



Installation Restoration Program



Air Force Civil Engineer Center

Air Force Civil Engineer Center (AFCEC) Emerging Contaminants Update

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JBCC Cleanup Team Meeting

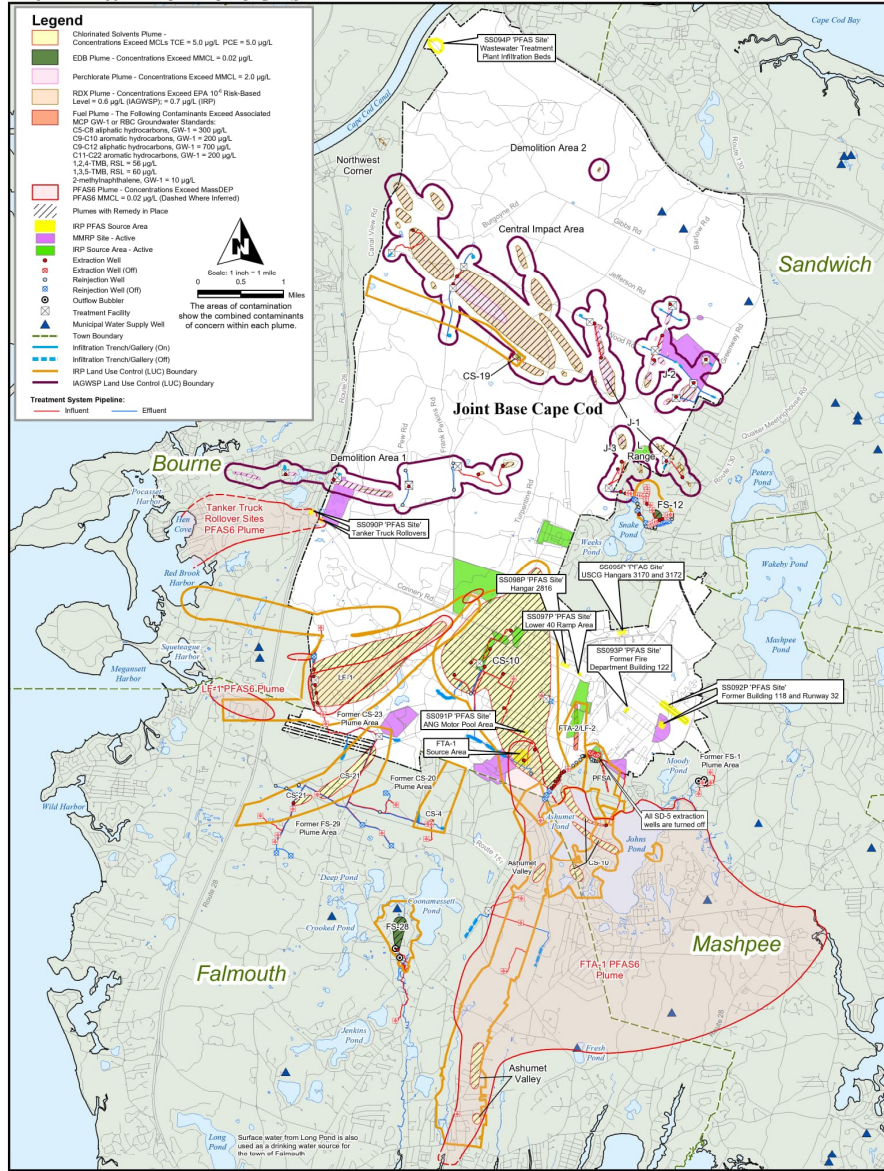
13 November 2024

Update on Deliverables:

- Fire Training Area-1 (FTA-1) – Explanation of Significant Differences (ESD) for Per- and Polyfluoroalkyl Substances (PFAS)
- Tanker Truck Rollover Sites (TTRS) – Supplemental Remedial Investigation/ Supplemental Feasibility Study (RI/FS) for PFAS
- Landfill-1 (LF-1) – ESD for 1,4-Dioxane and PFAS

Field Program Progress:

- Flight Line Area Operable Unit (OU) – RI for PFAS
 - Air National Guard Motor Pool
 - Former Building 118 - Runway 32
 - Lower 40 Ramp Area
 - Army Helicopter Hangar 2816, and
 - Western Flight Line Area



Legend

- Chlorinated Solvents Plume - Concentrations Exceed MCL: TCE = 5.0 µg/L, PCE = 5.0 µg/L
- EDB Plume - Concentrations Exceed MMCL = 0.02 µg/L
- Perchlorate Plume - Concentrations Exceed MMCL = 2.0 µg/L
- RDX Plume - Concentrations Exceed EPA 10⁴ Risk-Based Level = 0.9 µg/L (AGWSP) = 0.7 µg/L (RRP)
- Fuel Plume - The Following Contaminants Exceed Associated MCP GW-1 or RBC Groundwater Standards:
 - CS-C8 aliphatic hydrocarbons, GW-1 = 200 µg/L
 - CS-C10 aromatic hydrocarbons, GW-1 = 200 µg/L
 - CS-C12 aliphatic hydrocarbons, GW-1 = 700 µg/L
 - C11-C22 aromatic hydrocarbons, GW-1 = 200 µg/L
 - 1,2,4-TMB, RSL = 56 µg/L
 - 1,3,5-TMB, RSL = 60 µg/L
 - 2-methylnaphthalene, GW-1 = 10 µg/L
- PFAS Plume - Concentrations Exceed MassDEP PFAS MCL = 0.02 µg/L (Dashed Where Inferred)
- Plumes with Remedies in Place
- IRP PFAS Source Area
- MRRP Site - Active
- RP Source Area - Active
- Extraction Well
- Injection Well (OI)
- Rejection Well (OI)
- Rejection Well (OI)
- Outflow Bubbler
- Treatment Facility
- Municipal Water Supply Well
- Town Boundary
- Infiltration Trench/Gallery (OI)
- Infiltration Trench/Gallery (OI)
- IRP Land Use Control (LUC) Boundary
- IAGWSP Land Use Control (LUC) Boundary

Treatment System Pipeline:

- Influent
- Effluent

Scale: 1 inch = 1 mile
0 0.5 1 Miles

The areas of contamination show the combined contaminants of concern within each plume.

| Contaminant of Concern (COC) | Type of Contaminant | Risk-Based Level |
|---|-----------------------|---|
| TCE = trichloroethene | solvent | MCL = 5 µg/L |
| PCE = perchloroethene | solvent | MCL = 5 µg/L |
| CCl ₄ = carbon tetrachloride | solvent | MCL = 5 µg/L |
| EDB = ethylene dibromide | fuel-related compound | MMCL = 0.02 µg/L |
| benzene | fuel-related compound | MCL = 5 µg/L |
| 1,1,2,2-tetra-1,1,2,2-tetrachloroethane | solvent | MCL = 2 µg/L |
| 1,4-DCB = 1,4-dichlorobenzene | solvent | MMCL = 5 µg/L |
| Mn = manganese | metal | EPA Health Advisory = 300 µg/L |
| halium | metal | MCL = 2 µg/L |
| lead | metal | 15 µg/L (treatment technique action level for water distribution systems) |
| toluene | fuel-related compound | MCL = 1,000 µg/L |
| RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine | explosive | HA = 2 µg/L GW = 1 µg/L 10 ⁴ = 0.6 µg/L (AGWSP) = 0.7 µg/L (RRP) |
| perchlorate | oxidizer | MMCL = 2 µg/L HA = 15 µg/L |
| CS-C8 aliphatic hydrocarbons | fuel-related compound | GW-1 = 200 µg/L |
| CS-C10 aromatic hydrocarbons | fuel-related compound | GW-1 = 200 µg/L |
| CS-C12 aliphatic hydrocarbons | fuel-related compound | GW-1 = 700 µg/L |
| C11-C22 aromatic hydrocarbons | fuel-related compound | GW-1 = 200 µg/L |
| 1,2,4-TMB | fuel-related compound | RSL = 56 µg/L |
| 1,3,5-TMB | fuel-related compound | RSL = 60 µg/L |
| 2-methylnaphthalene | fuel-related compound | GW-1 = 10 µg/L |
| 1,4-dioxane | solvent | RG = 0.06 µg/L |

