

**Joint Base Cape Cod Cleanup Team  
 Building 1805  
 Camp Edwards, MA  
 April 8, 2015  
 6:00 – 8:00 p.m.**

***Draft Meeting Minutes***

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**Handouts Distributed at Meeting:**

1. Responses to the Action Items from the October 15, 2014 Meeting
  2. Draft final of the October 15, 2014 Meeting Minutes
  3. Presentation handout: Impact Area Groundwater Study Program Plume Updates
  4. Presentation handout: Private Residential Well Verification
  5. Presentation handout: Impact Area Groundwater Study Program Land Use Controls Update
  6. Presentation handout: Phosphorous At Ashumet Pond
  7. Presentation handout: Review of Ashumet Pond Restoration Progress
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## **Agenda Item #1. Introductions, Late-Breaking News, Approval of October 15, 2014 JBCC CT Cleanup Team Meeting Minutes**

Ms. Donovan began the meeting and asked those at the table to introduce themselves. Mr. Cody announced that he was going to be leaving for a year to go back to school and he introduced his temporary replacement, Lieutenant Colonel Brian Saunders.

The action item responses were reviewed and the October 2014 meeting summary was approved, as written.

Ms. Donovan turned the meeting over to Ms. Jennings to discuss late breaking news. Ms. Jennings stated that on March 25th, EPA issued a Notice Of Violation (NOV) for the Air Force for a failure to comply with the Federal Facility Agreement (FFA) because the Air Force did not submit additional plans, as requested. The NOV outlined the nature of the violation and stated that EPA is prepared to assess penalties if the items in the letter are not addressed. Ms. Jennings noted that at the October meeting there was a presentation on the emerging contaminants, 1,4-dioxane and perfluorinated compounds (PFCs). The investigations for 1,4-dioxane have been underway since February 2013. The agencies and IRP were looking at contaminants in the plumes, as well as influent and effluent from the treatment systems. The investigations for PFCs have been underway since last summer. Initially, the efforts were focused on the Fire Fighting Training Area One (FTA-1) because the compound is usually attributed to firefighting foams (AFFF). The investigations started downgradient of the FTA-1, primarily within Ashumet Valley. There were detections of PFCs in that area. Ms. Jennings stated that EPA was also involved with an investigation at Pease Air Force Base (PAFB) in New Hampshire where they were much further along with testing for PFCs. She noted that they had tested the fire training area and detected PFCs. They then tested the area along the flight line and detections were at very high levels. A public water supply well had to be shut down as a result. Blood testing for water consumers at the facility has also begun.

Ms. Jennings said that after she attended a meeting at PAFB last summer, EPA asked the Air Force at JBCC to “move quickly to characterize the flight line.” She added, “To be honest, with respect to the source at the flight line, it wasn’t really clear, we were still trying to figure that out at Pease. But the fact that it was higher at the flight line area was a red flag that we should be looking quickly here.” Ms. Jennings explained that EPA was also very concerned about the private wells in the area that people are still using.

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EPA issued a letter requesting that sampling be added and the investigation be expanded and gave a 120-day response period. EPA requested work plans be submitted to EPA in January. Ms. Jennings noted that correspondence with the Air Force was exchanged on this matter and that “the Air Force basically identified budget shortfalls, the need to wait for the award of a national contract to deal with this matter across all Air Force Bases, and the need to wait for a preliminary assessment to be done before further site inspection work could be done.” Ms. Jennings commented that these reasons were not justified, under the FFA, for delaying the work. She stated that, “EPA did not get a letter that was responsive to our request so, the appropriate next step, at this point, because we did not see that there was a firm commitment to get the work done under the schedule that complied with FFA requirements, that the next step under the FFA was to issue an NOV.” She added that EPA asked for information and a work plan by April 10th.

The Air Force responded to EPA’s letter and requested an extension to the deadline to submit the information. EPA agreed to an extension of April 24th. In addition, EPA also asked the Air Force to submit information regarding public water supply wells and private water supply wells east of the flight line. There has been work ongoing by the Air Force to investigate wells in the area and EPA asked them to provide that information by April 10th. EPA is currently looking at all of their sources and capabilities for conducting sampling of private wells in the area of concern. Ms. Jennings summarized the topic and said, “We are waiting for the response that is due April 24th. We are waiting for the submission of information on private wells and we will be considering doing the sampling and analysis ourselves.”

Ms. Forbes thanked Ms. Jennings for summarizing the issue. She stated that she feels that the Air Force has been responsive and pointed out that they have done the 1,4-dioxane and PFC sampling that was initially requested. She noted that when EPA requested additional sampling along the flight line, the Air Force had no contract mechanism to do that. Ms. Forbes explained that she immediately started working on a contract but, unfortunately, the process takes a while. She stated that “the Air Force can’t do the work without funds and funds are an issue right now within the military, within DOD.” Ms. Forbes stated that she thinks a contract award will happen soon and the Air Force will provide all the information in their response letter to EPA. She added that the response will include the RI/FS for 1,4-dioxane at the four groundwater plumes: Ashumet Valley, CS-10, CS-20 and LF-1. It will also include additional investigation of PFCs in Ashumet Valley and the flight line. Ms. Forbes explained that she is still discussing the matter with Air Force management, which is why they requested the extension.

