

**Building 1805
Camp Edwards, MA
08 February 2018
6:00 – 8:15 p.m.**

Meeting Minutes

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Handouts Distributed at Meeting:

1. Draft final of the 12 April 2017 Meeting Minutes
2. Responses to Action Item from the 12 April 2017 Meeting
3. Presentation: IAGWSP Update
4. Presentation: AFCEC 6 Month Look Ahead
5. Emerging Contaminants Update
6. CS-10 Supplemental Feasibility Study for 1,4-Dioxane



Agenda Item #1. Introductions, Late-Breaking News, Approval of 12 April 2017 JBCCCT Cleanup Team Meeting Minutes

Ms. Donovan began the meeting and asked the team members to introduce themselves.

LTC Cody began with an introduction of Brigadier General Magurn, Executive Director of Joint Base Cape Cod, and an announcement that Camp Edwards has received an award that will be given 08 February 2018 and invited team members. General Magurn introduced Mr. Stan Scott and Mr. John Broughton from the Army Assistant Chief of Staff for Installation Management. General Magurn stated that a document was submitted describing the many partnerships that take place on JBCC and that one of the partnerships that was highlighted was the environmental partnerships. Camp Edwards won the Army Chief of Staff's Partnership Award. He stated that the environmental partnership is vigorous, community oriented, and the secret to their success. General Magurn said "the work that the JBCC CT group does in helping the Army test their assumptions makes the Army better and lets us provide ready soldiers, ready units, and in a more efficient manner in a way that is in keeping with our commitment to the stewardship of the environment". General Magurn thanked the members for their work, for being a part of the Army being recognized, and for being a part of the Army's future.

Ms. Donovan asked if there were any comments on the 12 April 2017 meeting minutes. No comments were made. Ms. Donovan the asked if there were any comments on responses to action items from 12 April 2017 meeting. A one page document was included in the handouts on existing resources regarding PFCs and 1,4-dioxane so people could look up more information. No comments were made.

Ms. Donovan asked for feedback at the end of the meeting from team members regarding the frequency of JBCC CT meetings. She stated there will be a meeting in April that will primarily be for IAGWSP to discuss the Training Areas Decision Document.

Agenda Item #2. Presentation: IAGWSP Update – *Ben Gregson IAGWSP*

Mr. Gregson said that he would be providing a brief update of ongoing and upcoming IAGWSP projects. He displayed a map and pointed out the areas where work is being performed: the Central Impact Area (CIA), J Ranges, and Demolition Area 1. He pointed out the plumes in the CIA where UXO source work is being done. Approximately 58 acres of removal work has been completed and there is another 10 acres left to complete. Findings on the 58 acres will be discussed at the April JBCC CT meeting.

Mr. Gregson stated that they continue to have to put in monitoring wells to track where the plumes are going. He pointed out two extraction wells in Demo Area 1 and showed on the map an area between Pew Road and Frank Perkins Road that needs to be more defined. Recent modeling work in the CIA has identified a likely load of contamination of RDX. The area is currently defined by 8 monitoring wells which were placed there based on detections years ago and he pointed out on the map where the model had migrated the line forward. He would like to install two wells inside the base boundary to make sure nothing significant migrates off-base in that location.

On-base drive point work at the J-1 South area in the Forestdale section of Sandwich is being performed to define RDX contamination coming from the source area. Mr. Gregson pointed out

the area in the J-1 South where approval was received to do more drive point work which will take place late winter or early spring of this year. There is another well planned for the J-3 Range to better define contamination on the eastern side of that plume. And at the J-2 Range there are 4 locations to install shallow wells to monitor the source area cleanup that was recently completed.

Mr. Gregson stated that there is a Five-Year Review coming up where the draft has been submitted to the agencies. The Training Areas Decision Document will be a big part of the April JBCC CT meeting. He said that the work was done to look at some of the smaller areas which were held off on earlier in the program due to bigger priorities. They are now looking at some of these areas of potential contamination and will be reporting their findings at the next meeting. Within a month the Investigation Report will be finalized with regulators, so at the April meeting the public comment period will begin and the Draft Remedy Selection Plan in place for review which will work its way into the Decision Document which will be finalized later this year.

Mr. Winters asked how many monitoring wells need to be put in and how long will they be monitoring? Mr. Gregson replied that this year they will putting in between 5 and 10 monitoring wells, about a half dozen drive points. He said they typically sample three times, and based on what they find, they will make a decision if they need to monitor long-term.

Mr. DiNardo asked if all of the drive points are going to be within the base boundary. Mr. Gregson replied that all of the drive points in their program are on base.

Agenda Item #3. Presentation: AFCEC 6 Month Look Ahead – *Rose Forbes AFCEC*

Ms. Forbes stated that AFCEC has a lot of field efforts currently along with associated reporting. Referring to a handout, Ms. Forbes described field efforts starting with ongoing routine System Performance and Ecological Impact Monitoring (SPEIM) sampling at all active plumes. Ms. Forbes referred to Ashumet Valley Plume and Ashumet and Johns Ponds on the figure and said that is where AFCEC's attention is for emerging contaminants with respect to per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane. This work is off-base. She stated they recently collected some soil samples from the fire training area for a company that is working with AFCEC headquarters that is doing an innovative test to see if they can break the carbon-fluorine bonds of the PFAS compounds.

AFCEC is also investigating the source areas of two tanker truck rollovers from 1997 and 2000 in Bourne, in the area of Valley Farm Road, the cranberry bogs, and Red Brook Pond. Additionally AFCEC is sampling on base at the Flight Line sites for PFAS this spring. AFCEC is doing work at the Otis Gun Club including sampling in support of a remedial investigation primarily for lead. Sampling for lead is also being conducted at the Skeet Range inside the 102nd FW area.

Ms. Forbes reviewed active reports for AFCEC. The Draft Remedial Investigation (RI) Work Plan for Tanker Truck Rollover Sites was delivered to EPA and MassDEP on 12 January 2018. The Draft RI Work Plan for the Otis Gun Club was delivered to EPA and MassDEP on 25 January 2018. The Draft Expanded Site Inspection (SI) Work Plan for PFAS at Flight Line Sites will be delivered to EPA and MassDEP in February 2018. The Draft Engineering Evaluation/Cost Analysis (EE/CA) for contaminated soil removal for the Skeet Range will be delivered to EPA and MassDEP in March 2018. The Draft RI at the Old K Range will be delivered to EPA and MassDEP

in April 2018 where the work includes removing UXO, and groundwater and soil sampling. And, the Draft Five year Review (2012-2017) will be delivered to EPA and MassDEP in May 2018.