Joint Base Cape Cod Groundwater Plume Map, and IRP and IAGWSP LUC Areas

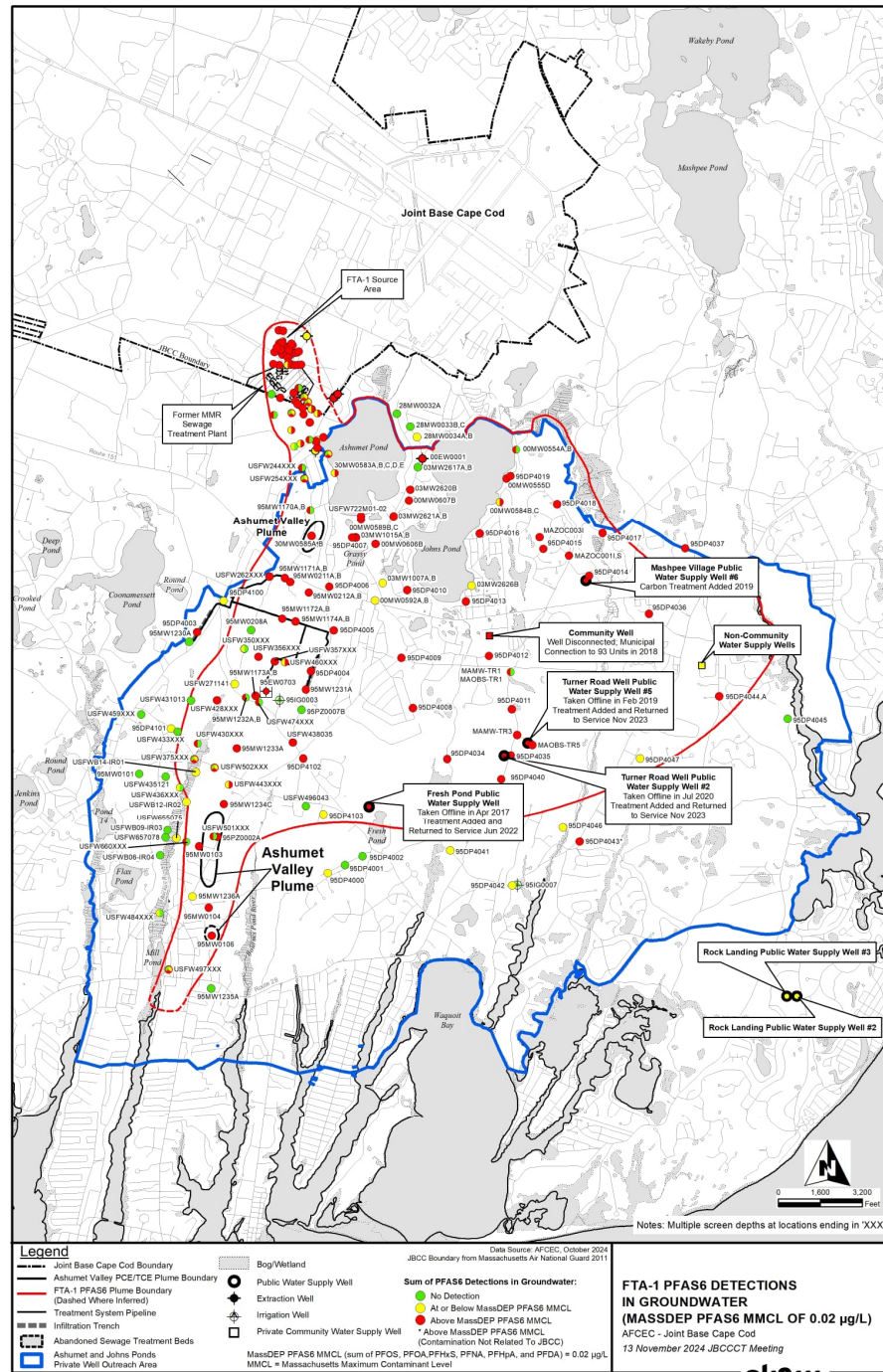
Issued October 2024

Note: MCL = Maximum Contaminant Level
 MMCL = Massachusetts Maximum Contaminant Level
 HA = Federal Lifetime Health Advisory
 PFAS = Per- and Polyfluoroalkyl substances
 GW-1 = State default cleanup value to be used in lieu of site-specific risk-based level
 10⁴ = EPA level resulting in an excess cancer risk of one in a million
 RG = Site Specific Risk Based Remediation Goal
 RSL = Regional Screening Level

FTA-1 Supplemental RI/FS Summary:

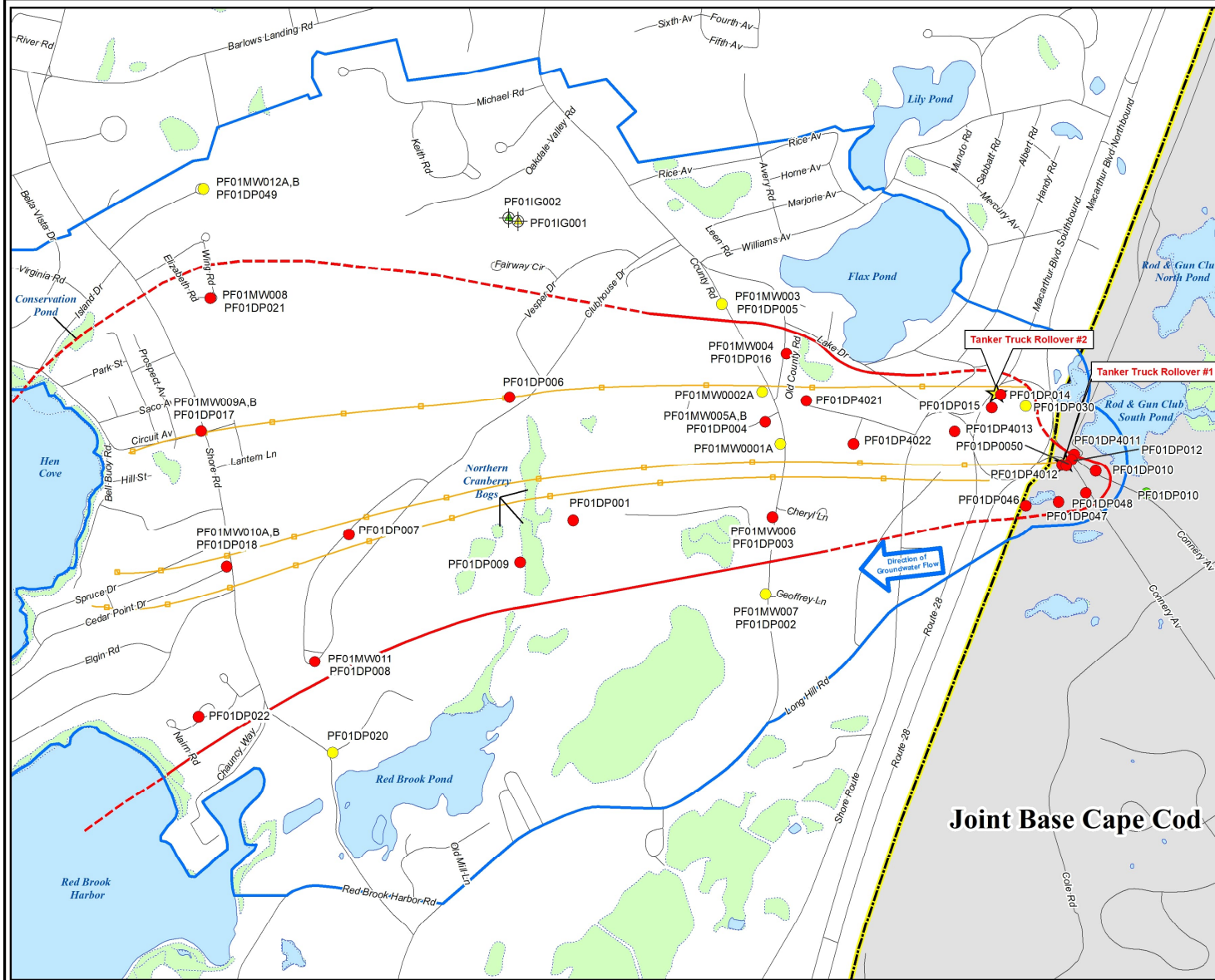
- Previously referred to as Ashumet Valley, source areas include the former FTA-1 and former base Sewage Treatment Plant (STP); application of aqueous film-forming foam (AFFF) during fire training activities at FTA-1 is the primary source for the PFAS contamination.
 - 1,4-Dioxane is not detected above the EPA Regional Screening Level in groundwater and is not a contaminant of concern.
- *Final Supplemental RI Report for 1,4-Dioxane and PFAS at FTA-1* was submitted 02 Apr 2024.
- *Draft ESD for PFAS at FTA-1* was prepared to modify the current remedy to implement an interim remedy for PFAS contamination in groundwater and was submitted to the agencies for review on 05 Apr 2024
 - MassDEP comments were received on 14 May 2024; EPA comments were received on 16 Jul 2024 and additional EPA comments regarding Federal Maximum Contaminant Level (MCLs) for PFAS¹ are pending; Response to Comments Letter (RCL) is in preparation.

