Joint Base Cape Cod Cleanup Team
Building 1805
Camp Edwards, MA
October 15, 2014
6:00 – 8:00 p.m.

***Draft* Meeting Minutes**

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Handouts Distributed at Meeting:

1. Presentation handout: J-3 Range Feasibility Study/Remedy Selection Plan
2. Presentation handout: J-3 Range Proposed Cleanup Plan
3. Information handout: J-3 Remedy Selection Plan
4. Presentation handout: Air Force Emerging Issues and Contaminants Program: 1,4-DX and PFCs
5. Presentation handout: Emerging Issues Contaminants
6. Information handout: NIH Perfluorinated Chemicals (PFCs)
7. Information handout: Boston University 1,4 Dioxane A Reference Guide for MA Residents
8. Information handout: Perfluorinated Chemicals

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9. Information handout: EPA Emerging Contaminants – Perfluorooctane Sulfonate (PFOs) and Perfluorooctanoic (PFOA)
10. Presentation handout: Testing of Ponds, Harbors, Rivers

Agenda Item #1. Introductions, Late-Breaking News, Approval of October 15, 2014 JBCC CT Cleanup Team Meeting Minutes

Ms. Donovan convened the meeting of the Joint Base Cape Cod Cleanup Team (JBCC CT) at 6:05 p.m. The team members introduced themselves. The meeting summary from the October 2014 meeting was approved, as written.

Ms. Donovan referenced Mr. LoGuidice's action item request to review photographs to determine if there was a former landfill east of Route 28A. Ms. Donovan spoke with Mr. Karson and he indicated that review is still ongoing. An update will be provided at the January meeting.

Agenda Item #2. J-3 Range Remedy Selection Plan

Mr. Gregson began the presentation showing a map of JBCC and reviewed the history of the J-3 Range. He stated that the primary area of concern was the area used for defense contractor testing from 1968-1997. The investigation of the range was broken into five features/areas. A map showing these areas was displayed and Mr. Gregson pointed to Area 1, which is the Melt Pour Area. This area had a building where the contactors would take explosives and load them into various munitions for testing. This activity generated some wastewater, which contributed to the groundwater plume. Area 2 was a 20mm and 30mm range, which had a workshop building and a burn, kettle, and Conex area. There was some disposal conducted at the burn, kettle area. The other sources for the groundwater contamination were from Area 3, where artillery firing, demolition and explosives storage took place. It is believed that the demolition activity was the primary source for the RDX and perchlorate plume at the J-3 Range. At Area 4, there was some sophisticated testing of ordinance (x-ray building, a test building, gauntlet area, and a berm). Mr. Gregson explained that Areas 5 and 6 had some of the historical use buildings at the range. Mortars were found at the old Hillside Study area and barrage rockets were found at the old Barrage Rocket Range from former training activities.

Mr. Gregson pointed to the groundwater study area on a figure and explained groundwater flow directions. He explained that ~1, 700 soil samples had been collected from 505 locations between 1997 and 2013 and 3,500 tons of contaminated soil has been removed. He reiterated that disposal and testing activities in Demolition/ Artillery/Warhead Testing Area and activities at Melt Pour Facility were the major sources of groundwater contamination. Approximately 1,900 munitions with high explosives, 560 munitions with small quantities of energetics, and 30,000 pounds of range debris were removed.

Mr. Gregson noted that there are 112 well screens in 56 locations and over 1,500 groundwater samples have been analyzed. There are large scale plumes of perchlorate and RDX. The current maximum perchlorate detection is 4.5 parts per billion (ppb) but it is believed that higher levels of contamination are in the area, just currently between monitoring wells. Historically the highest perchlorate concentration was 770 ppb (the highest perchlorate detection on Camp Edwards, program-wide). The current maximum concentration of RDX is 7.5 ppb. Historically it was as high as 37.6 ppb.

Mr. Gregson explained that in 2006, an Extraction, Treatment, and Reinjection (ETR) system was put into place as part of a Rapid Response Action (RRA). There are three extraction wells operating at 195 gallons per minute (gpm). The treated water is fed into the Air Force Civil Engineer Center's (AFCEC) Fuel Spill-12 effluent system. Over 750 million gallons of water has been treated to date.

Mr. Gregson outlined the J-3 Range Groundwater Alternatives that were evaluated in the Feasibility Study. The potential response actions were: No Further Action, Monitored Natural Attenuation (MNA) and Land-Use Controls (LUCs), Focused Extraction (3 wells) with MNA and LUCs (Existing System), Focused Extraction (3 wells) with MNA and LUCs (Existing System Optimized), Focused Extraction (4 wells) with MNA and LUCs (Existing System Enhanced), and Focused Extraction (6 wells) with MNA and LUCs (within10-years). He provided details about each alternative and modeling animations were shown for each:

- Alternative 1 – No Further Action would mean ETR system shut down and long-term groundwater monitoring would be discontinued. No LUCs would be implemented. Perchlorate is predicted to drop below 2 ppb by 2079. RDX is predicted to drop below 0.6 ppb by 2043. The cost for well abandonment/documentation = $228,000

- Alternative 2 – MNA and LUCs would mean ETR system shut down and groundwater contamination would be reduced through natural processes. Long-term groundwater monitoring would continue and LUCs would protect against use of groundwater during remediation. Perchlorate is predicted to drop below 2 ppb by 2079. RDX below 0.6 ppb by 2043. The cost for groundwater monitoring, well abandonment and closeout documentation = $1.8 million.

- Alternative 3 – Focused Extraction with Three Wells would mean groundwater contamination would be remediated through the maintenance of flow rates of the current groundwater ETR system (3 extraction wells; 195 gpm). Long-term groundwater monitoring would continue and LUCs would protect against the use of groundwater during remediation. Perchlorate is predicted to drop below 2 ppb by 2052. RDX below 0.6 ppb by 2032. The cost for the wells, the groundwater monitoring, well abandonment and closeout documentation = $7.9 million.