Mr. Goddard asked what led to the investigation at the Otis Gun Club as they were asked to vacate a while ago and there is a new fence there. Ms. Forbes replied that the site is considered a Military Munitions Response Site (MMRP) – one of 10 MMRP sites that AFCEC is managing. AFCEC has taken the site through the Comprehensive Site Evaluation (CSE) Phase II and is now conducting the Remedial Investigation consistent with the CERCLA process. Lt. Col. Cody responded that the new fence was to replace the old one for aesthetic purposes. He said that the Rod and Gun club started as an Air Force Morale, Welfare, and Recreation (MWR) site. Mr. Goddard asked if it was part of the military's responsibility to which Col. Cody replied yes.

Mr. DiNardo asked if there has been any progress with replacing AFFF and that it is still being used on base. Ms. Forbes replied that the Air Force has a three-step process for eliminating AFFF: the first step is to incinerate any AFFF that is in containers as that is currently the only way to destroy it; the second step is to remove it from fire trucks that use it and replace it with a substitute (six chain hydrocarbon instead of an eight chain); and, the third step is to replace it in the hangars. The JBCC fire station falls under the Commonwealth of Massachusetts and the Coast Guard has AFFF in their hangars as well. Mr. Pinaud, MassDEP, added that the fire station used to be under federal and was federal when the AFFF went in, but is now under the Commonwealth so they are trying to figure out who is going to pay to remove the AFFF, incinerate it, and replace it.

Mr. DiNardo commented that very little of AFFF can create such a huge problem and that used off-base was a necessary response to emergency situations. Ms. Forbes agreed and added that it is a nationwide problem.

Mr. Goddard commented that in the town of Bourne, the Bourne Fire Department has eliminated AFFF and replaced it with a product that has no PFOSs or PFCs and has a military spec. He has forwarded the information along to members to see if it is possible solution for base as well.

Mr. Pinaud added that the MassDEP Commissioners Office is working with the Division of Fire Services of the State Fire Marshall's Office to replace PFC-containing AFFF foam with non PFC-containing AFFF foam. There is no update, but they are evaluating alternatives to see if the options with non PFC-containing AFFF foam products works as well as the AFFF foam with PFCs. Mr. Pinaud stated that he would get an update on the progress for the April 2018 meeting. He added that he forwarded the information Mr. Goddard sent him to the Commissioner's Office.

Mr. Seaver inquired as to the meaning of the term "emerging contaminants". He said he is used to dealing with MCLs that have a well-defined history and clear-cut legal consequences. He said that the emerging contaminant term is in every newspaper, and is frequently used in non-environmental terms too. Mr. Seaver asked how the term emerging contaminants came to be and what are its legal consequences? Can it be used in a court of law to force someone to pay?

Mr. Lim, USEPA, replied that the short answer is that in the Five Year Review that ended in 2012 that the Air Force conducted, one of the recommendations the EPA made to the Air Force was to sample for PFAS and 1,4-dioxane. Mr. Lim's EPA supervisor requested sampling for those chemicals. With regard to MCLs and cleanup standards, Mr. Lim said there is currently no MCL for either the two PFAS compounds – PFOS and PFOA. EPA is currently using a "Health

Advisory” which is developed by the EPA’s Drinking Water Office which is apart and separate from EPA’s Superfund program. Mr. Lim said that with regard to 1,4-dioxane, the state has a GW-1 number but is not an MCL, it’s not a drinking water standard. Mr. Lim said he could do some research to find the history of the term emerging contaminants and what the driver was for PFAS. He said his understanding is that PFAS was identified as a chemical of concern in the late 90s/early 2000s. Mr. Lim said he can look into the chain of events that created the need to start looking for it and will take that as an action item for the next meeting.

Mr. Seaver asked if emerging contaminants can be brought to a court of law and can a judge force anything because of this? Mr. Lim responded that the health advisory is not akin to an MCL, and as they move into the feasibility study for PFAS, the Air Force and Regulatory agencies will figure out the legal angle for the final cleanup number. He continued that they are still in the investigation stage, and he did not think there is a legal framework yet for a judge to make rulings since there is no MCL yet.

Ms. Forbes added that the EPA also requested under the unregulated contaminant monitoring rule (UCMR) that all the water suppliers sample for these contaminants which include PFAS as well as 1,4-dioxane which was done not just on this program, but nationwide. Even though it is a health advisory that is not enforceable, the Air Force has a policy that will mitigate the risk associated with PFAS if the concentrations are above the health advisory. Ms. Forbes said that the following presentation on emerging contaminations will answer some of Mr. Seaver’s questions.

Mr. Seaver commented that it is so wide-spread it is a major economic development and it will all end up in the taxpayer’s pocket.

Mr. Goddard also replied to Mr. Seaver and said that his understanding is that enforceable standards are promulgated in the law, and Congress and the legislatures being the political entities that they are, can take decades to keep up with science. Mr. Goddard gave the example of permissible exposure limit for safety data sheets on an eight-hour work day. The American Academy of Industrial Hygienists has threshold limit values which are the latest science limits, but they are not law. Mr. Goddard continued there are also contaminants under the safe drinking water vs CERCLA. It gets down to what has Congress passed in law or what has the legislature passed under the Massachusetts Contingency Plan. Science is so advanced that the law can’t keep up, but they want to tell the public there is some risk, even though it hasn’t been passed into law yet.

