technologies
  - Three Super Critical Water Oxidation (SCWO) based
  - One Hydrothermal Alkaline Treatment (HALT)
- Anticipated facility upgrades (e.g., electrical, water, etc.) likely needed to host demonstrations simultaneously.
- Waste streams from concentration projects will be leveraged, sent to central site/s, split, and provided to each destructive vendor for treatability treatment and evaluation.
- GOAL – Not only demonstrate effective potential of each technology, but to demonstrate "Hub and Spoke" concept of treatment for PFAS impacted liquid waste streams.

ESTCP/DIU Destruction Projects – Overview

- Projects Overview
  - Initial project meetings and planning underway
  - Destructive Project field deployment will trail Concentration Projects
    - Initial deployment likely late Summer/Fall 2024
  - Facility upgrades being planned and need to be implemented.
  - Regulatory requirements being researched, confirmed, and then completed as appropriate.
  - Concentrated PFAS liquid waste streams from Concentration Projects must be accumulated first for shipment to host site/s for destruction projects.
  - Destructive treatment treatability testing to begin in Late 2024 (Calendar Year) and extend into 1st half of 2025.
  - Liquid wastes (all four vendors) and spent absorbents as slurries (two vendors) will be included in treatability demonstrations.
    - Effective treatment and air emissions to be evaluated and determined by data collected

ESTCP/DIU Destruction Projects – Vendors

Photo Courtesy of Craig Divine (Arcadis) of 374Water's AirSCWO-6 System

Photo of Aquagga's Steed HALT System as provided on company website

Photo Courtesy of Stephen Rosansky (Battelle) of Revive Environmental' s PFAS Annihilator SCWO System

One 3 GPM (11.3 LPM) iSCWO skid

Two 3 GPM transportable iSCWO systems

Modular design allows for rapid setup and start of process operations without the need for complex infrastructure

Photo Courtesy of John Follin (General Atomics) of their Industrial SCWO System

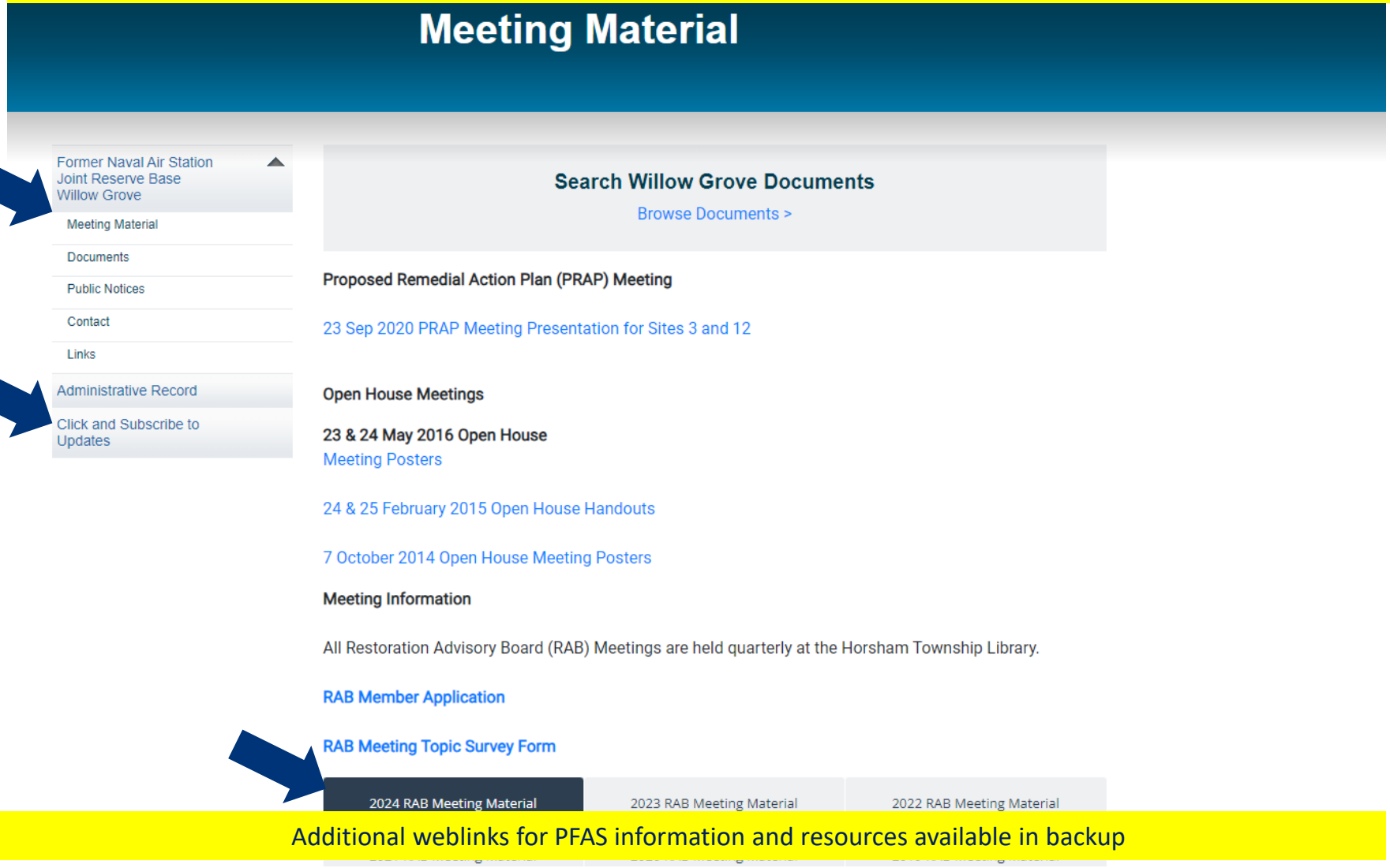
- Destruction Vendors Selected
  - SCWO Technology Vendors
    - Arcadis partnered with 374Water and Clean Earth
    - Battelle partnered with Revive Environmental Technologies, LLC
    - General Atomics partnered with Bay West and AX Nano
  - HALT Vendor
    - Aquagga, Inc.