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Ms. Forbes noted that the Air Force is also concerned about this issue. She said, “Anytime EPA or DEP brings up an issue with an emerging contaminant, we try to be as responsive as we can.” Ms. Forbes added that while PFCs are primarily attributed to AFFF, which is the case with the Air Force or the military, PFCs are also present in many common household products. She explained that PFCs likely will be present in private well samples and added that the “Onus is on us to determine if it is coming from the base or not.” Ms. Forbes stated that there have been some studies done by Silent Springs on the private wells and public water supply wells on the Cape with respect to emerging contaminants, not just PFCs but others as well. She suggested the team members look at those studies.

Ms. Forbes commented that she is not completely familiar with the situation at PAFB and has only read limited pieces of information. She cautioned that their situation may not be the same as JBCC. Ms. Forbes noted that the Air Force did a preliminary assessment in January to identify areas at the base where AFFF was used and where possible releases might have occurred. Ms. Forbes has received the draft report and is reviewing it. She said a site inspection will be done after the Preliminary Assessment is finalized.

Ms. Forbes stated that Doug Karson has also done a lot of the private well verification in the areas downgradient of the flight line and that he would provide an update later in the meeting.

Mr. Goddard stated, “Public health is the most important thing here. Obviously, everybody agrees. If there is somebody in the exposure pathway, EPA could pay for it (sampling) and get reimbursed later. Whatever or whoever has to do the sampling, get it done and let’s deal with the logistics later.” He then asked if the EPA enforcement action is under the Safe Drinking Water Act (SDWA) or CERCLA and if the Air Force violated one or the other. He also asked if there is a state action, as well, triggered by what EPA is doing. He then asked if there is a way to fingerprint PFCs to determine if the source is from household products like shampoos or AFFF.

Ms. Jennings replied that EPA is not really concerned with reimbursement but rather with getting the data quickly. She commented that it has been almost a year since the sampling request was made. EPA feels there is enough preliminary assessment information to move from that phase into a sampling phase. She said she would have liked to have started sampling at the base and then moved out into the neighborhoods but now too much time has gone by. The priority now has to be the sampling of private wells.

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Ms. Jennings addressed Mr. Goddard's second question and stated the enforcement is being pursued via the FFA under CERCLA. She added that, "We also believe we have SDWA authority to issue an order too. This was done with the Navy where they had a Federal Facility Agreement and it was in the drinking water supply. While they were working out the issues with the Federal Facility Agreement and trying to work the enforcement process there, they also issued a SDWA order to force the Navy to take action. So, we have multiple authorities. Right now we are just pursuing it under CERCLA, but it is not out of the question that we couldn't use the SDWA order as well."

Mr. Pinaud noted that there are a lot of people at this meeting who weren't at the last meeting and said there had been a very good discussion. He stated that MassDEP does have a cleanup standard that was just recently promulgated for 1,4-dioxane. MassDEP is using EPA's provisional health advisories for PFCs. Those are considered emerging contaminants and the MassDEP Office of Research and Standards is currently studying PFCs to better understand their toxicity and to decide if cleanup standards or drinking water standards need to be promulgated. MassDEP has a guidance level for drinking water for 1,4-dioxane, which is in use. It's the same as the cleanup standard under the MCP.

Ms. Jennings replied to Mr. Goddard's question about fingerprinting. She stated that EPA had a little bit of experience with the fingerprinting of perchlorate detected in a private well to determine if it was coming from the base. Even though the well was close to the base, the source was actually determined to be a septic system. She noted that there are ways to evaluate sources and she does not think it is reasonable to not sample wells just because the sources might be from something else. She stated that the most important thing is to find out if the contaminants are in the wells. She added that analytical work could be done simultaneously to look for things that are commonly seen in septic systems to see if it is possibly coming from a septic leach.

Ms. Forbes said, "I asked the same question to the Air Force Subject Matter Expert about the forensics and the fingerprinting of PFCs from AFFF versus other household products and she said that's a great area for research." Ms. Forbes explained there is no way to do it right now because PFCs are a whole group of chemical compounds and not much is known about a lot of them. "PFOS and PFOA are the major ones and PFOA is actually a degradation product of PFOS. So, there are a lot of complications with those compounds."

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Mr. Goddard asked if the state was deferring to the EPA on the legal action. Mr. Pinaud said MassDEP is determining how much they can contribute to this in terms of sampling expertise and whether they can perform analysis. MassDEP is going to work with both agencies to make sure the investigation gets done.

## **Agenda Item #2. Impact Area Groundwater Study Program Plume Updates**

Mr. Gregson began his presentation on the Impact Area Groundwater Study Program (IAGWSP). He noted that his presentation was going to be focused on groundwater work and he showed the JBCC map and the location of the IAGWSP plumes. He pointed out the plumes that have treatment systems and Decision Documents (DD) in place. He added that the J-3 Range plume has a DD pending and it should be finished this year. He also noted that a number of sites are going through monitored natural attenuation. Those include: the Northwest Corner, L Range, Western Boundary, and Demolition Area 2.