¹ Groundwater plumes are currently defined by the Massachusetts Maximum Contaminant Level (MMCL) drinking water standard of 20 nanograms per liter (ng/L) (0.02 micrograms per liter [µg/L]) for the sum of six PFAS (PFAS6) compounds: Perfluorooctane Sulfonic Acid (PFOS), Perfluorooctanoic Acid (PFOA), Perfluorononanoic Acid (PFNA), Perfluorohexane Sulfonic Acid (PFHxS), Perfluoroheptanoic Acid (PFHpA), and Perfluorodecanoic Acid (PFDA).



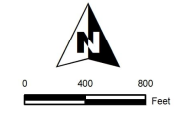
TTRS RI/FS Summary:

- The source of the PFAS was the application of AFFF as part of an emergency response to two tanker truck rollovers at or near the Route 28 traffic rotary in 1997 and 2000.
- Memorandum of Resolution (MOR) for the *Revised Draft RI Report for PFAS at TTRS* was submitted to the agencies on 30 Nov 2023; received EPA comments on 21 Dec 2023 and AFCEC responded via email on 21 Dec 2023; received MassDEP comments on 06 May 2024.
 - Supplemental comments from EPA were received on 30 Jul 2024 concurring with the plan to finalize the TTRS RI Report based on the PFAS6 Massachusetts MCL (MMCL) and to address Federal PFAS MCLs in the TTRS FS.
 - Resolution meeting was held on 28 Aug 2024 and MOR2 is in preparation.



Legend

- Outreach Area
 - ★ Tanker Truck Rollover Site
 - Joint Base Cape Cod Boundary
 - Particle Track With 1-Year Time Markers
 - TTRS PFAS6 Plume Boundary (Dashed Where Inferred)
 - ⊕ Irrigation Well
- Sum of PFAS6 Detections in Groundwater**
- PFAS6 = 0
 - PFAS6 Greater Than 0 and At or Below MMCL
 - PFAS6 Above MMCL
- MassDEP PFAS6 MMCL (sum of PFOS, PFOA, PFHxS, PFNA, PFHpA, and PFDA) = 0.02 µg/L
 MMCL = Massachusetts Maximum Contaminant Level



Data Source:
 AFCEC, October 2024
 JBCC Boundary from Massachusetts Air National Guard 2011

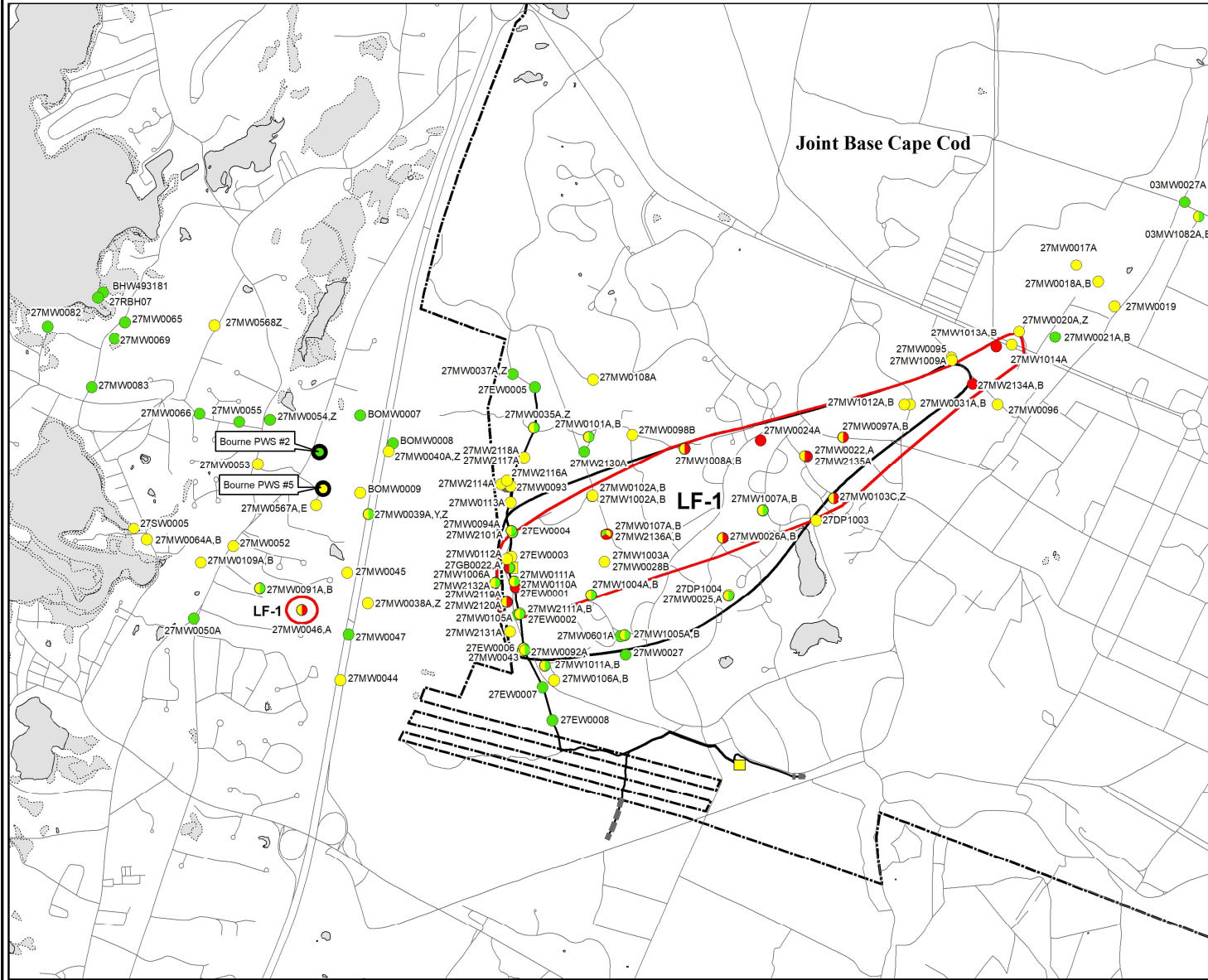
Joint Base Cape Cod

**TANKER TRUCK ROLLOVER SITES PFAS6
 DETECTIONS IN GROUNDWATER**
 AFCEC - Joint Base Cape Cod
 13 November 2024 JBCCCT Meeting



LF-1 Supplemental FS:

- A Supplemental FS was prepared at LF-1 to evaluate remedial alternatives for 1,4-dioxane and PFAS contamination in groundwater.
- Three alternatives were evaluated for PFAS and 1,4-dioxane: no additional action, existing remedial system with monitored natural attenuation (MNA) and land use controls (LUCs), and existing system supplemented by two additional extraction wells in the main body of the plume with MNA and LUCs.
- *Final LF-1 Focused Supplemental Feasibility Study Report for 1,4-Dioxane and PFAS at Landfill-1* was submitted to the agencies on 21 Dec 2023.
- *Draft Explanation of Significant Difference for 1,4-Dioxane and PFAS at Landfill-1, JBCC, MA* was submitted to the agencies on 19 Dec 2023; received agency comments in Feb 2024 and submitted the RCL on 11 Mar 2024; received one EPA comment on 27 Mar 2024 and MassDEP comments are overdue.
 - Supplemental comments from EPA were received on 02 Aug 2024 requesting AFCEC prepare a technical memorandum to incorporate the PFAS Federal MCLs into the analysis of alternatives from the Supplemental FS and to prepare a revised Draft ESD.