References: Actual Links to Webpages

- SERDP/ESTCP Homepage - https://serdp-estcp.mil/
- SERDP/ESTCP PFAS/AFFF Research Page - https://serdp-estcp.mil/focusareas/e18ec5da-d0de-47da-99f9-a07328558149/pfas-afff
- Defense Innovation Unit (DIU) Homepage - https://www.diu.mil/
- 2023 ESTCP/DIU Awarded Demonstration Projects Press Release - https://serdp-estcp.mil/newsitems/details/06b6078c-8a2f-47cf-b558-01e427db0150/estcp-and-diu-partner-to-advance-remediation-of-pfas-at-us-defense-installations
- For those Interested Announcement for FY2024 Awarded ESTCP Projects (Added for Interest)
  - https://serdp-estcp.mil/newsitems/details/9af54a44-d44f-4f7a-b67c-4abdfb2dc0a9/estcp-announces-2024-new-project-selections

Additional Information and Resources - Website

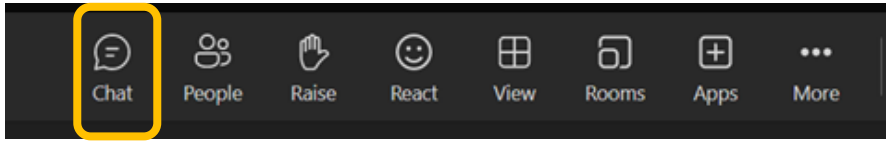
https://www.bracpmo.navy.mil/BRAC-Bases/Northeast/Former-Naval-Air-Station-Joint-Reserve-Base-Willow-Grove/



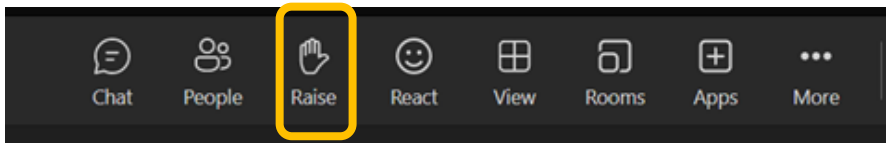
Additional weblinks for PFAS information and resources available in backup

Virtual Attendee Questions

1) To ask a question, select ‘Chat’, then type your question in the text box, and then select Send.



2) Raise your hand to be recognized and have your microphone unmuted. Select ‘Raise your hand’ icon in the meeting controls.



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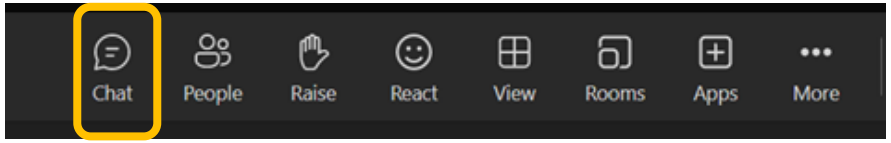

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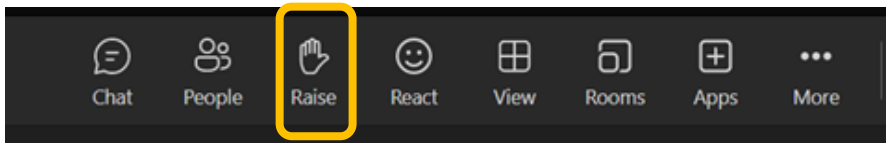