Mr. Gregson explained that throughout the presentation he would be displaying a historical figure and an updated map for each plume to show some of the differences. He noted that some plumes are a lot smaller than they used to be. The Northwest Corner had a significant decrease in the extent of perchlorate. For Demolition Area 1, the treatment has been very effective in treating perchlorate and RDX. The plumes associated with the southeast ranges have decreased in aerial extent through the treatment process. Treatment was just put in place on the Central Impact Areas plume.

Mr. Gregson showed the figures for the Demolition Area 1 plume and stated that the IAGWSP removed and treated 28,000 tons of soil in the source area. IAGWSP put in an interim groundwater treatment system in 2004, and that was expanded in 2006. In 2010, an additional extraction well was put at the base boundary to stop contamination from migrating off base. Combined, these systems have treated over 2.7 billion gallons of water to-date. In 2013, IAGWSP identified a plume of perchlorate off base and that is going to be addressed by an additional extraction well to be put in place this year. RDX is at the maximum concentration of 11 parts per billion (ppb) and perchlorate is 27 ppb. Concentrations off base are 4.98 ppb for perchlorate. The maximum historic concentration of RDX was 370 ppb and the maximum historic concentration of perchlorate was 500 ppb. Concentrations at the start of the plume have dropped dramatically.

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Pictures of the restoration of the source areas and the vegetation recovery were shown. Mr. Gregson commented that IAGWSP did a pretty extensive soil removal project in April 2005. They brought soil back in September 2005 and re-vegetated the area in September 2006. He noted that IAGWSP has been monitoring the recovery of the vegetation throughout 2008, 2010, 2012 and 2014.

Mr. Gregson moved on to the Central Impact Area (CIA) and stated the IAGWSP has cleared 50 acres and removed 15,000 tons of soil. Munitions removal for 58 additional acres is underway. Several finger-like plumes of RDX are migrating to the northwest towards the base boundary. He noted that two of three groundwater treatment systems have been installed. 300 million gallons of water have been treated to date. RDX concentrations are currently at 16.5 ppb and perchlorate is at 8 ppb. The maximum historic concentration of RDX was 44 ppb and the maximum historic concentration of perchlorate was 11.1 ppb.

Mr. Gregson pointed out the locations of the treatment systems and the two extraction wells. He also showed where the third extraction well is going to be put later this year, at the leading edge of the plume.

Mr. Gregson showed the J-1 Range and where the source area was removed. IAGWSP installed a treatment system at the northern plume with two extraction wells installed in 2013. 142 million gallons of water have been treated to date. An interim system was installed in 2007 for the southern plume and it was expanded in 2012. 250 million gallons of water have been treated to date. The maximum historic concentration of RDX in the northern plume was 71 ppb. Perchlorate is about the same level. The maximum historic concentration of RDX in the southern plume was 130 ppb with a current maximum of about 9.2 ppb.

Mr. Gregson displayed figures and noted that not much has changed with the J-1 northern plume because the system was just started in 2013. He pointed out the extraction well down at the toe of the plume and the one in the middle. He also showed the treatment system on Wood Road.

He then showed the figures for J-1 southern plume and noted that not much changed between 2010 and 2014. He pointed out the extraction well located off base in the neighborhood and the other extraction well at the base boundary.

Mr. Gregson showed pictures of the treatment system at J-1 southern and stated the areas are recovering nicely, particularly where the infiltration gallery is. He stated that 10,000 tons of soil and 40,000 munitions were removed from this area.

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The J-2 Range northern plume has three extraction wells and the system began operating in 2006 as an interim remedy. It became the final remedy in 2013. 1.5 billion gallons of water have been treated to date. The J-2 Range eastern plume treatment systems came on-line in 2008. It also became the final remedy in 2013. 1.3 billion gallons of water treated have been treated to date. The maximum concentration of RDX is 2.4 ppb and the maximum concentration of perchlorate is 30 ppb in the northern plume. The maximum concentration of RDX is 12 ppb and the maximum concentration perchlorate is 72 ppb in the eastern plume.

Mr. Gregson showed a figure depicting the original extent of the plume and the current state. He also showed pictures of the system at Wood Road, two Mobile Treatment Units (MTUs), and extraction well at the northern edge. He also showed the treatment system on Barlow Road and the infiltration gallery.

For the J-3 Range plume, Mr. Gregson stated there was source area removal and an interim treatment system was put in place in 2006. 800 million gallons of water have been treated to date. He noted that this plume has had the highest perchlorate concentration historically, base-wide, at 770 parts per billion. The current maximum perchlorate concentration is 28.8 ppb. Mr. Gregson said the DD for this site will be finalized this year and an extraction well will be added to the system to speed up the cleanup time.

He showed a depiction of the plume in 2007, shortly after the system was put in place, and a 2014 depiction. He noted the breakup of the RDX plume and some shrinking of the perchlorate plume to the north.