- Alternative 4 – Focused Extraction with Three Wells (Existing System Optimized) would mean groundwater contamination would be remediated through increasing the pumping rates in the existing ETR system (3 extraction wells; 265 gpm). Long-term groundwater monitoring would continue. LUCs would protect against the use of groundwater during remediation Perchlorate is predicted to drop below 2 ppb by 2039. RDX below 0.6 ppb by 2031. The costs of the optimized systems, groundwater monitoring, well abandonment and closeout documentation = $7.8 million.

- Alternative 4a – Focused Extraction With Four Wells (Existing System Enhanced) would mean groundwater contamination would be remediated through optimizing the pumping rates in the existing ETR system and adding one new extraction well (4 extraction wells; 265 gpm). Long-term groundwater monitoring would continue and LUCs would protect against the use of groundwater during remediation. Perchlorate is predicted to drop below 2 ppb by 2022. RDX below 0.6 ppb by 2021. The cost for optimizing the system, the groundwater monitoring, well abandonment and closeout documentation = $4.9 million.

- Alternative 5 – Focused Extraction With Six Wells (within 10 years) would mean groundwater contamination would be remediated through optimizing the pumping rates in the existing ETR system and adding three new extraction wells (6 extraction wells; 315 gpm). Long-term groundwater monitoring would continue and LUCs would protect against the use of groundwater during remediation. Perchlorate is predicted to drop below 2 ppb by 2024. RDX below 0.6 ppb by 2024. The cost for optimizing the system, adding the three new extraction wells, the groundwater monitoring, well abandonment and closeout documentation = $8.3 million.

Mr. Gregson showed a figure that summarizes the alternatives.

Ms. Jennings took over the remainder of the presentation and pointed out that after this decision is issued for J-3, there are only two more decisions to issue (for the Small Arms Ranges and the Training Areas). She commented on the progress that has been made in the last several years and commended everyone for their efforts.

She briefly explained EPA's remedy selection process and stated that Alternative 4a (Enhanced) is EPA's preferred remedy for the J-3 Groundwater Plume. She added that source area cleanup is believed to be complete but some additional investigations will verify this.

Ms. Jennings explained that Alternative 4a is the preferred remedy because EPA believes the four extraction wells will achieve containment at the base boundary. She noted there is modeling that is underway to finalize the exact location of additional in-plume extraction well, which will pump to the existing treatment facility. Infiltration will take place at the existing reinjection wells. Ms. Jennings reiterated the timeline that Mr. Gregson explained for this alternative: Perchlorate would reach 2 ppb by 2022 and RDX would reach 0.6 ppb by 2021 for a cost of $4.9 million.

Ms. Jennings stated that the sources for this plume were removed during prior investigations. She stated that some limited soil sampling is needed to confirm that no further soil contamination exists. She added that some limited geophysical investigations and UXO removal are also needed to confirm that no further UXO sources exist that could leach to groundwater.

Ms. Jennings noted that the Long Term Groundwater Monitoring Program will verify the remedy remains protective and cleanup is achieved. She explained that LUCs will protect against the use of groundwater and infrastructure loss during remediation. Five Year Reviews will evaluate the effectiveness of groundwater treatment and source control measures.

Ms. Jennings explained that there is currently an ongoing Public Comment Period through November 13, 2014 on this Proposed Remedy. Written comments should be sent to:

Kate Melanson
US EPA Region 1
5 Post Office Square - Suite 100
Boston, MA 02109-3912
Fax: (617) 918-0020
Email: melanson.kate@epa.gov

EPA will issue responses to comments on the Remedy Selection Plan with the final Decision Document expected in February 2015.

Mr. DiNardo stated that he agreed with the outcome of the Alternative Analysis but asked for clarification about Alternative 5 and the extension of cleanup time. Ms. Jennings explained that installing two additional wells (as outlined in Alternative 5) would cause the hydrology of the wells to interfere with one another and not perform as intended.

Mr. DiNardo then asked if the dollar amounts are in "present day" costs and Ms. Jennings confirmed that they are.

Mr. Winters asked how the pumping rate was determined, if increasing the pumping rate would have any adverse environmental effects and, if not, why the pumping rates wouldn't just be increased. Ms. Jennings responded that pumping rates are a very complex issue. She confirmed they do need to be balanced with potential environmental impacts and that higher pumping rates can lead to drawdown in another area down gradient. She stated that modeling is done with different pumping rates to determine the correct balance of effective pumping and to prevent capacity issues.

Mr. Winters then asked what the cost is to install an extraction well. Mr. Gregson responded that it was about $100k. Mr. Winters commented that this was money "well spent."

Mr. Goddard asked if the extraction well was a Mobile Treatment Unit (MTU) or connected to the treatment system by pipeline. Ms. Jennings confirmed it will be connected. Mr. Goddard asked if the well could be located more north, in an area with higher concentrations of contamination. Ms. Jennings explained that they wanted to capture the contamination before it reached the low-conductivity area because there is a theory that as groundwater contamination moves down into the low conductivity layer, it "binds up there and lingers there for a long time." Ms. Jennings also asked Mr. Gregson to confirm that there are topographical issues with trying to put the well further upgradient. Mr. Gregson agreed this would pose some construction issues.

Mr. Goddard asked if the water would be treated with Granular Activated Carbon and Ms. Jennings replied that it would be. Mr. Goddard then asked of there would be any benefit to air sparging. Ms. Jennings said that GAC is proven to be the most effective and that the other alternatives were explored but none of them really accelerated the treatment of the plume.