Mr. Seaver asked if there is a formal process outside of the EPA that establishes the level of risk? Mr. Goddard replied that ORS at DEP does research. Mr. Pinaud said he cannot speak to the federal process but that MassDEP has an Emerging Contaminants Work Group that includes toxicological professionals from DEP, industry, and academia who get together semi-annually and review the entire list of the group of compounds called emerging contaminants for which there aren’t yet cleanup standards or MCLs. The group reviews the most recent toxicological data and decides if there is enough data to move forward with making a legal standard. In Massachusetts there are Maximum Contaminant Levels which is the drinking water legal standard and there are cleanup standards which is the Massachusetts Contingency Plan which is similar to CERCLA. For 1,4-dioxane, Massachusetts has promulgated a cleanup standard and the Air Force can use that as an applicable and relevant requirement in their cleanup program and they are doing that. He continued that MassDEP is close to promulgating a standard for PFAS compounds. At a meeting of an advisory committee a month ago, the MassDEP Assistant Commissioner stated that they

have a regulatory packet that is ready for promulgation for a number of other compounds and other regulatory aspects of the MCP. The Assistant Commissioner publicly said that PFAS standards will be put out for public comment possibly this month and that they are coordinating with the Water Supply Program because they are doing a lot of testing under UCMR3 (Third Unregulated Contaminant Monitoring Rule) program. From the state perspective there may be some legal standards that the Air Force can use in their cleanup program under CERCLA but that would just apply to Massachusetts.

Mr. Martin, Deputy Regional Director of MassDEP, reiterated that MassDEP does have a work group working on the issue right now and any day now will be announcing an external work group to start working on this. He continued that MassDEP is coordinating their standards under the MCP for groundwater standards with the water supply standards so they match up. He said that before MassDEP comes up with a standard under the MCP they can require folks to do a cleanup of these compounds because they meet the definition of a hazardous material. Under the MCP, anyone who is responsible for the release of hazardous materials must clean it up. MassDEP has issues a number of Notices of Responsibilities (NOR) to potentially responsible parties even though they don't have reportable concentrations for PFAS compounds yet because it does meet the definition of a hazardous material and in those situations MassDEP thought there was a likelihood they were posing a risk so they issued NORs which requires certain entities to do a successful cleanup of these compounds. Mr. Martin stated there is a legal hook because of the definition of hazardous material.

Agenda Item #4. Presentation: Emerging Contaminants Update – Mary O'Reilly CH2M and Mark Hilyard, CH2M

Ms. O'Reilly began the presentation stating that in the last meeting the term PFCs was used, but now EPA, MassDEP, and AFCEC are using the term PFAS (per- and polyfluoroalkyl substances) because it includes a broader range of compounds. She then gave an overview of the presentation which will include background on PFAS and 1,4-dioxane; updates on Site Inspections (SI), Supplemental Remedial Investigations (RI), and Feasibility Studies (FS); and the path forward. She said in the CERCLA process they do a Preliminary Assessment first which is a records search to see if a chemical had been used at that site, and then they go to a Site Inspection which includes limited field work to see if they can determine the presence or absence of the compound. Next is the Remedial Investigation where they do more extensive field work to determine the nature and extent of the contamination. The Feasibility Study is next where they determine options for remedial action.

Referring to Figure 1 of the Plume Map, Ms. O'Reilly pointed to current plumes as well as Tanker Truck Rollover Sites and Flight Line Area Sites. Ms. O'Reilly explained that PFAS are compounds used in the formulation of aqueous film-forming foam (AFFF) which have been used on base to suppress fires since 1970. They are also used in off-base fire departments. They are used in household and industrial products and are soluble and mobile in groundwater and chemically and biologically persistent in the environment. The common PFAS are PFOS and PFOA. EPA Health Advisory for PFOS and PFOA is 0.07 µg/L for each and combined. There are no Federal Maximum Contaminant Levels (MCLs) or Massachusetts MCLs (MMCLs) for PFAS.

1,4-Dioxane is primarily used to stabilize solvents. It has been commonly used in printing and textiles, house cleaners and detergents and other household products (refer to Slide 5) as well as the industrial processing of fats and oils, pharmaceuticals, and the chemical industry. 1,4-Dioxane is soluble and mobile in groundwater and does not readily break down in the environment. There are no MCLs or MMCLs for 1,4-dioxane in drinking water but there is an EPA risk-based Regional Screening Level of 0.46 µg/L and MassDEP Massachusetts Contingency Plan (MCP) Groundwater-1 (GW-1) Standard of 0.3 µg/L.

Ms. O'Reilly continued with the Flight Line Area Site Inspection Report Summary. AFCEC looked at ten sites in the Flight Line Area and nine of the ten sites were confirmed for PFAS contamination through groundwater sampling. PFAS contamination was not confirmed at the Runway 32 Approach Area but will be investigated in the future for the Former Building 118 Release Area Site.

PFAS contamination from the Tanker Truck Rollover Sites has migrated off-base and has impacted private wells as shown in Figure 3. A Remedial Investigation is the next step for this site for further investigation. A Draft Work Plan was submitted to Regulators in January 2018. The remaining Flight Line sites are proceeding to an expanded Site Inspection to assess the ongoing source of PFAS from soil to groundwater and to determine if PFAS contamination in groundwater has migrated off-base potentially impacting drinking water supplies. Table 1, included in the handouts, identifies the 7 Flight Line Area Sites that are proceeding to the Expanded Site Inspection. A Draft Expanded Site Inspection will be submitted this month (February 2018.)

Ms. O'Reilly referred to Figure 3 which shows the two Tanker Truck Rollover Sites. In 1997 a tanker truck rolled over off- base within the Route 28 rotary west of the JBCC entrance releasing 520 gallons of fuel. The fuel contaminants were regulated by the state at that time so 310 tons of soil impacted with gasoline were excavated and removed from the site. The Base Fire Department responded to the crash site and released 500 gallons of 3% AFFF/water mixture. In 2000, a tanker truck released 300 gallons of fuel entering the base on Connery Avenue near the Otis Rotary. The Base Fire Department responded to the crash site and released 500 gallons of 3% AFFF/water mixture to suppress the flammable vapors. The fire department blocked the storm sewer inlets to prevent fuel migration, but AFFF may have drained into storm sewer inlets near the rollover area. 305 tons of petroleum-impacted soil were excavated and removed from the site.