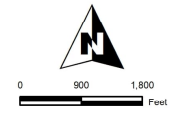


- Legend**
- Joint Base Cape Cod Boundary
 - LF-1 VOC Plume Boundary
 - 1,4-Dioxane Plume Boundary
 - ▨ Infiltration Trench/Gallery
 - Treatment System Pipeline
 - Treatment Facility
 - ▨ Bog/Wetland
 - ◆ Extraction Well (On)
 - Public Water Supply Well

1,4-Dioxane Detections in Groundwater:

- No Detections
- Detection Below or At EPA RG
- Detection Above EPA RG

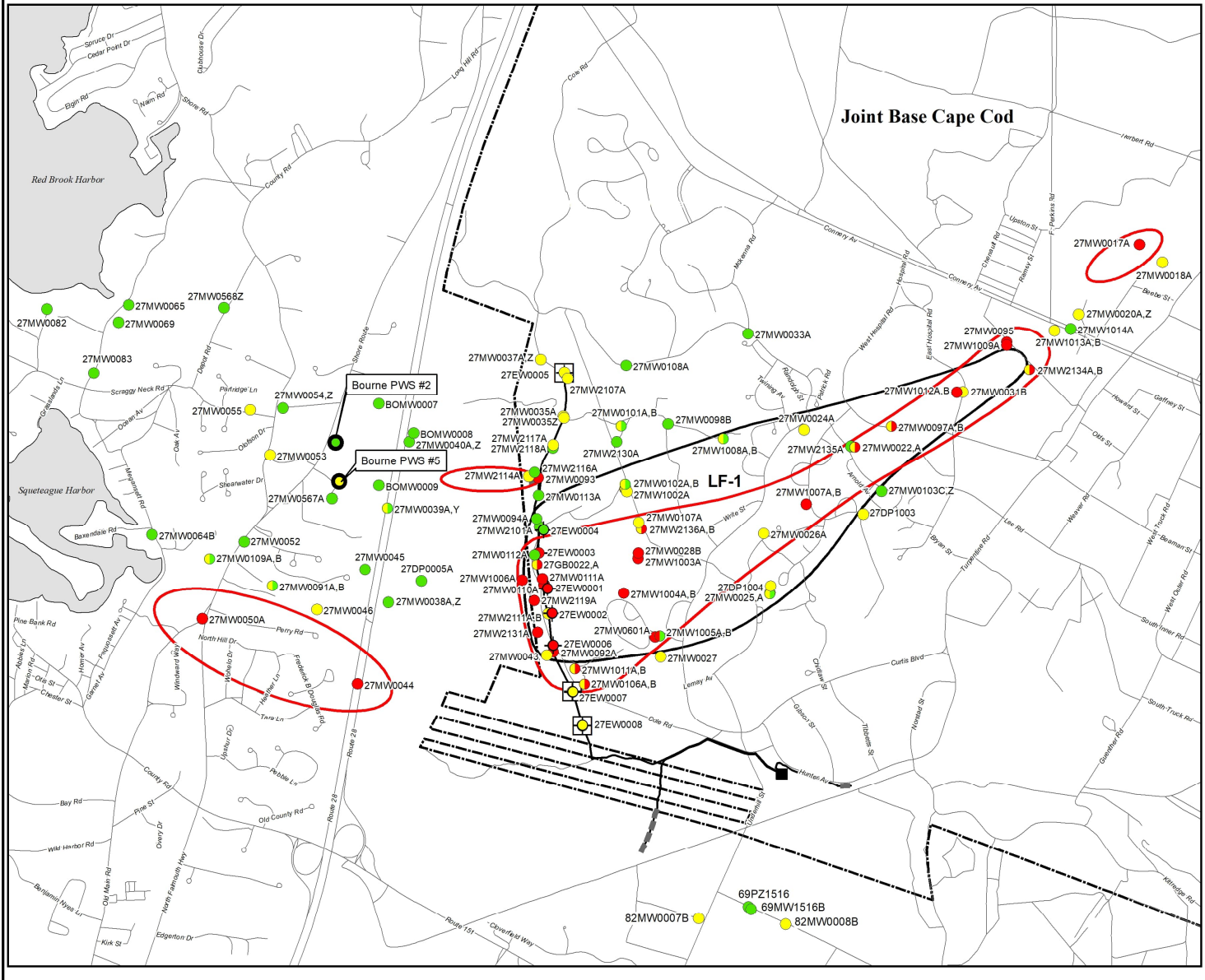
1,4-Dioxane EPA Site-Specific Risk Based Remediation Goal (RG) = 0.46 µg/L



Data Source: AFCEC, October 2024
JBCC Boundary from Massachusetts Air National Guard 2011

**LF-1 1,4-DIOXANE
DETECTIONS IN GROUNDWATER**
AFCEC - Joint Base Cape Cod
13 November 2024 JBCCCT Meeting





Legend

- Joint Base Cape Cod Boundary
- LF-1 VOC Plume Boundary (Dashed Where Inferred)
- LF-1 PFAS6 Plume Boundary
- Infiltration Trench/Gallery
- Treatment System Pipeline
- Treatment Facility
- Bog/Wetland
- Extraction Well (On)
- Extraction Well (Off)
- Public Water Supply Well

Sum of PFAS6 Detections in Groundwater:

- No Detections
- At or Below MassDEP PFAS6 MMCL
- Above MassDEP PFAS6 MMCL

MassDEP PFAS6 MMCL (sum of PFOS, PFOA, PFHxS, PFNA, PFHpA, and PFDA) = 0.02 µg/L
 MMCL = Massachusetts Maximum Contaminant Level

Note: Samples collected prior to January 2021 did not include PFDA in the PFAS analyte list.