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Environmental Protection Agency and Pennsylvania Department of Environmental Protection Comments

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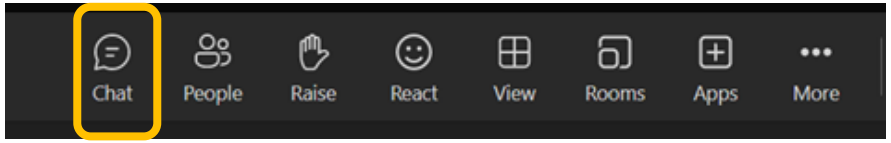

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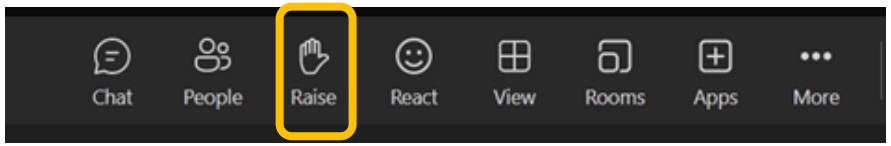

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Next RAB Meeting

Next Restoration Advisory Board (RAB) meeting:
Thursday, July 11, 2024 at 6:00 p.m.
Hybrid Meeting Planned
(Horsham Township Community Center)

Environmental Restoration discussions have concluded.

Health Professional Contact Information

Susan Wood

PADOH
Per and Polyfluoroalkyl Substances (PFAS) Project

c-swood@pa.gov

Dr. Linda Brown

RTI International

lindabrown@rti.org
(301) 816-4626

Thank you for joining the Restoration Advisory Board (RAB) meeting for the former Naval Air Station Joint Reserve Base (NASJRB) Willow Grove and the Biddle Air National Guard Base.

The meeting has concluded.