The SI field program for TTRS included sampling of two existing monitoring wells (MWs) and the completion of five direct push groundwater vertical profile borings (Figure 3). Ms. O'Reilly stated that PFAS contamination was detected in direct push groundwater vertical profile borings therefore private well outreach and sampling were added to the Site Inspection field program for the site. This area is outlined in red in Figure 3. Most homes in the area are on town water, but eight private wells were identified on Valley Farm Road which is adjacent to the Wilson Bog Complex. At three of those locations PFOS was above the HA so AFCEC provided bottled water until whole-house filtration systems were installed. One private well was sampled in August and results were above the HA. It was resampled in September and was below HA. AFCEC is providing bottled water to that home and sampling it quarterly along with remaining wells.

Surface water samples collected from three location in the Wilson Bog complex resulted in two samples above the HA. PFOS contamination above the HA of 0.07 µg/L extends from the TTRS source areas near the Route 28 rotary to Wilson Bog Pond. The RI field program will include

groundwater, soil, and surface water sampling. The Rod and Gun Club Ponds were sampled and results were ND. Flax and Lily Ponds were sampled and results were below HA.

Mr. Winters asked if the outreach area for TTRS should be further south? Ms. O'Reilly responded that yes, the outreach area was expanded further south after detections were determined in the SI.

Mr. Pinaud stated that AFCEC performed surface water sampling at three locations at the Wilson Bog Complex where there are active cranberry bogs. AFCEC did detect PFAS compounds in those surface water bodies that are used to irrigate the cranberry crop in that area. At harvest time in 2016 the MassDEP Commissioner, the MassDPH Commissioner, and the Mass Department of Agriculture Commissioner sent a letter to Ms. Maureen Sullivan, Deputy Assistant Secretary of the Department of Defense for Environmental Safety and Occupational Health, requesting that the Air Force sample cranberries due to concern there may be a connection between the surface water sampling results and the cranberry fruit. Ms. Sullivan responded with a letter saying CERCLA prevented the Air Force from sampling the cranberries. So, MassDEP reached out to the US Food and Drug Administration (FDA) and asked them to develop a methodology for sampling cranberries for PFAS compounds and analyzing PFAS compounds because the analysis, EPA 537.1, is a drinking water analysis. In 2016 MassDEP collected cranberry samples and sent them to the FDA where they were analyzed and the results came back non-detect. The grower brought his fruit to Ocean Spray and Ocean Spray ultimately decided not to accept the fruit as a business decision and the fruit was incinerated at the Southeastern Massachusetts (SEMASS) Resource Recovery Facility. In 2017 MassDEP sampled the cranberries again as a precaution and split surface water samples with the Air Force. The samples were sent out to a separate certified lab and the fruit came back non-detect again. Ocean Spray decided not to accept the fruit again so it was incinerated. MassDEP is trying to ensure the cranberry crop is safe. They have two rounds of data and are currently working on plans for this year's harvest. Mr. Pinaud added that the work that the Air Force is doing will establish whether or not there is a hydraulic connection between groundwater contaminated with PFAS and the bog system.

Mr. Goddard stated that he is reminded of EDB and AVGAS and cranberries and asked if that experience can shed any light on this? Ms. Forbes replied that Mr. Goddard is correct and that the program was in a steady state where plumes were cleaning up, extraction wells were being shut off, and everything was being managed, but they are now back in the investigation phase again. She said there are a lot of lessons learned from early on.

Ms. O'Reilly referred to Figure 4 and reviewed the Draft CS-20 Supplemental RI, submitted in June 2016, which included 32 monitoring wells, two extraction wells, two treatment plant ports, one private drinking water well under CS-20 LUC program, and one Deep Pond surface water sample for 1,4-dioxane. 1,4-Dioxane was detected above the MCP GW-1 in two monitoring wells and above the laboratory reporting limit in two additional wells. These wells were resampled in 2016 and concentrations decreased in all wells. Only 69MW1422 exceeded the MCP GW-1 with 0.48 µg/L. There is no current complete exposure pathway to the 1,4-dioxane groundwater contamination and the extent of contamination is very limited. AFCEC along with EPA and MassDEP is conducting an interim groundwater monitoring program for 1,4-dioxane at eight CS-20 monitoring wells and will determine next steps based on these data. The second sampling event in November 2017 resulted in concentrations in all eight wells below the MCP GW-1 standard of 0.3 µg/L. Two more sampling events are planned. The CS-20 Supplemental RI will be finalized after the 1,4-dioxane interim monitoring program is completed and determine the next steps.

The EPA requested AFCEC sample LF-1 extraction wells for PFAS since contamination has been associated with other landfills. Results confirmed the presence of PFAS at LF-1, so it was added to the LF-1 Supplemental RI Program initially established for 1,4-dioxane and all the wells were sampled for 1,4-dioxane and PFAS (Figures 5 and 6). The field program included sampling of 121 monitoring wells and eight extraction wells where results in 22 MWs and four EWs exceeded the MCP GW-1 standard of 0.3 µg/L for 1,4-dioxane; the LF-1 and Hunter Avenue Treatment Facilities (HATF) influent and effluent plant sampling ports with only the LF-1 plant effluent exceeding the MCP GW-1 standard; and, surface water/seep sampling at Red Brook Harbor and Squeteague Harbor with no results exceeding the MCP GW-1 standard.

Ms. O'Reilly stated that the LF-1 1,4-dioxane plume is within the LF-1 COC plume. The sum of PFOS and PFOA was detected at concentrations exceeding the EPA HA of 0.07µg/L in nine MWs and two LF-1 EWs. PFOS was detected at seven MWs above the EPA Screening Level (SL) of 0.0401 µg/L and PFOA was above the SL at five MWs. The highest concentration of PFOS was 0.37 µg/L at 27MW1003A and the highest PFOA concentration was 0.24 µg/L at 27MW1007B (Figure 6). Detections of the sum of PFOS and PFOA were above the EPA HA in the LF-1 plant influent and below in the effluent. The Final Supplemental RI Report for LF-1 was submitted in January 2018 with recommendations that 1,4-dioxane, PFOS, and PFOA to be added as COCs for the LF-1 plume and a streamlined Supplemental FS will be completed that will evaluate remedial alternatives for groundwater.

Mr. Goddard asked if the contaminants are being treated with the GAC. Ms. O'Reilly responded yes, except for 1,4-dioxane with which GAC treatment is not effective. She added that the feasibility study will look at the remedial alternatives for treatment for 1,4-dioxane. Mr. Goddard asked about carbon change out frequencies to which Ms. O'Reilly responded that the carbon is changed out based on current COC breakthrough.