Mr. Gregson then discussed the L Range plume that is undergoing monitored natural attenuation. The source area was removed and it's predicted to reach cleanup levels by 2027. RDX detections are currently around 2.8 ppb. The cleanup goal is 0.6. Perchlorate is already below the cleanup goal. The L Range has been returned to Camp Edwards for training.

The Northwest Corner site had a relatively large area of perchlorate contamination from pyrotechnics and fireworks. The DD signed in 2010 called for MNA and land use controls (LUCs). Contamination is predicted to reach cleanup levels by 2022 for RDX and 2012 for perchlorate. Perchlorate is currently just below 2.0 ppb in the monitoring wells. RDX is currently detected at 1.1 ppb. Comparison figures between 2009 and 2014 were shown.



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Mr. Gregson then moved on to Demolition Area 2 (Demo 2), at the northern part of the base. IAGWSP excavated about 1,200 tons of soil from the berm and is currently monitoring natural attenuation of the plume. Maximum concentration currently is 2.7 ppb and historically it's been 6.7 ppb for RDX. In this particular plume, it's taking a little longer to cleanup so IAGWSP had recently remodeled the plume and adjusted the predicted RDX restoration time to 2018. A DD Addendum will be finalized later this year and will be presented to the team.

Mr. Gregson stated that in 2015, more monitoring wells will be installed at J-1 southern and two wells will be installed at Demo 2 to monitor the downgradient portion of the plume near the base boundary. Source removal work will continue at CIA, J-1, J-2, J-3 and the Small Arms Ranges. IAGWSP is going to begin construction on the final extraction well in the CIA and the off base extraction well for Demo 1. There will probably also be some associated monitoring wells with that construction work. IAGWSP is going to finalize the Small Arms Ranges and J-3 DD this year. The Demo 2 DD addendum will have a public comment period at an upcoming meeting. The Training Areas DD will be issued later this year.

Mr. Winters asked about the ultimate fate of the soil removed from the area. He asked if it is treated and disposed elsewhere. Mr. Gregson replied that some of the soil has gone off-site to landfills. About 28,000 tons were treated onsite with Low Temperature Thermal Desorption 2005. More recently, alkaline hydrolysis has been used to treat soil.

Mr. Winters asked if the IAGWPS has one concise table to show all of the concentrations at each plume and the progress that has been made. Ms. Richardson indicated that there is a table and IAGWSP will provide it to the team. Mr. Goddard asked that the action levels also be included on the slide.

Mr. Goddard then asked what is going to be captured and not captured with the CIA plume and when and where will it cross the base boundary and at what levels. Mr. Gregson replied that the CIA plume is migrating to the northeast towards the base boundary. He stated that the goal in the DD was to prevent outside migration of RDX above 2 ppb and that's what the IAGWSP is trying to achieve using an extraction well at the toe of the plume.

Mr. Goddard asked about perchlorate. Mr. Gregson replied, "Perchlorate is not a real concern because it is not seen in this part of the plume (he displayed a figure). Wells are still detecting it upgradient of the treatment system but it will be captured at Burgoyne Road, before it reaches the base boundary."

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Mr. Seaver asked about the locations of the CS-19 and CS-17 plumes. Mr. Gregson put up a base-wide map and pointed out the locations. He explained that the remedy on that portion of the plume is monitored natural attenuation and that's continuing to be monitored by the Air Force Program.

Mr. Seaver asked about the RDX detections as CS-19. Ms. Forbes estimated the levels to be about 1 or 2 ppb but said she would confirm that and report back to Mr. Seaver. *Following the meeting, Ms. Forbes reviewed the CS-19 data and reports the RDX concentrations in the CS-19 plume ranged from non-detect to 2.87 ug/L in 2014.*

Mr. Seaver then asked about the location of the CIA plume. Mr. Gregson pointed to the area on a map explained showed the location where the extraction well will be installed at the downgradient edge of the plume.

### **Agenda Item #3. Residential Wells Update**

Ms. Grillo introduced Mr. Karson to present Private Well Verification Program. He explained the program is part of land use controls (LUCs) to prevent access to contaminated soil and groundwater. He noted he will focus on the groundwater components, which have two parts: One is to document and identify any private well or irrigation well in the footprint of the plume and also any well that may be in the projected path of the plume looking downgradient as these plumes continue to migrate in the groundwater; the second component is to determine if there is a risk.

Mr. Karson stated that the program began in 2008 at the Ashumet Valley plume, which was a very large plume. The IRP was aware there were many properties in that area and assumed there were many private wells, which was the case. At the same time, the Installation Restoration Program (IRP) established protocols for how the verification work would be conducted. Mr. Karson noted that those protocols are being updated to streamline and improve the way they collect information and manage it.

Mr. Karson showed a map of the plumes, outlined in red and then brown lines around the plumes to indicate the LUC areas that were established. He noted that the LUC boundaries are a little bit wider than the plume boundaries to include a buffer zone in case there is a little unknown in those areas. The IRP also looked downgradient to accommodate for plume travel time.