Mr. Goddard asked if Snake Pond would be degraded as a result of the effort and Ms. Jennings confirmed that would not be the case. She added that routine sampling of the pond is also performed and the results have been non-detect (ND) thus far.

Mr. Saucier asked about the depth of the wells. Mr. Gregson responded that they were about 100 ft below ground surface and Ms. Jennings added that the wells were in line with where the contamination is located.

Mr. Seaver asked about the status of the J. Braden Thompson plume. Mr. Pinaud said he would provide Mr. Seaver with information after the meeting.

Agenda Item #3. Air Force Emerging Issues & Contaminants Program: 1,4-Dioxane and PFCs

Ms. Forbes introduced Dr. Janet Anderson from AFCEC and thanked her for coming from Texas to help explain some of the issues the program is facing with emerging contaminants. Dr. Anderson stated that she is a board-certified toxicologist and a risk assessor with AFCEC's Technical Support Division. She said her department's job is "to understand the state of the science, make sure we're keyed in on what research and what things are evolving and how its progressing, sometimes identify the data gaps that need additional funding, and try to get that done in collaboration with EPA and DOE (Department of Energy), and bring that information to the decision makers for the programs." She noted that she previously worked

for EPA in the National Center for Environmental Assessment in the Office of Research and Development and noted that department is the one that sets the toxicity values.

Dr. Anderson said that she is currently the Program Manager for Emerging Contaminants at AFCEC. She explained that according to the Department Under the Secretary of Defense (DUSD) Installations & Environment (I&E), an Emerging Contaminant (EC) is a contaminant that: Has a reasonably possible pathway to enter the environment; presents a potential unacceptable human health or environmental risk; and does not have regulatory standards based on peer-reviewed science, or the regulatory standards are evolving due to new science, detection capabilities, or pathways.

Dr. Anderson stated that under CERCLA, the Air Force (AF) has to perform response actions "where there is a release or threat of release of a hazardous substance, or a release of substantial threat of a release of any pollutant or contaminant, which may present an imminent and substantial danger to public health." She stated that Contaminants of Potential Concern (COPCs) are defined by EPA as "chemicals that are potentially site-related and whose data are of sufficient quality for use in the quantitative risk assessment." Per the DERP Manual, under the Installation Restoration Program, the AF is required to consider hazardous substances, pollutants or contaminants, petroleum, oil, lubricants, hazardous wastes, and explosive compounds.

She noted that the Department of Defense (DoD) issued a formal policy following ECOS/DoD/EPA Working Group results in 2009. That policy states that the AF needs to: Determine if there has been an EC release, assess EC related risks to people and the environment, and take response actions for ECs released from DoD facilities, when necessary to protect human health and the environment.

The AF EI/EC Program ensures that all of the AF departments comply with CERCLA, DERP, and the DoD policy, ensure protection of human health and the environment, ensure that the AF has sufficient guidance and technical information needed to address EI/ECs, and ensure that the AF can achieve response complete (RC)/site closure (SC) by identifying all environmental liabilities.

Dr. Anderson moved on to the portion of the presentation that focused on 1,4-DX and stated that it is a probable human carcinogen and can also have noncancer effects on the liver and kidney. There is no federal MCL but several states have promulgated standards. In 2010 toxicity values were released so a risk-based screening level can be determined for various media. There is current testing of public water systems via the Unregulated Contaminant Monitoring Rule 3, which is EPA's process for deciding if something needs to be monitored or regulated in drinking water.

Dr. Anderson explained that 1,4-DX is a by-product of ethoxylation processes and it is a stabilizer so it is a minor constituent of many consumer products (paints, detergents, coolants, de-icers, adhesives, etc). She noted that the AF is mostly focused on the historic use as a chlorinated solvent stabilizer and its impact at chlorinated solvents sites (with TCA and TCE).

Dr. Anderson noted that 1,4-DX does not bioaccumulate in animals or in fish/aquatic organisms and plant bioaccumulation is negligible. She stated the "Campaign for Safe Cosmetics" report has a list of products containing ethoxylated surfactants. For air and surface water, photooxidation occurs and the degradation is rapid. It also adsorbs weakly to soil and is moved quickly to groundwater.

Dr. Anderson explained that a recent study determined that 1,4-DX plumes are dilute but not large and are frequently shorter than the chlorinated solvent plumes. Many conventional treatment technologies (e.g. carbon absorption, air stripping) are not effective remediation strategies. The only effective technology currently available is advanced oxidation processes, using either hydrogen peroxide with ultraviolet light or ozone. The DoD and AF are funding numerous research projects to develop, demonstrate and validate

more effective remedial technologies. There are some promising results with in-situ bioremediation and molecular biomarkers of natural attenuation.

1,4-DX is a listed Resource Conservation and Recovery Act (RCRA) hazardous substance but is NOT a common environmental contaminant of concern (COC) due to the lack of a federal MCL, but there are reliable screening levels and some state Applicable or Relevant and Appropriate Requirements (ARARs) (i.e. the MassDEP GW-1 standard of 0.3 µg/L). The AF estimates about 20% of their chlorinated solvent plumes might contain 1,4-DX. There are current analytical methods recently developed by EPA that can be used. Dr. Anderson noted that while some conventional technologies for cleanup will not be effective, there are a few options and technologies are improving

Dr. Anderson explained that the AF programmatic guidance indicates that a response is required to determine the nature and extent and remediation, if necessary. She added that in situ remediation options are being studied.

Dr. Anderson stated that Perfluorinated Chemical (PFCs) are also a concern. She explained these are man-made compounds with unique chemical properties that are very stable and persistent in the environment because they are highly soluble, non-volatile, and poorly sorbed. They were/are used to make fluoropolymer coatings and products that resist heat, oil, stains, and grease, clothing, furniture food packaging, heat resistant non-stick cooking surfaces, and electrical wire insulation. The most important use from the AF perspective was fluorosurfactants, in aqueous film forming foam (AFFF).