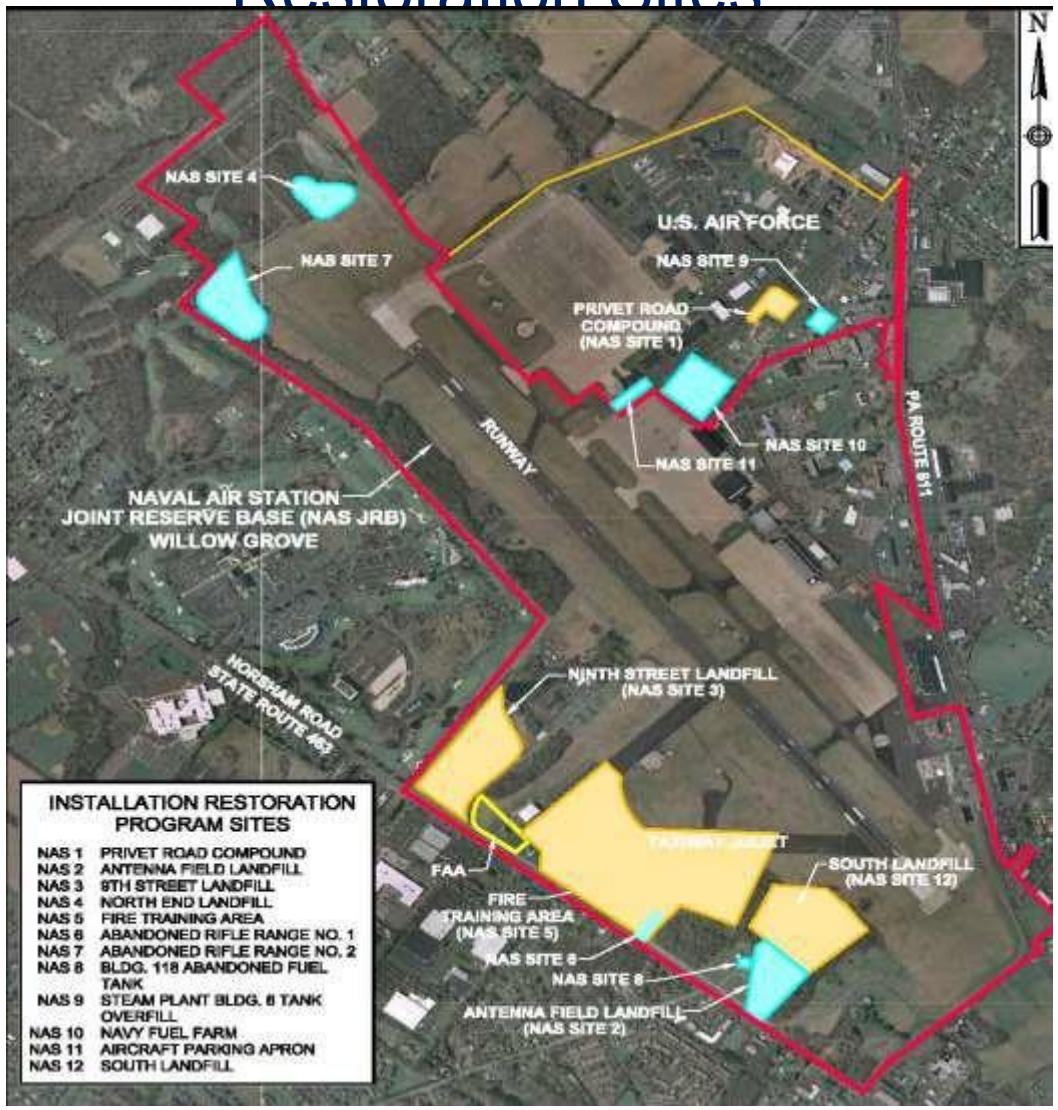
BACKUP / ADDITIONAL INFORMATION

NAVFAC
Naval Facilities Engineering Systems Command

Environmental Restoration Sites

Site	Name	Operable Unit (OU)	Status
2	Antenna Field Landfill	Soil - OU 5 Groundwater - OU 9	No Action ROD Signed June 17, 2010
3	Ninth Street Landfill	Soil - OU 6 Groundwater - OU 10	RI completed October 2011. FS and PRAP completed. ROD was finalized in September 2021. RD was finalized in January 2022. RA is in progress.
4	North End Landfill	. . .	Consensus Agreement for No Action Jan. 2009
5	Fire Training Area	Soil - OU 4 Groundwater - OU 2	Soil (OU 4) NFA ROD signed September 2007 Groundwater (OU 2) ROD signed September 2012 Groundwater (OU 2) RACR signed September 2014 Groundwater (OU 2) Final OPS and OM&M Plan May 2015
6	Abandoned Rifle Range No. 1	. . .	Consensus Agreement for No Action December 2007
7	Abandoned Rifle Range No. 2	. . .	Consensus Agreement for No Action August 2008
8	Building 118 Abandoned Fuel Tank	. . .	NFA Agreement October 2006
SSA 11	Aircraft Parking Apron	. . .	Eliminated From Consideration
12	South Landfill	OU 11 (Soil)	Final RI Feb. 2014. FS and PRAP completed. ROD in progress. ROD was finalized in October 2021. RD was finalized in January 2022. RA is in progress.
		OU TBD (Groundwater)	RI is still in progress.
PFCs/PFAS	Perflourinated Compounds/Per- and Polyfluoroalkyl substances	OU 12	TCRA September 2015, Final PA/SI Mar. 2016. RI phase I completed 2019. RI phase II in progress.

NASJRB Willow Grove
Environmental Restoration Sites



PFOA / PFOS Background

- In mid-2014, PFAS known as perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) were found in public drinking water wells near NASJRB Willow Grove through an EPA program known as the Unregulated Contaminant Monitoring Rule (UCMR).
- The health advisory levels at that time were 0.4 micrograms per liter (µg/L), or 400 parts per trillion (ppt), for PFOA and 0.2 µg/L, or 200 ppt, for PFOS.
- PFOA/PFOS are man-made chemicals used in many products, including fire-fighting solutions known as aqueous film-forming foam (AFFF), which were used at NASJRB Willow Grove.
- In the summer of 2014, the Navy began sampling for PFOA/PFOS in private drinking water wells and worked with Horsham Water and Sewer Authority (HWSA) on the municipal drinking water wells.

PFOA / PFOS Background *(cont.)*

- In May 2016, the Environmental Protection Agency established a lifetime Health Advisory (HA) level of 70 ppt (0.07 µg/L) for combined PFOA and PFOS.
- The Navy's priority continues to be eliminating exposure to
- PFOA/PFOS above health advisory levels in drinking water.
- Any health concerns should be addressed with your health professional. Weblinks to health information is provided at the end of this presentation.

Removal (Interim) Actions for PFOA / PFOS

- PFOA and PFOS above the EPA provisional health advisory (PHA) levels in drinking water sources (2015). The PHA levels were 0.4 µg/L, or 400 ppt, for PFOA and 0.2 µg/L, or 200 ppt, for PFOS.
- PFOA and PFOS above the EPA lifetime health advisory levels in private drinking water sources (2017).
- PFOA and PFOS above the EPA lifetime health advisory levels in municipal drinking water sources (2017).
- Removal of soils containing PFOS exceeding project screening levels (2018).
- Other interim actions to reduce PFOA and PFOS in drinking water sources are being considered.