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Mr. Karson then showed a screen shot of one of the reports for the LF-1 plume. It served as an example of how the collected data is used. There is a database for all of the private well information, which includes contact information and well status information, such as if a well is active or not.

Mr. Karson then showed a color-coded map and pointed out a property in red. He explained that the well was used for drinking water purposes and the owners do not have a town water connection. The properties shown in green indicate there are no private wells. Other color-coded markers show wells used for irrigation, wells that have been disconnected, or if a property owner doesn't know if there's a well on the property, or if a property appears to be unoccupied or abandoned.

Mr. Karson then showed a slide with a recap for the first six years of the program. He noted that many wells have been identified but not many are used for drinking water. He then showed a figure with all the different plumes and noted that, with the exception of CS-23, well verifications have been completed at all of the plumes. CS-23 had previously been completed but parcels were added to the research area.

Mr. Karson stated that when a property has a private well for drinking water purposes, a technical evaluation is done. This looks at all the technical information for the particular plume in that area, using modeling transport simulations. Sampling data is reviewed. Active wells used for drinking water were tested and most remain in the sampling program. The summary from the investigation concluded that no wells were identified with an unacceptable exposure risk from the plumes.

Mr. Karson summarized the work that had been done in 2014 as part of the well verification program. He explained that postcards were mailed to all of the non-operational well owners asking if they had restarted their well. This was an agreement with the regulatory agencies. One response indicated there was a well used for drinking water. The IRP researched it and determined that property should have been included in the previous agreement for a municipal water conversion so they appropriated funds to convert the property and disconnected the private well.

Mr. Karson noted that a LUC report is provided annually to the regulatory agencies and the Boards of Health. Mr. Karson noted that there was a prohibition for well installation on the base, issued in 2006. No one can drill a well that will serve 25 or fewer customers at Joint Base Cape Cod. Updated plume maps and other information is also provided annually to the town Boards of Health.

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Mr. Karson explained that each town has specific policies that affect the use and installation of private wells in plume areas. The cleanup programs also review Dig Safe notices for all the plume areas that were on the notification list. He noted that there have been incidents in the past and the programs have had to resolve issues to prevent well installations in plume areas, which might pose a public health risk. Mr. Karson confirmed that MassDEP did not issue any well drilling permits in 2014 for any of the four surrounding towns.

Mr. Karson stated that several private and irrigation wells were tested for VOCs. They were all non-detect except for one irrigation well with a detection for TCE below the reporting limit of 1 µg/L. He added that testing has also been done for 1,4-dioxane and PFCs at some private wells and irrigation wells. Detections were found but none were above the state guidelines or standards. Information was provided to the property owners, the Boards of Health, and the regulatory agencies.

In August, Mr. Karson said some additional work was done in three specific areas to identify if any private wells exist. In the Briarwood area, which has been looked at before, IRP added 245 parcels; in the Route 130 area, 293 parcels were added. Both of those investigations were related to PFCs. 143 parcels were added to CS-23 area. Mr. Karson noted that the original CS-23 area only had 13 parcels and those were related to TCE.

Mr. Karson showed a map of the Briarwood area and pointed out Ashumet Pond and John's Pond. The properties that were added were marked on the figure. Another figure showed the runways on the base and Mr. Karson pointed out Mashpee Wakeby Pond. Particle tracks from the flight line were also depicted on the figure. Mr. Karson explained that another residential area had been part of Fuel Spill 1 investigation so the private well research was already done for that area.

Mr. Karson then showed a figure with CS-23 and explained that, due to TCE concentrations, the well research area has been expanded and about 150 parcels were added. To date in the Briarwood area, 239 out of 245 parcels verified through site visits, mailing, phone calls, and coordination with the Board of Health and the Water District. For the Route 130 area, 248 out of 293 parcels verified. For the CS-23 area, 98 out of 156 have been verified.

For the property owners who have not responded, additional notices will be sent to them and more site visits will be conducted. If these efforts are unsuccessful, the IRP will notify the regulatory agencies and Boards of Health. Sampling and technical evaluations for those active wells will be determined in the future.

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Ms. Jennings asked to see the figure that shows the flight line and surrounding area. She asked Mr. Karson to confirm research for private wells had been conducted in the FS-1 plume area. Mr. Karson confirmed that was correct. Ms. Jennings then asked to see a figure that showed which parcels had been investigated.

Ms. Jennings pointed to the figure and stated that the parcels investigated were in a very concentrated area and commented that “there is a fairly large area that is not being covered by the FS-1 investigation.” She noted that while information with respect to the extent of PFCs contamination is unknown, following the flight lines and particle tracks makes the most sense and, in that case, the contamination would not be limited to the one area. Ms. Jennings asked about the availability of private well information in the larger area.

Mr. Karson replied that he believes the investigation did include the larger area. Ms. Jennings commented that 13 parcels did not seem like a good representation. Mr. Karson noted that some of the parcels are very large.