Ms. O'Reilly gave an update on the Ashumet Valley Supplemental RI and referred to Figure 7. It was assumed that 1,4-dioxane and PFAS contamination would be contiguous with the existing AV PCE and TCE groundwater contamination and that 1,4-dioxane and PFAS would be detached from the source area. Based on the initial assessment of the data collected under the Supplemental RI in May 2016 and the final EPA HA values for PFOS and PFOA, it became apparent that the extent of PFAS contamination was more widespread than originally anticipated and additional data collection was necessary. An interim emerging contaminants conceptual site model (CSM) technical memorandum was submitted in March 2017 using the Supplemental RI data to support additional activities. A Draft Supplemental RI Data Gap Work Plan was submitted in April 2017 which identified gaps and a plan to address those gaps. The highest PFOS and PFOA concentrations are currently detected near the AV source areas indicating the need for soil sampling and to determine if there is a continuing source of PFAS contamination to groundwater and the nature and extent of soil contamination. Additional investigation is needed to determine if contamination was discharged via the AV infiltration trenches. Further investigation is also needed for Ashumet and Johns Ponds to determine the extent of PFAS.

Ms. O'Reilly reviewed the initial field program which included sampling of 126 MWs, five irrigation wells, four EWs, the AV influent and effluent plant sampling ports, surface water sampling at Ashumet and Johns Ponds, and five direct push groundwater vertical profile borings. The results included 16 MWs and one direct push boring exceeding MCP GW-1 for 1,4-dioxane

with the highest concentration in the northern plume lobe (Figure 7). PFOS concentrations at 35 MWs and one direct push boring exceeded the EPA HA with the most elevated PFOS concentrations located between the source areas (FTA-1 and MMR Sewage Treatment Plant) and Ashumet Pond. PFOA concentrations exceeded the EPA HA at 32 MWs and one direct push boring with the highest concentration near the source area (Figure 8).

Surface water samples were taken at recreational beach locations along Ashumet and Johns Ponds for 1,4-dioxane and PFAS (Figure 9). 1,4-Dioxane was detected at a very low concentration BRL at Johns Pond. 1,4-Dioxane was ND in five other surface water samples. PFOS was detected at all six locations from 0.083-0.18 µg/L. Vertical profiling samples were collected to characterize the water column in each pond and the PFOS and PFOA results were consistent with initial sampling. Data indicate that PFOS and PFOA are present in Ashumet and Johns Ponds at concentrations greater than background ponds for nearby surface waters thus the areas downgradient of the ponds were reviewed for the presence of private drinking water wells and the Supplemental RI field program was expanded to cover that area.

Mr. Cusak, Mashpee resident, asked what the function of surface water sampling is and what is the purpose of the site on the figures. Ms. O'Reilly responded by pointing out the Ashumet Valley source areas including the fire training area. She said that the contamination from the fire training area has migrated downgradient in the groundwater and discharged into the pond and that is why they see PFAS contamination in the ponds. She added that all of the ponds have a hinge line and the upgradient side of the hinge line receives groundwater from the aquifer to recharge the pond and the downgradient side the pond recharges the aquifer. If there is PFAS contamination in the pond, you will also see it in the aquifer downgradient of the pond. This is the same for Ashumet Pond and Johns Pond.

Mr. Cusak asked if Johns Pond is supplying aquifer or vice versa? Ms. O'Reilly responded that Johns Pond also has a hinge line and the downgradient side would recharge the aquifer so the contamination in Johns Pond would be seen in the aquifer downgradient. So if there are residential wells or private wells around the pond they are probably drinking pond water. Mr. Cusak asked if the sampling results from the Johns Pond surface water are available. Ms. O'Reilly pointed out the where the results are located in the handout.

Ms. O'Reilly continued with the Ashumet Valley Data Gap Field Program. She stated that the data gap direct push drilling began in September 2017 and 14 groundwater vertical profile borings have been completed to date (Figure 10). Samples were collected at Transect 1 locations. 1,4-Dioxane was ND at two direct push locations and was detected at BRL in two samples collected from 95DP4006. PFAS was analyzed at all locations and resulted in PFOS plus PFOA exceeded HA at each direct push boring. The PFAS contamination was generally thickest around the ponds at groundwater vertical profiling locations. Preliminary PFAS and 1,4-dioxane results are consistent with the CSM.

Ashumet Valley influent and effluent plant samples were tested for PFAS and 1,4-dioxane in the effluent. Effluent results remain below HAs for PFAS and the GW-1 for 1,4-dioxane. Sandwich Road influent and Northern Lobe influent tested below HAs for PFAS. Samples of individual CS-10 Sandwich Road EWs were taken for PFAS and results are pending.

Due to the detection of PFOS plus PFOA above the HA in the Mashpee Village Public Water Supply Well (PWSW), groundwater samples from the 4 Mashpee Village PSWS sentry wells were collected for PFAS analysis. Concentrations at all four sentry wells were above the HA for PFOS and PFOA. Results are pending for samples taken at additional MWs between Ashumet and Johns Ponds.

Mr. Hilyard, CH2M, continued the presentation with the Ashumet Valley private well sampling (Figure 11). Sampling of the private drinking water wells in area of infiltration trenches began in July 2015. For the Sandwich Road trench four private wells were identified and 45 wells were identified for the Currier Road trench. PFOS and PFOA were detected in private wells near Currier Road trench so AFCEC shut down the trench in September 2015 and diverted the treatment plant discharge to the Sandwich Road trench. Bottled water was provided to residences with PFOS and PFOA greater than the HA and monitoring of private wells for PFAS and 1,4-dioxane is continuing.

Nine sampling events were completed through November 2017 which resulted in ND for 1,4-dioxane and very low concentrations BRL of PFAS at the four wells near the Sandwich Road trench. Near the Currier Road trench, 1,4-dioxane levels are consistently below the MCP GW-1 standard and PFOS and PFOA exceeds the HA at the southeast of the trench. Over time, PFOS and PFOA exhibit decreasing trends near the Currier Road trench and increasing trends southeast of the trench. Mr. Hilyard referred to Figure 11 which represents a time step progression of monitoring of private well sampling results in the area of Currier Road.