The interim action memorandums are available in the administrative record

Phase I PFAS Investigation Summary

- Soil, groundwater, and surface water samples were collected in potential sources area.
- Human health screening assessment:
  - PFOS or PFOA sample results exceeding screening levels were detected in the soil, groundwater, and surface water.
  - PFBS sample results did not previously exceed screening levels for soil, groundwater, and surface water. However, PFBS sample results exceed the new screening level in groundwater based on updated toxicity values (May 2021)

Download available from Administrative record or the Horsham Township Library Information Repository

Phase I PFAS Investigation Summary (cont.)

- Ecological screening assessments:
  - Screening levels for PFAS have not been developed by EPA, so the Navy identified criteria and performed the screening assessment based on a review of available literature. Screening levels were updated in January 2021 with new data available.
  - In sediments:
    - PFOA exceeds screening levels for invertebrate and wildlife.
    - PFOS exceeds screening levels for wildlife at one location.
  - In surface water:
    - PFOS exceeds screening levels for aquatic organisms and wildlife.
  - In soil:
    - PFOS exceeds screening levels.

Phase II PFAS Investigation

PlumeStop Design Verification Test (DVT)

- A workplan for a PlumeStop Design Verification Test (DVT) at the Northern Ponding Area was submitted to the EPA and PADEP in January 2020. The purpose of the study is to evaluate the feasibility of PlumeStop as a permeable reactive barrier (PRB) along the Keith Valley Road property line.
- PlumeStop is an in-situ (in ground) technology composed of very fine particles of activated carbon suspended in water using unique organic polymer dispersion chemistry.
- The test is planned for a phased approach:
  - Phase I - Overburden groundwater and soil study
  - Phase II - PlumeStop injection test
- Phase I occurred in late March 2020. A draft technical memo summarizing Phase I results and the revised workplan for the injection test is currently under regulatory review.

Stormwater System Evaluation

- The NASJRB storm water system was evaluated to locate portions where PFAS impacted groundwater may infiltrate and discharge to surface water. Over four miles of storm sewer lines reviewed, using remote video inspections.
- A Tech Memo with recommended repairs was finalized in July 2020.
  - Joint Rehabilitation on 6,136 LF of concrete pipe (cleaning, joint sealing, testing)
  - Abandonment of four pipes and three structures
  - Replacement of 201 LF of 24” metal pipe
- Repairs were completed in October 2021.

PFAS Information and Resources

Department of the Navy (DON) Perfluorinated Compounds (PFC)/PFAS website
https://www.secnav.navy.mil/eie/Pages/PFAS_Home.aspx

NAVFAC BRAC PMO Websites (includes links to environmental information and the administrative record):

https://www.bracpmo.navy.mil/BRAC-Bases/Northeast/Former-Naval-Air-Station-Joint-Reserve-Base-Willow-Grove/Documents/

https://www.bracpmo.navy.mil/BRAC-Bases/Northeast/Former-Naval-Air-Warfare-Center-Warminster/Documents/

A subscription service is available on the BRAC PMO websites to receive e-mail notification of new information.

PFAS Information and Resources (continued)

Environmental Protection Agency

https://www.epa.gov/pfas

Agency for Toxic Substances and Disease Registry

https://atsdr.cdc.gov/pfas/index.html

Pennsylvania Department of Environmental Protection

https://www.dep.pa.gov/Citizens/My-Water/drinking_water/Pages/default.aspx

Horsham Township

https://horsham.org/

Warminster Township

https://warminstertownship.org/

PFAS Information and Resources (continued)

Horsham Water and Sewer Authority

https://www.horshamwater-sewer.com

Warminster Township Municipal Authority

https://www.warminsterauthority.com/

Warwick Township Water and Sewer Authority

https://wtwsa.org/

Pennsylvania Department of Health

https://www.health.pa.gov/topics/envirohealth/Pages/PFAS.aspx

Participation in DoD Funded PFAS Research

- SERDP/ESTCP are DoD-funded environmental research programs.
- NAWC Warminster and NASJRB Willow Grove is supporting ~$9M of SERDP/ESTCP funded research investigating new PFAS assessment and remediation technologies.
- Will continue to seek participation in additional SERDP/ESTCP work at NASJRB Willow Grove or nearby NAWC Warminster.
- Participate in other Navy or USEPA funded research.