Ms. Jennings stated that the LUC boundary was focused on the size of the plume and this limited the parcels that were explored. She is concerned about the area beyond the LUC boundary. Mr. Karson showed the FS-1 investigation area figure. He noted that the particle tracks indicate a due south flow.

Ms. Jennings commented that the figure was just for the FS-1 fuel spill contamination and said PFCs have not been characterized in that area so there is no way to know the true extent and if the area would, in fact, be much larger for PFC contamination. Mr. Karson replied, “We know there are no wells out in that particular area, in talking with Orenda Wildlife, and the town, and a couple of private property owners there.” He added that all of the information is in the IRP database.

Ms. Jennings asked if there were more than the 13 parcels already mentioned. Mr. Karson stated, “That’s the number of parcels that we investigated as part of that.” Ms. Jennings asked that the April 10<sup>th</sup> submittal include more detailed information about the parcels that were investigated. Mr. Karson agreed to provide a larger map. Ms. Forbes confirmed that would be part of the Air Force’s response.

Ms. Valiela asked about the location of CS-23 and its source. Mr. Karson commented that there is no specific source for CS-23. He explained it is co-located, adjacent to the landfill plume and there appears to be some interaction vertically and sideways but the IRP was “never able to really determine the exact source here

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unlike some of the other plumes down in that area, cause they've moved on from the source areas.”

Ms. Valiela noted that there was a red circle on the figure and asked how high the concentrations of TCE were. Ms. Forbes replied that she believes the levels are between 12 and 16 µg/L, less than 20 µg/L.

Ms. Valiela asked if the red circle was the leading edge of CS-23 at this point. Ms. Forbes replies that there are some extraction wells upgradient. She noted that the monitoring wells along the NStar Easement are downgradient of the extraction wells that were installed as part of CS-23. As part of the monitoring program, the IRP monitors those wells that are downgradient of the system and concentrations of TCE above the MCL were detected in one of the monitoring wells there. It was very likely downgradient of the system when it started up and so, now it's passing through that location.

Ms. Valiela asked if there any wells for CS-23 west of Route 28. Ms. Forbes stated that they looked downgradient for monitoring wells. She said there is one that could be monitored and it is at the right depth.

*Following the meeting, Ms. Forbes reviewed the CS-23 data and is issuing a correction as follows: There are two wells downgradient of the CS-23 extraction wells that have TCE concentrations greater than the MCL of 5 ug/L. Monitoring well 69MW1710A was last sampled on 15 May 2014 and had a TCE concentration of 10 ug/L. Monitoring well 69MW1712B was last sampled on 15 May 2014 and had a TCE concentration of 24 ug/L. We believe these detections are residual concentrations that were downgradient of the extraction wells at the time of startup and not a result of contamination bypassing the extraction wells or a new source. Because of these TCE concentrations, AFCEC expanded the LUC area downgradient of the detections. AFCEC also added an appropriately-screened downgradient monitoring well 27MW0051 to the monitoring network. Note the wells were resampled on 06 May 2015; preliminary results show the TCE concentrations in 69MW1710A decreased from 10 ug/L in May 2014 to 4.8 ug/L in May 2015 and TCE concentrations in 69MW1712B decreased from 24 ug/L to 13.9 ug/L. The preliminary result for TCE in 27MW0051 was below the reporting limit (i.e. less than 1 ug/L).*

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Pam Richardson with the Groundwater Study Program introduced herself and noted that she was not going to provide great detail about the IAGWSP LUC programs because it includes everything the IRP does. She noted that the IAGWSP LUC program is a lot smaller than the IRP's because the IAGWSP plumes haven't migrated as far off base and the ones that have traveled off base are in a much smaller area.

Similar to the IRP, the IAGWSP also does an annual LUC monitoring report. IAGWSP also monitors daily dig safe notices and she stressed the importance of this. She commented that the purpose of this is not just to prevent people from putting in a well in an area they shouldn't be but it is also done to protect infrastructure off base. She provided the example of the J-1 extraction wells. She explained that all of the utilities in that neighborhood are underground and dig safe notices come in continuously for various underground work such as cable trenching or even mailbox installation. She stated that IAGWSP does confirm there won't be any digging near the infrastructure.

Ms. Richardson stated that work on base is also reviewed. She noted that the IAGWSP has returned some areas for training however, there are still monitoring wells in those areas and IAGWSP needs to make sure they aren't impacted

She added that the IAGWSP also worked with the IRP make sure the prohibition for drinking water wells are in place and they coordinate to make sure that the updated plume maps go to the Boards of Health. She added that annual meetings are also held with the Boards of Health.

Ms. Richardson stated that in addition to the regular LUC activities, the IAGWSP is also working on a private drinking water well verification program, similar to the IRP's. She stated that the research has been completed for the Northwest Corner, the J-1 Southern, and L range. She noted the work is in progress for the J-2 East, Demolition Area 1, and J-3 will be added this this spring. She added that even though Decision Documents for J-3 have not been finalized yet, the IAGWSP already looked at a lot of that area. She commented that the IAGWSP has a good idea of wells in that area and added there aren't very many

Ms. Richardson showed a slide with the private well information. No drinking water wells have been identified. There are a couple of irrigation wells, which are part of the IAGWSP sampling program for plume investigations. The IAGWSP also tracks the private well research results the same way the IRP does, in a database. The information is provided in an annual report.