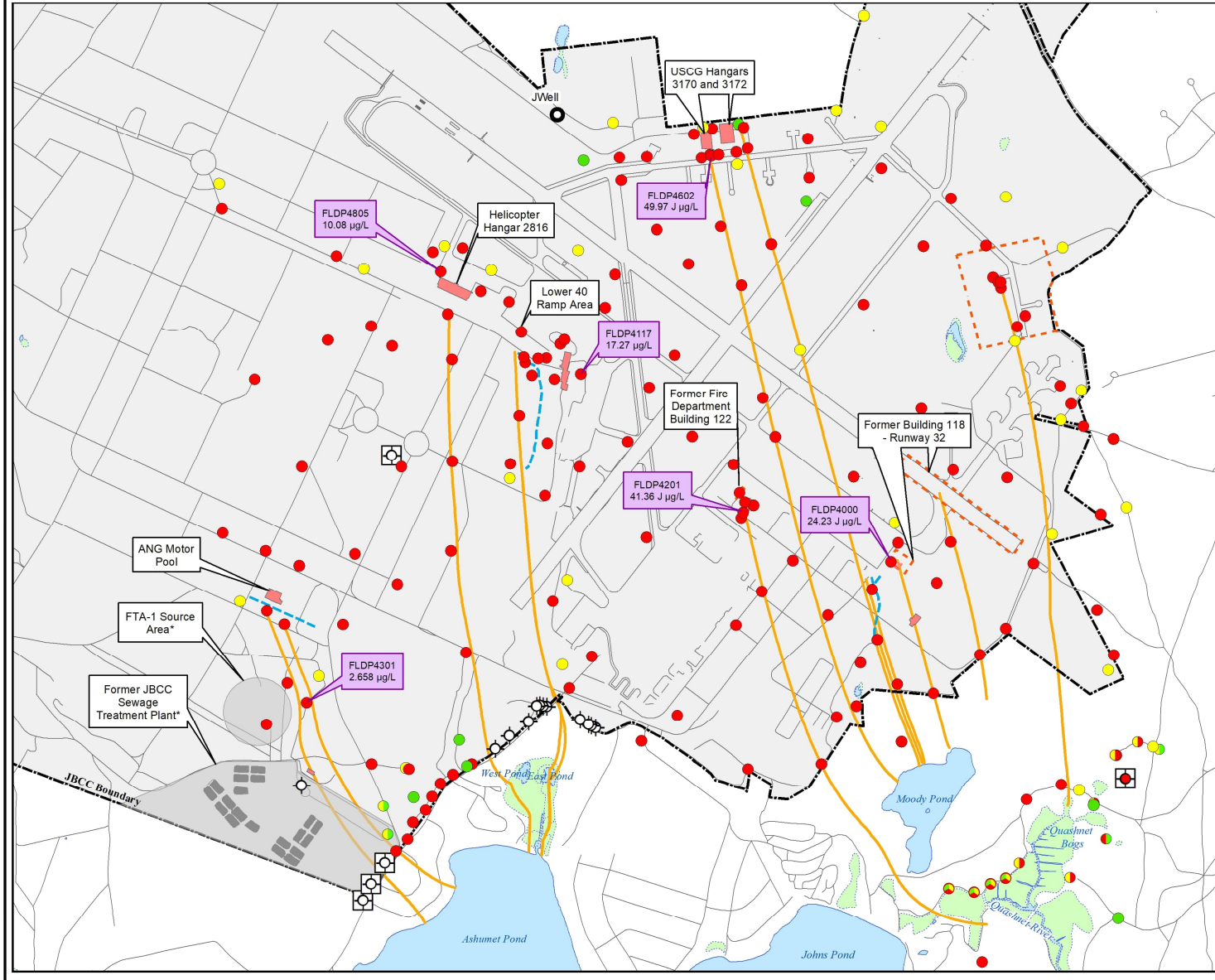
LF-1 PFAS6 DETECTIONS IN GROUNDWATER
 AFCEC - Joint Base Cape Cod
 13 November 2024 JBCCCT Meeting



Flight Line Area RI:

- An RI is in process at six Flight Line Area sites collectively referred to as the Flight Line Area OU; field program includes groundwater, soil, surface water, and sediment sampling.
 - Air National Guard Motor Pool
 - Former Building 118 - Runway 32
 - Former Fire Department Building 122
 - Coast Guard Hangars 3170 and 3172
 - Lower 40 Ramp Area
 - Army Helicopter Hangar 2816

- RI field work was completed at the following sites since the 17 July 2024 JBCCCT meeting:
 - Air National Guard Motor Pool
 - Former Building 118 - Runway 32
 - Lower 40 Ramp Area
 - Army Helicopter Hangar 2816
 - Western Flight Line Area



Legend

- Groundwater Model Particle Track
- Storm Drainage Ditch
- Approximate Site Boundary
- Joint Base Cape Cod Boundary
- Existing Structure
- Former Structure
- Abandoned Cranberry Bog/Wetland
- Abandoned Sewage Treatment Beds
- Public Water Supply Well
- Extraction Well (Off)
- Reinjection Well (On)
- Reinjection Well (Off)

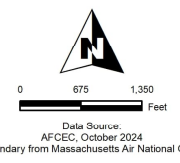
49.97 J µg/L
Highest PFAS6 Concentration in Groundwater (µg/L) Detected to Date During RI

Sum of PFAS6 Detections in Groundwater From Flight Line Area Site Inspections:

- PFAS6 = 0
- PFAS6 Greater Than 0 and At or Below the MMCL
- PFAS6 Above the MMCL

MassDEP PFAS6 MMCL (sum of PFOS, PFOA, PFHxS, PFNA, PFHpA, and PFDA) = 0.02 µg/L
MMCL = Massachusetts Maximum Contaminant Level

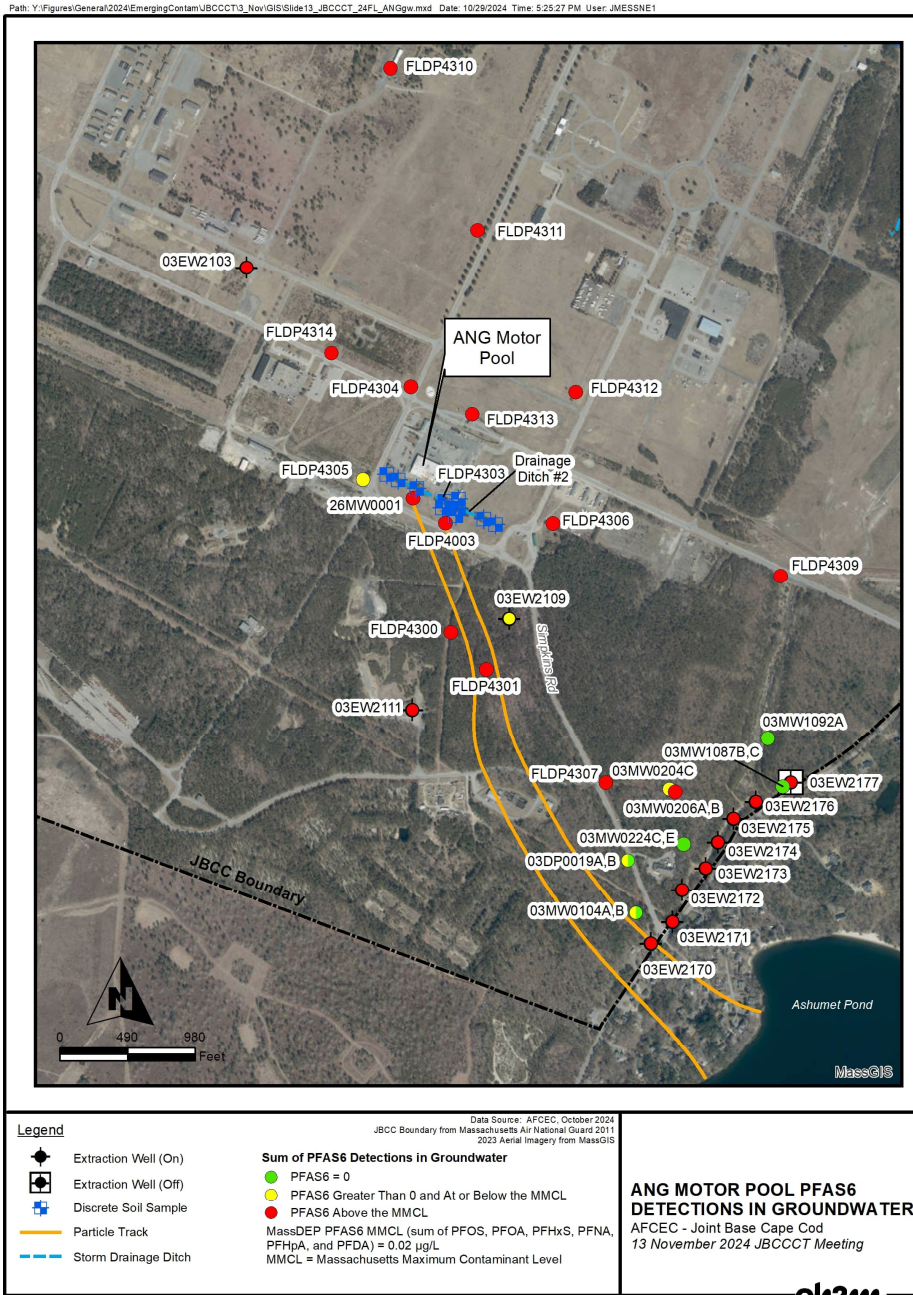
*Sites Being Investigated Under the FTA-1 Remedial Investigation