SERDP/ESTCP Projects and organizations leading the research:

- **Soil or Groundwater Treatment**
  13 Total Projects Participated, projects since last RAB
  - ER18-1300 –College of Wooster
    Completed pilot column study with new absorption media in March/April 2020.
  - ER18-1063 – Colorado School of Mines
    Pilot column testing of different commercial resins to commence in late June at WG
- **Passive Treatment of Storm Water**
  - ER18-1230 –Oregon St. Univ.
- **Assessment of Fate and Transport of PFAS in Surface Water**
  - ER19-1073 (New Start) –Academy of Natural Sciences of Drexel University
  - ER19-1193 (New Start and potential participation) –Towson State University

DoD's SERDP/ESTCP PFAS website:

https://map.serdp-estcp.org/Featured-Initiatives/Per-and-Polyfluoroalkyl-Substances-PFASs/pfas_efforts.pdf

EE/CA SUMMARY

Per- and Polyfluoroalkyl Substances Groundwater Remediation

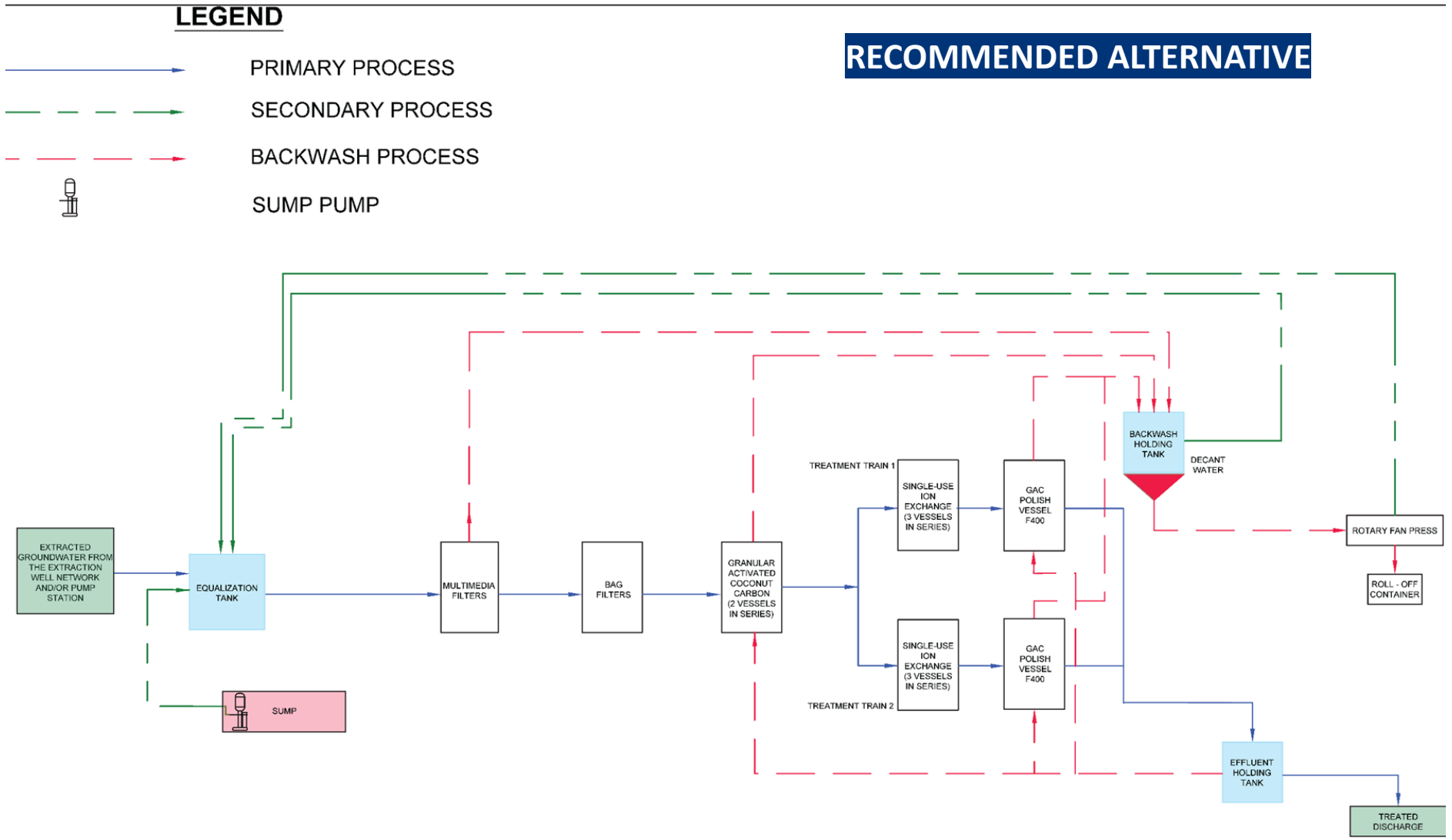
Building 680 and Site 5 – Former Fire Training Area