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Ms. Richardson stated that all of the homes in the outreach area have town water accounts. Ms. Richardson explained that the Demo 1 area probably would have been closer to complete but the plume area was expanded so the LUC outline also changed. Ms. Richardson anticipates some door-to-door outreach in the spring in areas that haven't gotten a great response from mailings. She reiterated that everyone is on town water and the efforts now are to determine if there are any irrigation wells. She noted that the J-2 Range area is almost done and that neighborhood will be canvassed too. She added that the research for the J-3 Range will begin once the decision document is finalized and the annual monitoring report is produced.

#### **Agenda Item #4. Ashumet Pond Update**

Mr. LeBlanc began the presentation on Ashumet Pond and gave credit to his colleague, Tim McCobb, who put together the slides but couldn't be at the meeting because he has been working in the field for the last couple of days. Mr. LeBlanc explained that the focus of his presentation was the phosphorus plume that originated from the old wastewater treatment plant infiltration beds and partially discharges into Ashumet Pond. He said it first raised environmental concerns because there was good evidence that discharge of phosphate from the waste water plume was impacting the ecological health of the pond. He explained that this was first investigated in the 1970s. There was evidence, both anecdotal and then later with actual measurements, that the trophic health or the environmental health of the pond showed Ashumet Pond was declining. There were increased reports of algae blooms, there was a reduction in water clarity, and a development of an anaerobic or oxygen-free hypolimnion in the deep parts of the pond during the summer months, indicating that the pond was mesotrophic or going toward the eutrophic end of things. There was a lot of biological productivity resulting in oxygen consumption. A variety of studies had evidence that this degradation in the environmental health of Ashumet Pond was being driven by an increase in phosphorus entering the pond. Most of these fresh water lakes are nutrient-limited and they're limited by the availability of phosphorus, as opposed to nitrogen, which is the problem on the coast and in the salt waters. An increase in phosphorus will increase biological productivity. Mr. Leblanc commented it is like putting fertilizer in the lake. This issue was partly attributed to an increase in housing development along the pond however, that area isn't particularly dense and most of the septic systems are set back from the lake. The thought was that a substantial amount of the increased phosphorus input into the pond was derived from this much larger source, which was the old wastewater infiltration beds.



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Mr. LeBlanc stated that a number of actions have been taken to improve the pond helped in the last decade or so. The most substantial one was the end of disposing of treated wastewater at the old wastewater plant. In December of 1995, the disposal for the wastewater infiltration beds that are near Ashumet Pond, adjacent to the wastewater plant, ended and the new disposal beds were built near the Cape Cod Canal. “That’s probably the most important thing that was done for the long-term picture for addressing the phosphate problem,” he said.

Mr. LeBlanc noted that the USGS has been involved in monitoring the plume from those old beds for some time. But, beginning in 1999, the fairly intensive monitoring began at the phosphate plume to monitor its changes, particularly related to the cessation of the disposal. There were some alum treatments that were conducted in the pond in September of 2001 and September of 2010, which substantially reduced phosphorus concentrations in the water column and greatly improved the clarity of the pond water. In August 2004, a permeable reactive barrier was installed at the location where the wastewater plume is discharging into Ashumet Pond to intercept that groundwater flow that’s carrying the phosphorus and to actually strip the phosphate out of the biosorption so that it would reduce the load going into the pond.

Mr. LeBlanc then showed a series of photographs. The first was of the waste water plant in 1984, when the plant was operating. He then showed a picture of the new plant, located in a wooded area and the treatment effluent from the plant was discharged through rectangular infiltration beds, percolated about 20 feet down to the unsaturated zone, reached the water table and then began to move off with the flowing groundwater. He noted that this was a very standard technique that was used, a widely-applied technique in the areas where you don’t have a large surface water body, like the Mississippi River.

He noted the plant operated between 1936, just before World War II, until the wastewater disposal ended in December 1995. The approximately 60 years of disposal created a large contaminant plume that is called the “sewage plume,” or “wastewater plume,” or the “Ashumet Valley plume.”

Mr. LeBlanc showed a map of the wastewater part of the Ashumet Valley plume based on over 1,000 water samples that were collected from clusters of wells along the entire length of the plume. He pointed out nitrate, which is another nutrient in the wastewater plume, as the mapping agent for the plume. He showed a picture of the old wastewater beds. He then showed Ashumet Pond with Fisherman’s Cove and the large wastewater plume tracking pretty much the full length of the Ashumet Valley right down to the head waters of Green Pond.

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Mr. LeBlanc stated the plume is about 1 kilometer wide, about 10 kilometers long and it's about 23 meters thick. The part of the plume that contains the elevated phosphorus is restricted to an area close to the wastewater plant. The reason is that phosphorus or phosphate ("it is predominantly in the form of phosphate"), is restricted close to the bed because the phosphate sorbs very strongly to the iron oxides that coat the sediments that make up Cape Cod. So, as the wastewater is disposed of to the ground, more than 99% of the phosphates goes onto the sediments and adheres to the sediments and only a little bit moves forward.