FLIGHT LINE OPERABLE UNIT SITES
AFCEC - Joint Base Cape Cod
13 November 2024 JBCCCT Meeting

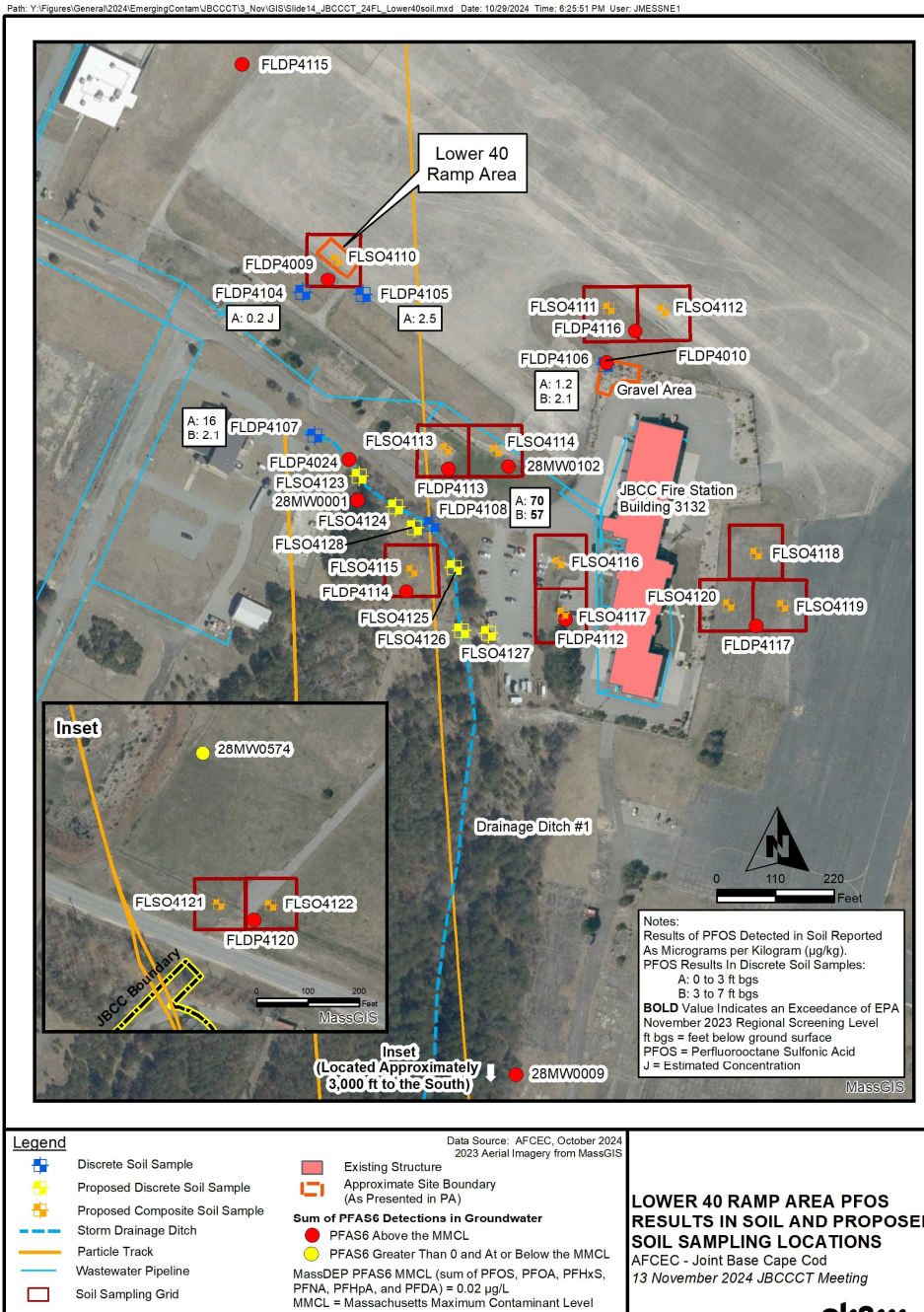


Flight Line OU RI - ANG Motor Pool:



- Jet propulsion-4 fuel spilled from a 5,000-gallon refueler truck at the Vehicle Maintenance Building in 1984 and AFFF was applied as a response action.
- Collected groundwater samples from 8 borings, 10 extraction wells, and 13 monitoring wells; highest PFAS6 concentration is 2,658 nanograms per liter (ng/L) (2.658 micrograms per liter [µg/L]) in boring FLDP4301 which is located to the south and downgradient of the source area.
- PFAS6 groundwater contamination extends to the base boundary and the Chemical Spill-10 Sandwich Road extraction fence.
- Five additional RI groundwater vertical profile borings were completed for further definition of the extent of groundwater contamination; results indicate there are potentially several different unknown source areas located near and to the north of the ANG Motor Pool source area.

Flight Line Area OU RI - Lower 40 Ramp Area:



- AFFF was stored at the current Fire Station; hoses containing residual AFFF were flushed to the ground surface after responding to emergencies; and accidental releases of AFFF occurred during training.
- Soil samples were collected at five borings in 2019/2020. Four additional soil borings near Drainage Ditch #1 were identified for further definition of the extent of soil contamination and 13 composite soil sampling areas were selected to attempt to locate potential releases contributing to water table contamination observed in nearby groundwater borings. Sampling is ongoing.
- PFOS is the predominant PFAS, and highest PFOS soil concentration is 530 ng/g (530 µg/kg) at FLSO4126, located near Drainage Ditch #1. Additional sample locations are planned within/near Drainage Ditch #1 to the south of this boring.