PFOA and PFOS were evaluated in human monitoring conducted as part of Center for Disease Control's National Biomonitoring Program. Dr. Anderson displayed a figure which showed that concentrations of PFOA and PFOS are trending downward. There are high concentrations of perfluoroalkyls in apex predators (e.g., polar bears), which indicates these substances bioaccumulate and biomagnify. The biological significance of the concentrations in human and wildlife serum are unknown.

Dr. Anderson noted AFFF is the "product of choice" for fighting petroleum-based fires. Development began in 1960s by 3M and the U.S. Navy for use on Class B fires (flammable liquids). The AF started using it in 1970. AFFF contains fluorosurfactants (and other compounds) and is a PFOS-based foam. Dr. Anderson explained that because 3M had a patent on the PFOS-based foams, other companies created their own versions of telomer-based foams, which mimic PFOS. These can be in long-chain and short chain formulas, depending on the telomer. PFOS has not been manufactured in the US since 2001. Current foams are made with small-chain PFCs. However, PFOS-based foam is still in stockpiles at some sites.

Dr. Anderson showed a timeline of toxicity assessments and explained that in 2005 eight major companies entered into agreement with EPA to phase-out production of PFOA in the US. They met the first milestone in that agreement in 2010 and by 2016 there will no longer be any PFOA manufactured in the US. In 2009, EPA adopted the European Food Safety Authority's Assessment and removed PFOS from EPA's "IRIS track." Dr. Anderson added that in 2009 "ATDSR concluded that the data was too complicated and insufficient to make a determination." She added that many worldwide government agencies are struggling with the data as well.

Dr. Anderson noted that EPA is currently finalizing a health effects document for PFOS and PFOA. She stated previous assessments for PFOS and PFOA did not address cancer risk; however, the 2014 draft EPA document did look at the ability to assess cancer risk. Dr. Anderson noted that EPA's conclusion in this draft document was that PFOS and PFOA were "suggestive of carcinogenity but the data is inconclusive, especially for PFOS to do any kind of assessment cancer risk." The noncancer risks of PFOA are increased liver, kidney and spleen weight and developmental effects in rodents. The noncancer risks of PFOS are liver, developmental, and immune effects in monkeys and rodents, changes in lipid and TH levels in

monkeys. She added that some studies are being conducted with human epidemiological data for PFOA. This was due to court-ordered studies at a DuPont site in West Virginia.
Dr. Anderson said the issue is complicated because the effects observed in animals may not be relevant to humans. She explained that PFCs bind to blood proteins and circulate; retention time in humans is long compared to animals (~4-5 years humans vs. ~4 months monkeys or ~30 days in mice). There is significant reabsorption from the kidney in humans.

The EPA Toxic Substance Control Act (TSCA) requires actions to reduce manufacture/use PFCs and review their substitutes. PFCs are not a regulated waste under RCRA and are not listed as a hazardous substance under CERCLA. PFCs are considered a pollutant or contaminant and EPA Tier 3 toxicity values for PFOS and PFOA are applicable. Groundwater and soil screening levels can be calculated, with high uncertainty

EPA's Office of Water (OW) is looking at national exposure to PFCs, requiring public water systems to monitor concentrations of six PFCs (including PFOS and PFOA) from 2013-2015. Dr. Anderson showed a figure with state guidelines and noted Minnesota is the only state with a promulgated standard for PFOS and PFOA.

For risk assessment purposes, the AF recommends screening potential drinking water sources using the EPA 2009 provisional health advisory and performing risk assessments using the noncancer reference dose from the provisional health advisory until other values are finalized by OW. Dr. Anderson noted that fish consumption is a concern because PFOS bioaccumulates in the fish. Research is ongoing by AFCEC and Texas Tech University on toxicity and body concentrations in freshwater organisms.

Dr. Anderson said while many treatment approaches have been considered, the only technology currently effective to treat PFCs in water is granular activated carbon (GAC). Reverse osmosis has been effective for higher concentrations in industrial waste streams for 3M. Bench-scale research has been funded by DoD to develop alternative treatment approaches.

Dr. Anderson noted that the AFCEC Program began data gap investigations in 2009, following results from an OSD Phase I Impact Assessment, which implied AF had the largest impact. In 2012, the AF and DoD began funding remedial technology and research. In May 2012, Michigan issued a "Do Not Eat" Fish Advisory near Wurtsmith AFB due to PFCs in fish tissue and AFCEC began to receive regulatory requests for sampling at bases.

The AF Interim Guidance on PFCs was issued in 2012 and provides Installation Restoration Program Managers and BRAC Environmental Coordinators with a response to regulator requests for PFC sampling. The guidance outlines the AF-wide strategy for PFCs and follows the CERCLA process for sampling, delineation, evaluation of interim response actions based on risk assessment and human exposure potential, and mitigation of exposure to humans and off-site migration, if warranted. It also provides technical guidance for analytical methods, recommended detection limits, and toxicity values for risk assessment.

Dr. Anderson explained that her office is trying to fill in the data gaps and determine the probable release sites for AFFF (lagoons/ponds, fire stations, crash sites, hangar systems, fire equipment testing and maintenance areas, etc.). An AF-wide Preliminary Assessment contract was just awarded to conduct detailed records searches and installation-specific interviews.

In FY15, site inspections will be conducted at prioritized probable release sites, based on the results of the PA, the potential for human exposure, and regulatory requirements. Remedial investigations and possible mitigation will follow.