Mr. LeBlanc commented that the plume is not very extensive and in many locations the phosphate doesn't get very far away. He noted however, that the wastewater plant was sited very close to Ashumet Pond, and the beds were loaded for such a long period of time, that the plume was able to travel all the way to the pond. He estimated, "There is still 99% of the phosphate sitting there that has to bleed out over many, many decades; that's the basic problem." He added that the problem is compounded because Ashumet Pond is known as a "groundwater flow through pond." Fisherman's Cove and the old sewage plant are on the upgradient side of Ashumet Pond, where groundwater is discharging up into the lake. The northern shore is groundwater inflow and then pond water is leaving the aquifer by seeping through the bottom and recharging along this whole southern shore. The wastewater discharge point is on the upgradient side of the pond, in the area where the pond is capturing the groundwater and that groundwater is discharging into the lake.

Mr. LeBlanc noted that in the early 2000s, his colleague used a state-of-the-art groundwater flow and chemical transport model to simulate the phosphate plume. Mr. LeBlanc showed a depiction of the observed plume based on data that was collected in 1993. He explained that his colleague developed computer code for a three dimensional groundwater flow and geochemical model that allows users to completely account for all the reactions that are taking place between chemicals in the water and the sediment surfaces to simulate the development of the plume. A loading history for the beds starting in 1936 was determined and then the modeler simulated the loading up to 1993, at the point where the groundwater was discharging into the lake.

The modeler looked at the amount of loading that was taking place at the lake over time and he was able to predict the loading in kilograms per year to Ashumet Pond. It peaked in about the year 2000, with over 1,000 kilograms for the year, and then, when they shut off the plant, the prediction was that loading would decrease somewhat dramatically but still remain pretty high from an ecological point of view. The prediction of the extensive loading is what prompted the IRP to determine a way to capture the phosphate and reduce that bed loading to the pond.

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The USGS has taken a snapshot of the phosphate plume over time. He showed maps of the plume in 1999, 2007, 2012 and the data from 2014. “What we’re seeing is a gradual diminishment in the maximum concentrations of phosphorus in the plume based on the fact that they’ve shut off the source.” The peak concentrations have been decreasing with time but there’s still this really large residual plume of concentrations of phosphate above that ground. Mr. LeBlanc commented that it’s going to take a long time to get the phosphate out but it correlates with the decreasing load that was predicted. Mr. LeBlanc explained that the modelers recently looked at their predictions and compared them with what actually happened. The predicted concentrations were very close to the actual concentrations that were detected. “The point of this is that the predicted loading from the phosphate plume to the pond without this in place, is pretty much on track. So, that’s, that’s good news. We kind of understand what that plume is doing.”

Mr. LeBlanc stated a permeable reactive barrier was installed in the summer of 2004 at the location in the Ashumet Pond, where the phosphate plume intersects the lake, in the groundwater inflow area. He explained that the IRP installed a cofferdam pumped out most of the water between the shoreline and the copper dam and dug up the sand, and then mixed into the sand zerovalent iron (iron filings) to “turbocharge” the iron oxides that are naturally present in the sediment by adding a lot more to give a much greater capacity to adsorb that phosphorus. As the phosphate is coming up with the groundwater and goes through the 3 foot thick barrier of sand and about 3% by weight of zerovalent iron, the phosphate is adsorbed and doesn’t get into the lake water.

Mr. LeBlanc showed a picture of the shoreline of Ashumet Pond and pointed out the sampling locations. He then showed map of the phosphate concentrations and the effectiveness of the permeable reactive barrier. The zerovalent iron barrier is doing what it was designed to do, moving that phosphate out of the water as groundwater is coming up through it.

Mr. LeBlanc noted that the USGS installed a variety of instrumentation in the barrier that allows them to measure things by collecting samples from permanent locations. He then showed the results from one line of samples that extends from the land to the edge of the barrier.

He then showed a diagram of Ashumet Pond. He explained the plume is coming up through the pond and USGS installed tubes that run out underneath the lake about 40 or 50 feet below the barrier, just below the pond bottom. The tubes are pumped just like wells.

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The field observations show that the concentrations in the phosphorus plume are declining, as has been predicted by the modeling and they're going to continue to decline. The phosphorus that's discharged into the barrier is relatively effectively intercepted but that capture is a little bit dependent on the pond stage.

*The remainder of the presentations ("Review of Ashumet Pond Restoration Progress" and the "2015 Ashumet Pond Trophic Health Update") were inaudible due to a microphone issue. If you would like copies of the presentations, or would like to speak with one of the presenters, please contact Doug Karson at [douglas.karson@us.af.mil](mailto:douglas.karson@us.af.mil).*

#### **Agenda Item #4. Final Discussions, Adjourn**

Ms. Donovan stated that the next meeting is tentatively scheduled for July 8, 2015. The meeting was adjourned.