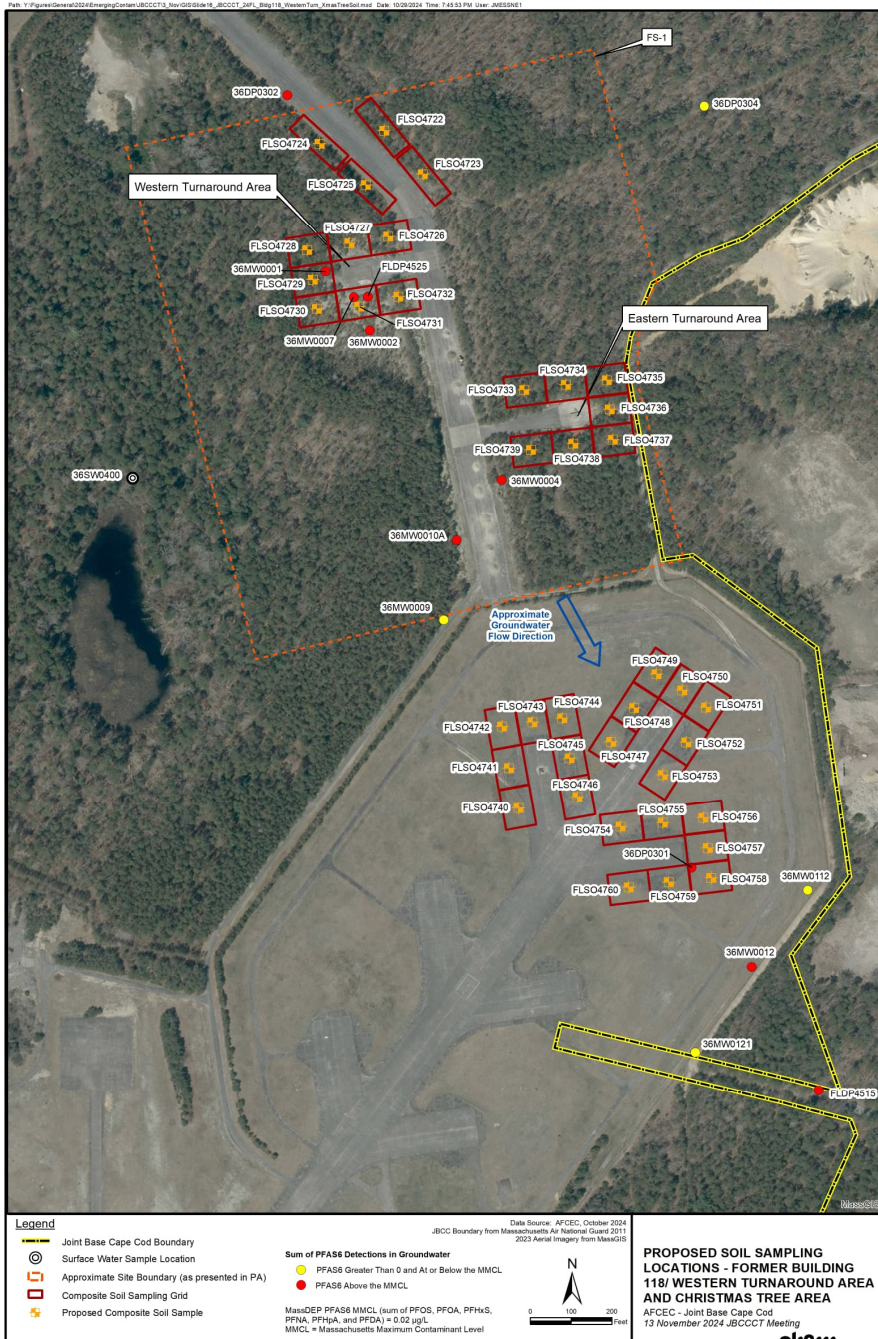


Flight Line Area OU RI - Former Building 118 and Runway 32:



- Time and distance testing was conducted annually for 10 years, and the area was used to flush hoses containing residual AFFF after responding to emergencies; area was expanded to include PFAS contamination to the east.
- Groundwater results from RI borings located to the north of the aircraft turnaround indicate an AFFF releases may have happened on the northern runway.
- Sixteen areas were selected for composite soil sampling adjacent to paved areas at the end of the northern runway to attempt to locate potential releases contributing to water table contamination observed in groundwater borings located near the runway.
- PFOS was the predominant PFAS in soil and the highest concentrations, 1.1 and 0.93 ng/g (1.1 and 0.93 µg/kg) were detected at FLSO4710 and FLSO4721, respectively, which are located to the south near the intersection of the two-access roads; additional discrete soil sampling is planned in these two areas.

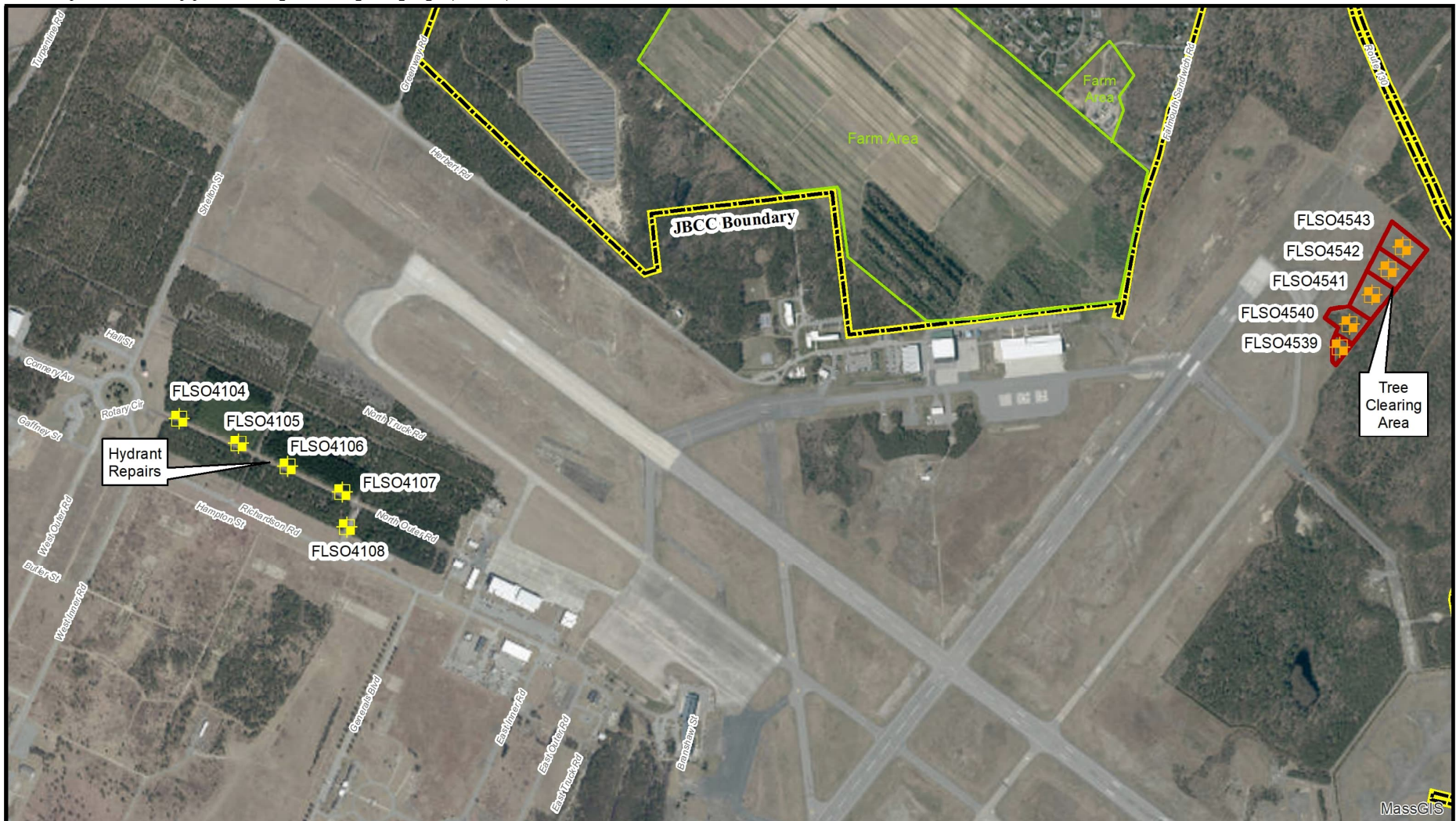
Flight Line Area OU RI - Former Building 118 and Runway 32 (cont.):



- Groundwater results from RI borings indicate an AFFF release may have happened within and/or to the north of the aircraft turnaround areas and the SAC Ramp Area.
- Eighteen areas were selected near the Western and Eastern Aircraft Turnaround Areas and an additional 21 areas were selected near the SAC Ramp Area for composite soil sampling to evaluate the presence/absence of PFAS in soil in these areas; sampling is ongoing.

Flight Line Area OU RI - Former Building 118 and Runway 32 (cont.):

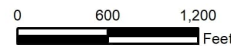
- New information was received about JBCC Wastewater Treatment Plant (WWTP) sludge disposal on the base and this composted sludge may contain PFAS.
- Five additional areas were defined for composite soil sampling in the area previously cleared of trees to the northeast of the aircraft turnaround areas based on information indicating that WWTP-derived compost was placed in this area.
 - PFOS concentrations in two composite sampling areas were above the reporting limit (RL) of 0.5 ng/g (0.5 µg/kg) and ranged up to 4 ng/g (4 µg/kg) at FLSO4540 and up to 7 ng/g (7 µg/kg) at FLSO4543. PFOS concentrations detected at these two sampling areas may contribute to groundwater contamination in this area. Further sampling will be completed to determine if contamination is related to the compost or to another release in this area.
- Five shallow discrete soil samples were also collected near hydrants along North Outer Road that were also reportedly backfilled with WWTP-derived compost.
 - PFOS was detected above the RL in two discrete soil samples collected from FLSO4106 at concentrations of 1.7 ng/g and 0.88 ng/g (1.7 µg/kg and 0.88 µg/kg) and results decreased with depth.