Former Naval Air Station Joint Reserve Base Willow Grove
Horsham Township, Pennsylvania

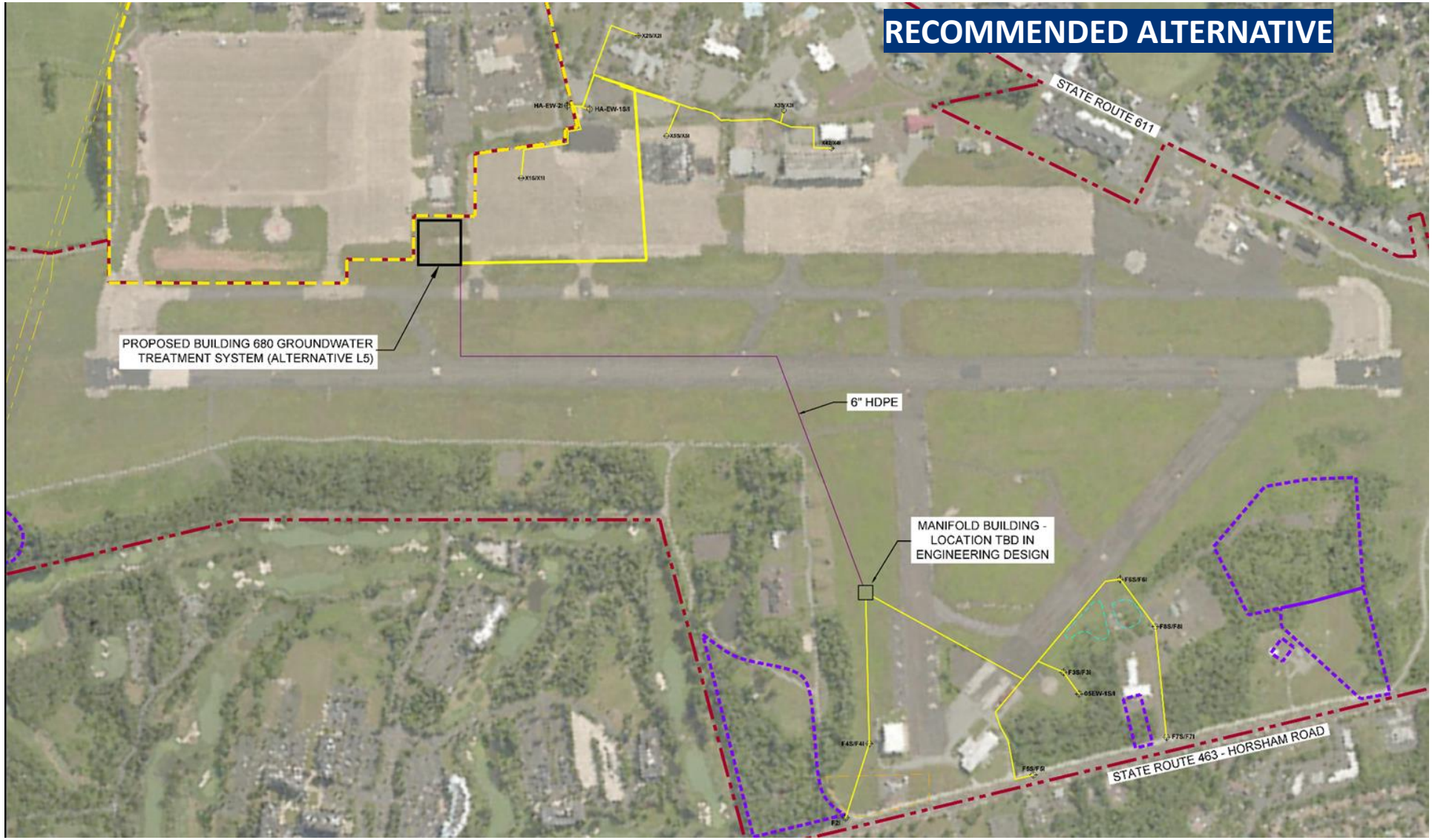
EE/CA Alternatives Evaluation

- An Engineering Evaluation / Cost Analysis (EE/CA) was conducted for alternatives to address PFAS in groundwater.
- The EE/CA considered groundwater remediation alternatives for treatment type, building location, and discharge location.
- Recommended alternatives included:
  - Alternative T3 - Treatment system using GAC and single-use ion exchange (IX) resin
  - Alternative L5 - One GWTS building constructed at the North Ramp and one manifold building constructed at IR Site 5
  - Alternative D4 - Discharge to Park Creek via a new piping system (not relying to the existing system)