Dr. Anderson noted that characterization activities at BRAC installations are slightly different. Preliminary assessments/site investigations will be conducted at 30 fire training areas (FTA) at preliminary assessments will be conducted non-FTA at 39 installations. Response Actions are being implemented at Wurtsmith AFB (installing Pump & Treat w/ GAC system for mitigation of PFC release to Clark's Marsh) and at Pease AFB (conducting additional site investigation for PFCs detected above EPA advisory level in public drinking water distribution well). Additional remedial investigations and possible mitigation are anticipated in 2015 and beyond.

In conclusion, Dr. Anderson reiterated the EI/EC Program has research and technology initiatives to provide technical support to the installations and updated PFC guidance. She outlined the communications available from the EI/EC office and the outreach efforts to industry and regulatory agencies. The EI/EC Program ensures the AF has the money and knowledge to address new regulatory requirements and mitigate impacts (budget and schedule). The EI/EC Program conducts high-level data mining and analyses and uses state-of-the-science technical experts. The Program develops data-driven guidance to ensure systematic responses and practices. She reiterated that AFCEC funds and supports technology research and development.

Dr. Anderson stated questions could be emailed to the AF Program's organizational mailbox:
AFCEC/CZTE Emerging Issues
afcec.czte.emergingissues.1@us.af.mil

Mr. Goddard asked if the AF effort is DoD-wide. He clarified that he hoped the information was being shared with other military agencies so efforts were not being duplicated. Dr. Anderson responded that they are working closely with the other agencies and sharing "lessons learned." She added that AF-funded research and results are shared DoD-wide.

Mr. Goddard asked the regulatory agencies about the next steps for treatment of IRP plumes, if 1,4-DX is present, since GAC is not effective at removing it. Ms. Jennings replied that this would need to be addressed with an RI/FS for 1,4-DX to evaluate where it is located, determine nature and extent, and the alternatives for treating it. She anticipates Decision Documents would need to be amended. Ms. Jennings noted that this would not apply to PFCs.

Ms. Jennings noted that the AF and EPA "are not in lockstep, sync on this." She added, "The good news is we are going in the same direction." She clarified that there is disagreement on the pace of the investigation but the agencies are in agreement on the steps that need to be taken.

Mr. Goddard commented that if it is possible to detect 1,4-DX in the effluent right now, there should not be a delay in treating it. He recommended getting an oxidation treatment method in place now. Ms. Jennings replied that it was her understanding that GAC was only effective with one of the PFCs. Dr. Anderson clarified that GAC is most effective with PFOS and there are challenges with getting it to work for PFOA and shorter chain PFCs and some additional engineering design work would need to be done.

Mr. Winters asked if it is common to have a "two order of magnitude difference" in the state levels. Dr. Anderson replied that is an indication that the science is evolving and those standards were promulgated at different times, with different information that was available at those times. She noted that the more recent standards are more consistent.

Mr. Winters asked Dr. Anderson why PFOS stay in humans for so much longer than animals.
Dr. Anderson replied that it is believed PFOS acts like a fatty acid and has a higher binding affinity to the human serum protein. She said there are numerous studies ongoing now to determine the possible cause and effects. She surmised that PFOS and PFOA "reabsorb longer and stronger in humans."

Mr. Cambareri asked Dr. Anderson to explain the differences between the 2009 EPA Health Advisory and the Risk-Based Screening Levels, which were noted on slide 30. Dr. Anderson stated that from the AF perspective, under groundwater/CERCLA, they look at the risk-based screening level calculator that includes all of the complicated parameters for exposure, duration, and frequency. She added that the Health Advisory does not include some of those parameters. There is a default calculation that is made based on assumed exposure to drinking water. Dr. Anderson stated that for consistency, the AF always uses the CERCLA risk-based screening levels.

Ms. Jennings noted that Maine has a standard for both PFOS and PFOA and New Hampshire is working to promulgate standards as well. Mr. Pinaud stated the MADEP does not currently have drinking water values for either of these emerging contaminants. He noted that there is an ORS goal, which is the same as the cleanup standard under the MCP, for 1,4-DX. He added that for PFCs, MADEP is using EPA's provisional standard

Ms. Forbes followed-up on Mr. Winters question regarding the differences between animal and human adsorption of the emerging contaminants. She suggested that it could be attributed to the high use/exposure of humans (e.g. frying eggs in Teflon pans). Dr. Anderson acknowledged that this was a good point and mentioned that the ongoing human studies could help to clarify this.

Mr. DiNardo noted that emerging contaminants will affect the IRP remediation and asked how long it will be before there is an MCL (i.e. one year, 10 years). Dr. Anderson stated that for PFCs, it will be a long, long time." She added there are national sites (3M sites) undergoing remediation.

Ms. Jennings stated that EPA is taking the issue very seriously and it is being elevated to get it back on the IRIS track. She said this is a high-profile issue for the EPA Administrator. She did not think it would take years. She explained that to get to an MCL, EPA looks at water supplies and determine how many are being impacted, how badly, and does this justify the need for a cleanup standard. Ms. Jennings said that an MCL is not needed for the EPA to take action and noted that often times the states "trump" the federal MCL process by promulgating their own standards. EPA also believes they have the authority to require assessment, cleanup, and prevention of exposure. Ms. Jennings said this is a bigger issue that affects more than just DoD sites.

Dr. Anderson stated that she misunderstood Mr. DiNardo's question and thought he was asking about how long remediation would take. She did not realize her was asking about the promulgation of a federal standard.