AFCEC provided bottled water to six residences until whole-house filtration systems were installed. Semiannual monitoring continues to ensure the whole-house filtration systems are effective at removing PFAS and to identify when a carbon change is needed. Bottled water is being provided to 4 residences that are above HA where PFOS and PFOA concentrations are expected to decrease below the HA in a short time. Monitoring of active private drinking water wells located downgradient of the trenches is continuing.

Mr. McCarthy, resident of Currier Road, expressed concern that even though he has the whole-house filtration system and the last sampling results showed that PFOS and PFOA were non detect, there is still detection of 1,4-dioxane. He said he was told that AFCEC was going to do some flushing of the wells and asked if there was more testing in wells towards Rte 151 which might remove the 1,4-dioxane. Mr. Hilyard referred to Figure 11 and pointed out a decrease in 1,4-dioxane at the wells at the bottom of Cape Woods Drive and a decreasing trend at the private wells to the north. He said the trend hasn't happened yet in the Currier Road area yet, but it is expected. He added that all of the results have been below the MCP GW-1 standard and that groundwater vertical profiling was conducted north of the neighborhood with no 1,4-dioxane detected in the water column.

Mr. Hocking, resident of Currier Road, stated that two out of his three private wells were not tested for 1,4-dioxane in the last sampling event and asked if AFCEC is concerned about that. Mr. Hilyard replied that 1,4-dioxane is sampled on a semiannual basis as of now and that Mr. Hawking's wells are being tested for 1,4-dioxane every 6 months.

Mr. Winters asked if the squares in Figure 11 represent one water sample or a series of water samples. Mr. Hilyard replied that the square represents one private well and they take a raw water sample before it goes into the filtration system.

Mr. DiNardo asked if there are any data on the consistency as to the depth of the private wells and where in the aquifer they are drawing from. Mr. Hilyard responded that they have well construction data for approximately 1/3 of the wells in the area from the town and from that data can see that the wells are roughly 30-40 feet from the water table. Mr. Hilyard said that in his experience doing residential well sampling across the Upper Cape that is generally the case for most wells. Mr. DiNardo asked if they were comfortable as to where the impact area is. Mr. Hilyard replied that private wells are not ideal as they are not monitoring wells where they know the exact depth and how much they were pumped before they collected a sample, and that is why they are doing a lot of groundwater profiling.

Mr. Goddard asked since the PFAS detections are downgradient of the trench and the trench comes from the treatment plant, that would mean that detections are coming from the effluent, so why weren't they picked up by the GAC at the treatment plant? Mr. Hilyard replied that when emerging contaminants became a concern in the 2014-2015 time frame, AFCEC was not monitoring the plants for PFAS and the carbon was being changed out only when one of the PCE or TCE compounds would break through. PFAS breaks through quicker so the GACs will need to be changed out more often. Mr. Goddard asked once the routine of carbon change out is managed for PFAS, will AFCEC reopen the infiltration trenches for discharge? Ms. Forbes answered that there is currently one extraction well operating and the treated effluent is going to the Sandwich Road trench. The flow of the well was reduced from 350 gpm to 210 gpm to Sandwich Road since there is only one trench being used which worked out well since AFCEC was looking to optimize that extraction well anyway. But now they are seeing a little bit of TCE outside of the capture zone of that well so they are monitoring to see if any adjustments need to be made to the system. Mr. Goddard stated that it would be a good action item down the road as to how this is affecting the plants, how it is effecting the pumping systems, and the optimization. 1,4-dioxane has a different treatment technology which is still emerging. The assumptions as to where AFCEC discharged was downgradient to private wells weren't affected before may be now coming into play. Ms. Forbes agreed. Mr. Goddard asked about the whole-house filtration systems and if they are going to be managed until AFCEC is confident that they have eliminated the risk from the infiltration – could it be a couple of years that AFCEC will be responsible for running for these residents? Ms. Forbes responded that AFCEC would be responsible for the carbon filtration systems and will be sampling semi-annually and changing out carbon as needed to make sure residents are protected and not getting PFOS and PFOA above the health advisory. AFCEC is committed to do that until it flushes out. Mr. Goddard commented that 1,4-dioxane is the “tricky one”. Ms. Forbes replied that all the 1,4-dioxane they are seeing is below the GW-1 standard so it isn't being targeted but if it did go above the standard, AFCEC would investigate options.

Mr. Pinaud referred to the boring upgradient of Currier Road and asked Mr. Hilyard if it was on the map. Mr. Hilyard replied it is not on the map and is upgradient of the neighborhood where a power easement is located. Mr. Pinaud asked if they found PFAS compounds there. Mr. Hilyard replied no 1,4-dioxane was not found but PFAS compounds were found. Mr. Pinaud stated there may be an alternate explanation as to why there are PFAS compounds in that area.

Mr. Jacobs, MassDEP, stated there could be numerous explanations for PFAS in the area. The trench could be a source for it. They never saw it in the effluent as Mr. Hilyard pointed out and they never saw it breakthrough, so they don't have the data to support that argument. Mr. Jacobs said that when the area was first sampled for PFOS and PFOA in July of 2015, when the trench was operating, they didn't see any PFOS or PFOA above the HA in those wells. It was after the trench was shut off that it started coming into those wells. It is a reasonable explanation it could be coming from the trench, but we are seeing PFOS and PFOA detections all around this area – cross-gradient, upgradient, everywhere else so it could be aquifer related. Mr. Jacobs said that it might not be in the direct area of Currier Road, but directly upgradient at the Cape Woods neighborhood where they did find PFOS and PFOA at the well which is 10 feet below the bottom of the deepest screen from construction details. Mr. Jacobs stated that MassDEP asked for additional monitoring in that area because they were concerned about that. He continued that MassDEP feels the trench was operated for a very long period of time and changed the hydraulics in the area. He said that AFCEC is still seeing 1,4-dioxane which was derived from the trench, 2 years after the trench was shut off, which tells them that it has had a long-term impact on the hydraulics of the area. MassDEP is concerned that hydraulics of the area equilibrate after the trench has been shut off because all of that trench water is still up in the Vadose Zone and it is going to take a long, long time to trickle down for everything to equilibrate and the hydraulics to go back to the pre-trench state and the 1,4-dioxane surrounding this area could come back and impact those wells. This is why MassDEP has been very ardent in recommending monitoring of all private wells in this area because they feel the conceptual site model is still evolving and there are too many data gaps right now. So, he continued, it is important to keep all these wells on radar and keep up the monitoring until the remedial investigation is complete and they have a thorough understand of what is happening.