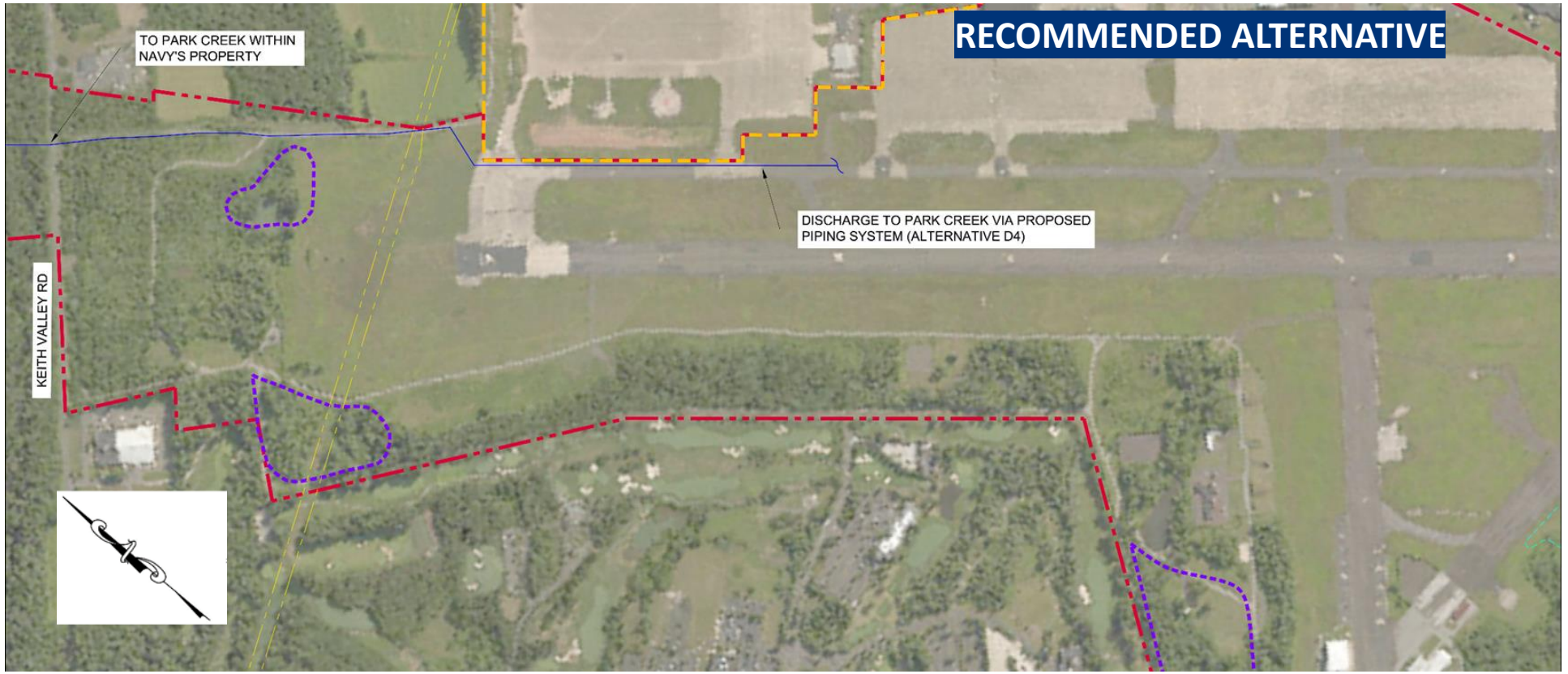
Alternative T3: Treatment System using GAC and Single-Use IX Resin



Alternative L5: GWTS and Manifold Building Locations



Alternative D4: Discharge to Park Creek via a new piping system



Alternative T3 - Net Present Worth Treatment Alternative Cost Alternatives Summary

	D1	D2	D3	D4	D5
L1	$ 57,123,540	$ 56,918,984	$ 57,640,708	$ 56,979,488	$ 59,156,869
L2	$ 46,248,509	$ 46,043,953	$ 46,765,677	$ 46,104,457	$ 48,281,838
L3	$ 46,245,856	$ 46,041,300	$ 46,763,024	$ 46,101,804	$ 48,279,185
L4	$ 45,475,013	$ 45,270,457	$ 45,992,181	$ 45,330,961	$ 47,508,342
L5	$ 45,005,881	$ 44,801,326	$ 45,523,050	$ 44,861,830	$ 47,039,211