Agenda Item #4. Emerging Contaminants

Ms. Forbes noted that, as was already discussed, the AF is comparing 1,4-DX results against the EPA 10^{-6} risk-based level of 0.67 µg/L and the MassDEP GW-1 standard of 0.3 µg/L. She explained that in February 2013, EPA requested that AFCEC sample for 1,4-DX at JBCC and that rolled into an official recommendation in the 4th Five-Year Review (Oct 2013) to sample for 1,4-DX at several of the chlorinated plumes. The samples were analyzed for 1,4-DX via SVOC method 8270 Selective Ion Monitoring to meet the QAPP requirements for MDL of 0.075 µg/L and RL of 0.15 µg/L.

Treatment plant sampling for 1,4-DX began in October 2013 with influent and effluent samples from all of the VOC treatment plants including: Ashumet Valley (AV) ETI, AV ETD, CS-10 IP, CS-10 SR, LF-1, and HATF (including CS-4/CS-20, CS-21 and LF-1/CS-23 sampling ports). The treatment plant results were assessed to determine potential presence/absence of 1,4-DX at VOC plumes and determine if it has been reintroduced in effluent to groundwater or surface water, and help determine what monitoring wells to sample.

Ms. Forbes displayed a figure of treatment plant results and pointed out the results at Ashumet Valley Extraction Treatment Infiltration (ETI) showed 0.323 µg/L going into the influent (just above the GW-1 standard) and then ND in the effluent. Ms. Forbes clarified that this does not mean that GAC effectively treated the 1,4-DX. Rather, she explained, it was most likely because there had been a carbon exchange just prior to sampling. This could indicate that the carbon will remove 1,4-DX for a short time. Ms. Forbes reviewed the remaining results for other treatment listed on the figure to further illustrate this point.

Extraction well sampling was done in December 2013 at LF-1, LF-1/CS-23, CS-10 IP, CS-10 SR, CS-4, and CS-20 (based on treatment plant results). Ms. Forbes reviewed the results and noted they were consistent with the treatment plant results and the overall distribution of historic 1,1,1-TCA and 1,1-DCE detections within these plumes.

Forty monitoring wells were sampled for 1,4-DX in February 2014 to evaluate the range of concentrations and determine the general geographic extent. The data were used to assess the presence/absence of 1,4-DX and to focus additional investigations in each of the affected plumes.

Monitoring wells were selected for 1,4-DX sampling based on historical distribution of 1,1,1-TCA detections, historical distribution of 1,1-DCE detections, treatment plant and extraction well sampling results, and the overall understanding of the conceptual site model.

Ms. Forbes listed the following sampling results:

- Twelve LF-1 monitoring wells - seven detections ranging from 0.153 µg/L to 0.809 µg/L.
- Three CS-23 monitoring wells - no detections.
- Five CS-20 monitoring wells - three detections ranging from below the reporting limit (BRL) to 0.783 µg/L.
- Fourteen 14 AV monitoring wells - seven detections ranging from BRL to 0.993 µg/L.
- Six CS-10 monitoring wells - four detections ranging from 0.184 µg/L to 2.08 µg/L

Ms. Forbes noted that private well sampling was performed in November 2013 in the AV Central Plume Zone (Hayway Road). She stated that one property had two wells (potable and irrigation; not in the AV LUC monitoring program) and 1,4-DX was not detected at either well. 1,4-DX was not detected in a private well (used for irrigation) in AV, north of Route 151 (Ashumet Road). 1,4-DX was detected BRL in a private well used for potable water supply in AV, north of Route 151 (Currier Road). This well was resampled in February 2014 and it was also BRL. Another well used for potable water supply in AV, north of Route 151 (Currier Road) was sampled in May 2014 and the result was ND. A CS-10 LUC well on Galleon was sampled in June 2014 and the result was ND. An LF-1 LUC well on Megansett will be sampled in summer 2015.

In December 2013, AFCEC sampled two Bourne Water District wells for 1,4-DX and it was detected at PWS #5 at 0.206 µg/L. It was not detected at PWS #2. The town of Falmouth had sampled the Crooked Pond PWS Well for 1,4-DX in August 2013 and it was not detected. The B Well, an irrigation well on base, was sampled in June 2014 and the result was ND.

Ms. Forbes referred to a series of figures in the presentation, which showed the sampling areas and the results. She then began the portion of the presentation that focused on PFCs. She reiterated the 4th Five-Year Review provided a recommendation to determine whether PFCs are present in the AV groundwater plume. A potential source of the PFCs at the AV plume was FTA-1, where AFFF may have been used. Ms. Forbes noted that EPA requested AFCEC expedite the PFC sampling in a December 2013 letter. EPA had identified six AV monitoring wells that should be sampled for PFCs and also indicated that private

wells should be sampled. After discussions with AF management, AFCEC issued a contract modification in March 2014 for PFC sampling at AV.

Eight monitoring wells, including six requested by EPA, and the AV ETI system treatment plant influent and effluent were sampled for PFCs in July 2014. Based on PFC detections at some sample locations, samples were collected from four private residential wells.

Ms. Forbes again stated there is no MCL or MMCL for PFCs and the EPA Provisional Health Advisory for PFOS is 0.2 µg/L and for PFOA it is 0.4 µg/L. Six PFC compounds were analyzed for:

- Perfluorooctanesulfonic acid (PFOS)
- Perfluorooctanoic acid (PFOA)
- Perfluorohexanesulfonic acid (PFHXS)
- Perfluoroheptanoic acid (PFHPA)
- Perfluorononanoic acid (PFNA)
- Perfluorobutanesulfonic acid (PFBS)

All six PFCs were detected in the AV treatment plant influent; a few were detected in the effluent. As previously stated some PFCs are effectively treated by granular activated carbon (e.g., PFOS) and some are partially treated (e.g., PFOA).

PFCs were detected in six of the eight monitoring wells sampled at AV. PFOS and PFOA were detected at two of the eight monitoring wells at concentrations greater than the EPA Provisional Health Advisories. The other four PFCs were detected sporadically along with the detections of PFOS and PFOA. The highest PFOS (19J µg/L) and PFOA (4.5J µg/L) detections were reported at 30MW0417C, which is within the FTA-1 source area. PFCs were either not detected or detected sporadically at low concentrations in the southern portion of the AV plume.