Mr. Goddard asked if there is any place the fire departments used AFFF in town that could contribute to these problems. Mr. Pinaud and Mr. Jacobs responded they didn't know. Mr. Jacobs continued in saying that they do know that the ponds have been impacted above the health advisory and they are impacting the whole area around the ponds and downgradient also.

Mr. Hilyard agreed and said there is a lot going on in the area. He pointed out there are several lines of evidence they look at and Ashumet Pond is at the top of these figures and it is true there is probably pond water migrating out of the pond moving south into the area referring to Figures 10 and 11. PFAS water originating from the ponds has a very different signature than the water in the private wells. The water that is discharged from the treatment plant has undergone some treatment through the carbon. PFOS is removed more efficiently than PFOA so the plant effluent does have PFOA detection. The groundwater coming from the ponds has more of a PFOS signature. Remedial investigations are being done to reduce the uncertainty.

Ms. Forbes added that AFCEC is still working on the remedial investigation and there is a lot of sampling left to do, and there is a lot of discussion going on about this particular area and other areas which Mr. Hilyard is going to touch on with respect to residential wells.

Mr. Hilyard referred to Figure 12 which shows PFOS and PFOA results at private wells in the Ashumet and Johns Ponds area. He stated that AFCEC saw surface water at the two ponds with concentrations of PFOS and PFOA above the drinking water standard, so they performed outreach in the area starting closest to the ponds and work outward/downgradient from the ponds. Outreach and sampling of private drinking water wells downgradient of the ponds has been ongoing since

June 2016 and that the results show PFOS and PFOA detections above the HA at most private drinking water wells located closest to the ponds and that results of private wells further from the pond are generally below HA. Bottled water and/or whole-house filtration systems were provided by AFCEC until a municipal water connection could be installed. The municipal water connections are completed for all but one location which is being scheduled. The municipal water connection at Lakeside Estates is complete. There are two homes on Anton that are below the HA and opted to connect to town water on their own (blue shade on Figure 12). All yellow highlighted on Figure 12 are AFCEC funded connections.

Residences that have a municipal connection will no longer be sampled. Monitoring of active private drinking water wells at risk downgradient of the ponds will continue and AFCEC will respond with bottled water as needed. Outreach will also continue.

Mr. Cusak said he received notice that borings were going to be done for PFCs, and asked Mr. Hilyard to explain the difference between that testing, the private well testing for PFCs and surface water testing. Mr. Hilyard replied that the Neighborhood Notice he received was for the groundwater profiling being performed in that area. The first data set done was the surface water which gave them the indication that there was something that needed further investigation. They then sampled the private wells in the area and saw that those were impacted. Since vertical profiling is a useful tool, using a direct push rig they take a groundwater sample every ten feet. They start at the water table and go down as deep as they can go which is often 180-200 ft deep. That gives a detailed vertical profile of where there is clean water and where they enter the zone of contamination. That is the work being done in Mr. Cusak's neighborhood so AFCEC will be able to do cross sections to see how deep the contamination is and where it is located relative to the private wells. Mr. Cusak asked when the results would be back. Ms. O'Reilly replied that the results are back from that area and there were exceedances of the Health Advisory. Ms. Forbes said AFCEC would provide those results to Mr. Cusak.

The path forward for emerging contaminants includes submitting the Draft Expanded Site Inspection Work Plan for PFAS; continuing the Tanker Truck Rollover Sites Remedial Investigation Field Program and Valley Farm Road private well sampling; continuing the Ashumet Valley Supplemental Remedial Investigation Field Program and private well sampling and outreach in the Ashumet and Johns Ponds area; providing water as needed; continuing interim monitoring program for 1,4-dioxane at CS-20 and finalizing the Supplemental Remedial Investigation Report after the interim program is completed; completing a Supplemental Feasibility Study for 1,4-dioxane and PFAS at LF-1; and, presenting sample results and field program updates to the agencies at Technical Update Meetings and to the public at future JBCC Cleanup Team meetings.

Agenda Item #5. Presentation: CS-10 Supplemental Feasibility Study for 1,4-Dioxane – Mary O'Reilly CH2M

Ms. O'Reilly presented the background on CS-10. The Supplemental Feasibility Study was recently submitted to the regulators for review. The COCs for CS-10 are the VOCs TCE and PCE. Ms. O'Reilly referred to Figure 2 in pointing out the 4 systems designed to remediate for CS-10. The Record of Decision (ROD) for CS-10 (2009) identified groundwater pump and treat with Land Use Controls (LUC) and long-term monitoring as the selected remedy. In the 2011 Explanation of Significant Differences (ESD), monitored natural attenuation (MNA) was clarified as a

component of the remedy. An optimization evaluation completed in 2013 in response to the post-ROD data gap investigation produced an expanded remedial system which began in 2014 to improve plume capture for COCs and reduce the aquifer restoration timeframe. The most recent models predict remedial system shut down by 2055 and aquifer restoration of 2060 instead of original 2094 from original ROD.

1,4-Dioxane is commonly associated with 1,1,1-trichloroethane (TCA) and 1,1-dichloroethene (DCE). Both have been detected in CS-10 monitoring wells. The Final Supplemental Remedial Investigation submitted in 2017 included 1,4-dioxane detections at concentrations exceeding the MCP GW-1 standard in 10 monitoring wells located in the northwestern portion of the CS-10 plume (Figure 3). The 1,4-dioxane plume was delineated at approximately 3000 ft wide, 3000 ft wide and 130 ft thick. Figure 4 shows transport model simulations that indicate 1,4-dioxane is not expected to extend the predicted restoration timeframe of 2060 for TCE. Recommendations included completing a streamlined Supplemental Feasibility Study to evaluate alternatives, adding 1,4-dioxane as a COC for CS-10, and additional sampling for delineation.