Legend

-  Composite Soil Sample
-  Discrete Soil Sample
-  Joint Base Cape Cod Boundary
-  Soil Sampling Grid

Data Source: AFCEC, October 2024
 JBCC Boundary from Massachusetts Air National Guard 2011
 2023 Aerial Imagery From MassGIS

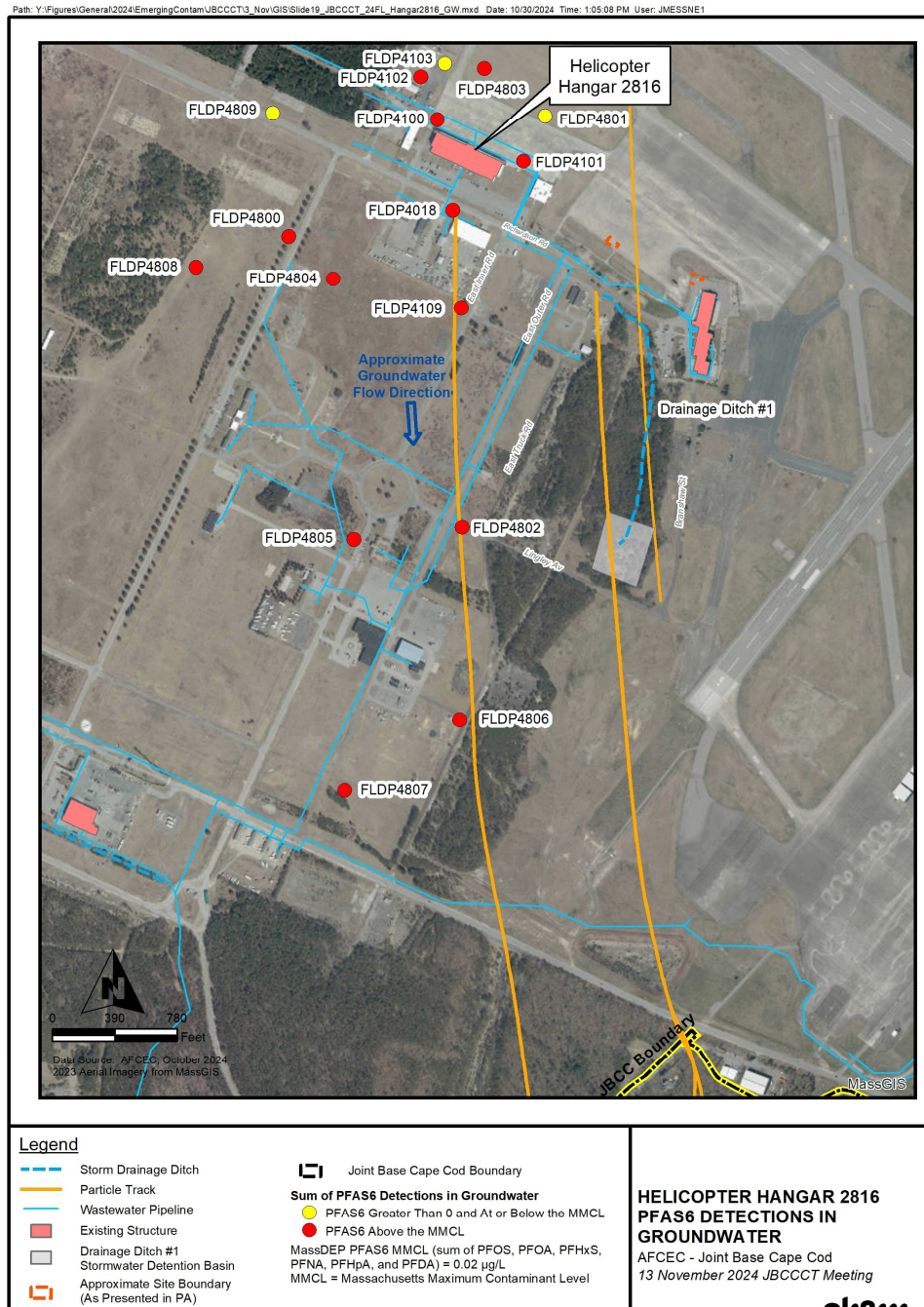


Note: Farm areas reportedly received compost from municipal waste water treatment facilities.

SOIL SAMPLING IN AREAS OF WWTP COMPOST PLACEMENT

AFCEC - Joint Base Cape Cod
 13 November 2024 JBCCCT Meeting

Flight Line Area Operable Unit RI - Army Helicopter Hangar 2816:



- AFFF was stored outside of the hangar but was not used and there are no documented AFFF releases at this hangar.
- Collected groundwater samples from 14 borings; highest PFAS6 groundwater concentration is 10,080 ng/L (10.08 µg/L) in boring FLDP4805.
- Two additional groundwater borings were completed for further definition of the extent of groundwater contamination and results helped define the western extent of PFAS6 contamination in this area.
- PFAS6 concentrations at FLDP4808 were just above the MMCL at 22.5 ng/L (0.0225 µg/L) in one sample collected from 10 ft below the water table.
- PFAS6 concentrations were below the MMCL or 0 in all sample intervals collected at FLDP4809.

Flight Line Area OU RI – Western Area:

- The Flight Line Area OU RI field program was expanded to the west to investigate the extent of PFAS contamination detected in the influent of selected Chemical Spill-10 In-Plume extraction wells and in groundwater borings installed near Fuel Spill-13 which is located downgradient of the western end of the Flight Line.
- A transect of ten groundwater borings was selected along Richardson Road and Gaffney Street; sampling is ongoing and received results for one boring.
- FLDP5009 is the easternmost boring in this transect; PFAS6 concentrations were just above the MMCL in one sample at 21.7 ng/L (0.0217 J µg/L) and were PFNA/PFOS dominant; results from this boring define the eastern extent of PFAS6 contamination in this area.

Path Forward:

The following deliverables will be completed with existing funding:

- Receive additional EPA comments on the *Draft FTA-1 ESD for PFAS*, prepare and submit the RCL.
- Hold meeting to resolve agency comments on the RCL for *Draft FTA-1 Lysimeter Work Plan*, prepare and submit the MOR.
- Prepare and submit MOR2 for the *Revised Draft TTRS RI Report* and prepare and submit the *Final TTRS RI Report*.
- Resolve EPA comments on the *WWTP Infiltration Beds Draft Interim Land Use Controls letter* and submit the final letter.

The following deliverables will be completed under contract modifications or follow-on contracts:

- Prepare and submit the *Revised Draft FTA-1 Supplemental FS Report*.
- Prepare and submit the *Revised Draft TTRS FS Report*.
- Receive MassDEP comments on the RCL for the *Draft LF-1 ESD for 1,4-Dioxane and PFAS*; hold resolution meeting, prepare and submit the MOR.
- Prepare a technical memorandum incorporating the PFAS MCLs into the analysis of alternatives from the Supplemental LF-1 FS and prepare a revised Draft LF-1 ESD.

Path Forward: (continued)

- Review enforceable milestones and submit extension request to EPA in Jan 2025.
- Continue private well sampling program.
- Based on the recent “*Prioritization of Department of Defense Cleanup Actions to Implement the Federal Drinking Water Standards for Per- and Polyfluoroalkyl Substances Under the Defense Environmental Restoration Program,*” released on September 3, 2024, AFCEC will complete removal actions (e.g., municipal connection, point-of-entry treatment systems, point-of-use treatment systems, bottled water) at private drinking water wells with exceedances of the Federal MCL for PFAS.
- Continue FTA-1 Lysimeter Study, collecting pore water samples after agency comments have been resolved.
- Continue Flight Line Area OU RI sampling program.
- Present sample results and field program updates to the agencies at future Technical Update Meetings and to the public at future JBCC Cleanup Team Meeting.