PFCs were detected in one of two private wells used for drinking water (Currier Road), and one of two private wells used for irrigation/outdoor use (Ashumet Road). PFOS and PFOA detections were below the EPA Provisional Health Advisories.

The JBCC J-Well (base water supply well) results from samples taken in September were ND (preliminary, unvalidated).

Ms. Forbes stated that in July 2014, EPA formally requested AFCEC expand the PFC investigation at and downgradient of the flight line area. AFCEC responded that a contract for a preliminary assessment/site investigation (PA/SI) was being developed to address PFCs at numerous AF bases.
The contract was awarded for the PA on 18 July 2014; SI will be contracted following the PA. The PA site visit at JBCC is scheduled to begin January 26, 2015. EPA recently submitted a second letter to AFCEC requesting an expedited investigation effort for the flight line area and AFCEC is considering the request.

AFCEC initiated a private well verification effort for the areas downgradient of the flight line: In the Mashpee Briarwood area and in the Route 130 area of Sandwich and Mashpee. Ms. Forbes turned the presentation over to Mr. Karson to provide more details on the private well research.

Mr. Karson stated that the investigation in the Briarwood area began in July and 245 parcels were identified. AFCEC then proceeded to determine if any of the 245 parcels had private wells. These efforts included delivery of notices, knocking on doors, a mailing to the owners, and confirmation of existing municipal water accounts for all houses (minus vacant lots). He reported that 234 out of the 245 were validated so 11 parcels remain unverified. Eighty-five wells were identified and 10 of those are active.

All of the active wells are used for outside watering except one, which is used for washing machines. None of the wells are used for drinking water.

Mr. Karson explained that the Mashpee Board of Health was notified of the outreach effort and were asked to provide information on the remaining properties. The Mashpee police and town manager were also notified of the outreach effort.

Mr. Karson then discussed the Route 130 area (Forestdale/Mashpee) and noted that 293 parcels were identified. The parcel maps and property list have been prepared. AFCEC also notified the Boards of Health, police departments and town managers regarding upcoming door-to-door canvassing and the reason for research. The Mashpee and Sandwich Water Districts have verified that 157 parcels do not have a municipal water account. Some parcels are vacant lots. Ongoing outreach efforts will validate well existence/status.

Ms. Forbes reviewed the next steps. The PA for PFCs is scheduled to begin soon at JBCC. A Remedial Investigation/Feasibility Study for 1,4-DX and possible additional investigation for PFCs at AV and flight line are scheduled for FY15, pending funding and AFCEC management approval.

Mr. Goddard asked Ms. Forbes to point out the location of the ethylene dibromide plume. She pointed to the area on the map and indicated it was the Fuel Spill 1 (FS-1) area. Mr. Goddard then stated that he thought residents in that area would have already been contacted about private wells. Ms. Forbes replied that there are no residents in the FS-1 area and that it is mostly conservation area. Mr. Karson confirmed that this was part of the FS-1 LUC area and the Conservation Commission, the Orenda Wildlife Trust, and other owners of the land were contacted to confirm there were no private wells were located in that there. Mr. Goddard sought clarification that the land owners that are part of this current effort had not been contacted before. Mr. Karson replied that was the case.

Ms. Rielinger stated that based on the fate and transport model it looked like 1,4-DX was often not co-located with the chlorinated solvents but she noted that the data provided today showed that it was co-located in the plumes that are very detached from the source. She asked if sampling had been done closer to the source area. She also asked if it were possible that the 1,4-DX may be lagging and located closer to the source areas. Ms. Forbes commented that Ms. Rielinger raised a good point and noted that AFCEC had not done that sampling yet. She added that right now they are trying to get an idea of where 1,4-DX is located in the known plumes but additional upgradient sampling would be considered as part of the RI/FS.

Mr. Winters asked about the slide pertaining to data quality. He asked if the data protocols represented "one draw, one measurement or the average of 10 measurements." He used the result of 0.17 as an example and asked if that represented one measurement or an average. Ms. Forbes confirmed this represented one result from one sample at one well. Mr. Winters then asked about the level of confidence in the results. Dr. Anderson stated that there is an error reporting range for each sampling method and it depends on the analyte, the method, and the laboratory. Ms. Forbes added that duplicate samples are taken in the field to QA/QC the data quality.

Ms. Jennings stated that the EPA focus started with fire training areas and the use of foam at these areas. Sampling was initiated based on that potential usage. She added that EPA is still learning more about the contaminants and has had some recent experience with this at other sites, which are farther along in their investigations. She noted that PFCs were found in a public water supply at Pease Air Force Base, at much greater levels, 10 times higher than the EPA Provisional Health Advisory. She noted this public water supply well also happened to be downgradient from the flight line at Pease and this opened up another area of investigation because it was unclear as to why the concentrations were so high in this area. She noted

that one possible cause could be that the foam was used on the runways to protect the planes whenever there was a fire and then it got into the storm drains system.

Ms. Jennings explained that this was the reason why EPA asked AFCEC to expand the investigation and conduct more sampling downgradient of the flight line area. She noted that there was heightened public concern at Pease AFB because people were drinking the water. She added that State of NH is conducting blood studies because of the potential exposure of residents to the contaminated water from the public water supply well. Ms. Jennings stated that this issue is of "paramount importance" to EPA because they want to make sure no one is being exposed to PFCs in their drinking water. She said, "That is why EPA is pushing so hard." She added that if it is determined that no one is being exposed, the investigation can slow down on the next steps.