The Remedial Action Objectives (RAOs) for TCE and PCE continue to be applicable. They include preventing residential exposure to CS-10 groundwater with TCE and PCE concentrations greater than their MCLs of 5 µg/L each. Based on the presence of 1,4-dioxane within the existing CS-10 TCE/PCE groundwater plume at concentrations exceeding the MCP GW-1 standard of 0.3 µg/L, 1,4-dioxane will be added as a COC, and an RAO of prevention of residential exposure to 1,4-dioxane concentrations in CS-10 groundwater over MCP GW-1 standard of 0.3 µg/L will be added.

Ms. O'Reilly explained that a variety of technologies were screened for remediation during the FS. In situ technologies were ruled out due to the considerable challenges and cost. The 1,4-dioxane contamination is co-located with the TCE contamination in the northwest corner of the CS-10 plume where a treatment facility is capturing and treating TCE and PCE with GAC. Even though GAC is ineffective in treating 1,4-dioxane, it was ND in the influent and effluent plant sample therefore additional treatment was ruled out.

The two alternatives considered were no action for 1,4-dioxane (alternative 1) or adding 1,4-dioxane to existing remedy as COC (alternative 2). The first alternative does not ensure protection to exposure. By adding 1,4-dioxane as COC, a monitoring program would be developed along with LUCs on-base and off-base to prevent exposure. Both alternatives are compliant with ARARs and residual risks are the same for long-term. Since alternative 2 assures reliable remedy for reducing 1,4-dioxane and controlling risk to human health and the environment, it is the selected alternative.

Moving forward Ms. O'Reilly stated that AFCEC would prepare an ESD to include 1,4-dioxane, prepare a monitoring plan, and inclusion of 1,4-dioxane in annual reporting for the CS-10 plume.

Mr. Goddard asked even though GAC is ineffective on 1,4-dioxane why did the effluent come out ND. Ms. O'Reilly responded because the influent was ND also. She referred to Figure 3 and showed where a few of the wells did have detections but were all BRL. Mr. Goddard asked if when referring to natural attenuation is that through a degrading process where it breaks down to daughter compounds and granddaughter compounds or is it dilution dispersion. Ms. O'Reilly responded that it is dispersion. Mr. Goddard asked if 1,4-dioxane breaks down in the environment

like VOCs do. Ms. Forbes replied there is some research going on and with the right conditions and the right microorganisms you might be able to enhance it with some food for the microorganisms – there is a lot of research going on with respect to biodegradation of 1,4-dioxane. Mr. Goddard asked if the exposure is ingestion for all of these compounds – not inhalation or anything else. Ms. Forbes replied the exposure is related to ingestion.

Mr. Pinaud stated MassDEP's position is that they have agreed to let the Air Force go forward with this alternative but they are concerned because 1,4-dioxane doesn't break down regularly and they are talking about dispersion and dilution and granular activated carbon does not treat 1,4-dioxane. MassDEP has communicated to the Air Force that if 1,4-dioxane is detected in the influent they would like them to evaluate an active treatment. This was argued at length and MassDEP and AFCEC reached a stalemate. Mr. Pinaud stated he thinks AFCEC agrees with this and would like to put it on the record. Ms. Forbes replied that AFCEC is bound by the CERCLA process which is they go through the RI and FS which was just completed, then they prepare an ESD (a decision document) and they are going to add 1,4-dioxane as a COC. Then after that in the CERCLA process is remedial design, remedial action and in the case of long term monitoring, they would develop a monitoring plan. Ms. Forbes continued that AFCEC would not make any decisions until after there is a signed Record of Decision or in this case an ESD. AFCEC has been doing this all along in the System Performance Ecological Impact Monitoring Program (SPEIM) – AFCEC monitors the situation and if the results don't fit into the conceptual site model and look like they are going to be a risk, AFCEC does something about it. AFCEC has added extraction wells and has done system modifications, as examples. Ms. Forbes added that AFCEC is not disagreeing with MassDEP's position, it is more of a wait and see after the CERCLA process.

Agenda Item #6. Final Discussions. Adjourn.

Ms. Donovan asked if anyone had a comment on the length or content of the meeting. Mr. DiNardo commented that the time between meetings is too long because of the wealth of information. He stated he thought the information was presented very well but would like to meet more frequently. Ms. Donovan added that they had to take a couple of items off the agenda based on the level of information since it has been so long since the last meeting. Mr. DiNardo added that he would like an update of MMRP as an action item. Ms. Forbes responded that they would send out the overheads of the presentation that was already prepared on MMRP for this meeting but was postponed until next meeting.

Mr. Goddard commented that this was a short meeting not even approaching the intensity of meetings in the past. He said the team needs to be vigilant. He added because the public is here tonight and people living around the ponds are being effected, neighborhood notices are going out. Mr. Goddard said he would be happy with at least three meetings a year. He said it is really for the public because new people have moved in and all these questions come up again. It is important to give the public a venue. Ms. Donovan stated they will look at the presentations and make sure they aren't too long.

Ms. Donovan stated that the next meeting is scheduled for April 11, 2018. The meeting was adjourned.

Action Items:

1. Mr. Pinaud, MassDEP, stated that he would get an update on the progress of evaluating alternatives to see if the options with non PFC-containing AFFF foam products works as well as the AFFF foam with PFCs for the April 2018 meeting.

An update will be provided at the April meeting.

2. Mr. Lim, EPA, said he would do research to find the history of the term emerging contaminants and what the driver was for PFAS. He will look into the chain of events that created the need to start looking for emerging contaminants and will take that as an action item for the next meeting.

In 2009 the EPA Office of Water published a list of unregulated contaminants for public water systems (Contaminant Candidate List (CCL)), which included PFOA/PFOS, and issued Provisional Health Advisories for PFOA/PFOS. In 2012 EPA included six PFAS compounds including PFOA/PFOS in its third Unregulated Contaminant Monitoring Rule (UCMR 3).

3. Ms. Forbes, AFCEC, would provide the results from November of Quail Hollow Road boring well samples to Mr. Cusak.

Completed 28 Feb 2018

4. Ms. Forbes, AFCEC, would send out the overheads of the MMRP presentation that was already prepared but was postponed until next meeting to team members, specifically Mr. DiNardo.

Completed 02 Apr 18