Ms. Jennings stated that if AFCEC does not agree to sample at the flight line, EPA "has mechanisms to make it happen," and noted that EPA could conduct the sampling or issue an enforcement action. She said the main issue is legal and regulatory authority. She commented, "With dioxane, we have a promulgated standard so I think the Air Force feels there is legal authority to do nature and extent, if you find it, address any exposures, and do an RI/FS to clean it up and take it through the whole CERCLA process." She added that there are avenues, even in CERCLA, to accelerate that process.

Ms. Jennings noted that the situation with PFCs is a little different because there isn't a promulgated standard. She stated that EPA's position is that the Provisional Health Advisory gives them the authority to walk through that CERCLA process for PFCs (characterization, eliminate exposures, go through and RI/FS, and treat). She commented that the AF doesn't agree with that approach. She said, "They believe they need a promulgated standard in order to enforce the CERCLA provision and take it through the whole process." She added that she hopes the AFCEC management will approve the sampling along the flight line.

Mr. Goddard asked what the AF is using to fight petroleum-based fires. Dr. Anderson said the MILSPEC requires fluorosurfactant-based products (i.e. AFFF) to fight petroleum-based fires. She noted that the current formulation contains the shorter-chain PFCs. She said the longer chain is still in stockpiles but her program is working with AF Management to determine the best way to handle that supply. She noted that the AF is no longer training with the foam and it is only used for emergency response.

Mr. Goddard said that he hopes there would be a prohibition on using the longer-chain foam on a runway, if an exposure pathway is determined. He asked if EPA was looking at the shorter chain to determine if it also might pose a risk. Ms. Jennings responded that she cannot address that at this time but does agree it will need to be explored.

Mr. Saucier asked, "Can someone explain to me what a flight line is? Is that just a runway or is it also planes going over civilian houses?" Ms. Forbes responded that it is just the runway, the physical asphalt. Mr. Saucier asked for more information on how and why AFFF was used. Ms. Forbes explained that the foam was used as part of firefighting training so crews could practice putting out fires. She added that if a plane crashed, they would spread AFFF out. She also stated that it is stored in hangars and a potential source is leaking storage containers. Mr. Saucier commented that there should be records of the usage and Ms. Forbes agreed. She stated that research into those records will be part of the Preliminary Assessment that will begin in January.

Ms. Malowicz (MassDEP) stated that it was her understanding that the foam was spread on the ground surface and she asked how the right sampling depth is determined. Ms. Forbes said that, "at that time it no longer the original product. It has dissolved into the groundwater. It is highly soluble. As it is used on the surface, the precipitation dissolves it, it gets into the subsurface, it migrates down to the groundwater and by the time it gets there, it is no longer the original product itself, it has dissolved." She added that

because the source area is the same for AV, the fire training area and the wastewater treatment plant, it is anticipated that any of the AFFF that dissolved into the groundwater would follow the same path as the groundwater plume. She added that AFCEC has years of experience monitoring the groundwater plumes for TCE and PCE.

Mr. Davis stated that he is the Installation Support Team Supervisor. He said he was concerned there might be possible misinterpretation surrounding the earlier discussion. He then said, "AFCEC can respond to these contaminants to ensure there are no health impacts. What we can't do right now is do a restoration of the aquifer." He noted that Ms. Jennings' earlier comment that AFCEC can't respond to the cleanup aspect might have confused people and he wanted to state clearly that AFCEC can eliminate the exposure and the health risk. He added that this was different than restoring the aquifer and that is the issue that needs to be resolved further down the line unless by that time there is a promulgated standard.

Agenda Item #5. Ponds and Rivers

Mr. Karson referred to the briefing from the previous JBCC CT meeting regarding the ponds and harbor sampling. He briefly reviewed the information and updated sampling results. Samples were collected from recreational ponds in April 2014. The samples from Snake Pond and Deep Pond were tested for EDB and they were ND. The samples from Ashumet Pond, Johns Pond and Deep Pond were tested for plume-related volatile organic compounds (VOCs) and they were also ND.

The IAGWSP collected samples from the Snake Pond public beach, the Camp Good News private beach, and a private property owner's beach at the northwest edge. All explosives results were ND. Perchlorate results were below the laboratory reporting limit and were well below the Massachusetts drinking water standard of 2 µg/L.

Mr. Karson explained that there was monitoring of harbors in April 2014. The groundwater seep at Red Brook Harbor was ND for PCE, BRL for TCE. The seep/surface water sampling at Squeteague Harbor showed PCE detected at 1.8 µg/L and TCE at BRL, similar to past sampling events. PCE and TCE were BRL or non-detect at nearby surface water locations.

Mr. Karson stated that per an agreement with the cranberry stakeholders, AFCEC conducts annual testing of the Coonamessett and Backus Rivers prior to harvest. The results below MCL/MMCLs indicate the fruit can be harvested. If COC concentrations are above the MCL or MMCL then fruit testing is required. Surface water results for the Coonamessett River were ND for EDB and the harvest is not affected. Surface water results for the Backus River shows detections both below MCLs (5 µg/L) and BRL (1 µg/L), thus the harvest is not affected with regards to PCE/TCE.

He noted the Quashnet River is no longer cultivated for cranberries. Surface water monitoring is conducted to monitor remedial progress and results continue to be ND for EDB.

Mr. Karson then reviewed a figure that showed FS-28 surface water results from June and August 2014.

Mr. Karson then said he wanted to go back to the discussion on the research for the private wells in Briarwood and Route 130 area. He explained the normal LUC process has been "expedited" in this area to determine potential for exposure and get the information more quickly.

Agenda Item #4. Final Discussions, Adjourn

Ms. Donovan stated that the next meeting is tentatively scheduled for January 14, 2015.

The meeting was adjourned.