Sherri Anderson-Hudgins	USACE - Huntsville	
Thomas Bachovchin	ERT	
Brenda Barber	USACE - Baltimore	
Todd Beckwith	USACE - Baltimore	
Janelle Boncal	Parsons	
Bethany Bridgham	American University	
Sean Buckley	Parsons	
Paul Chrostowski	CPF Associates, American University Consultant	
Tom Colozza	USACE - Baltimore	
Jennifer Conklin	DOEE	
Kathy Davies	EPA – Region III	
Dr. Peter deFur	Environmental Stewardship Concepts/RAB TAPP Consultant	
Diane Douglas	DOEE	
Bill Eaton	AECOM	
Chris Gardner	USACE – Corporate Communications Office	
Alma Gates	RAB Member – Horace Mann Representative	
Elise Goggin	TetraTech	
Steven Hirsh	EPA –Region III	
Holly Hostetler	ERT	
Dawn Iovan	EPA – Region III	
Carrie Johnston	ERT – Community Outreach Team	
Carlos Lazo	USACE – Government Affairs Liaison	
Lowell (J.R.) Martin	USACE – Site Operations Officer	
Steve Norman	ECBC	

Dan Noble	USACE - Baltimore	
Cliff Opdyke	USACE - Baltimore	
Randall Patrick	Parsons	
Amy Rosenstein	ERT – Risk Assessor, Independent Consultant	
Tom Rosso	ECBC	
Lattie Smart	ERT - Community Outreach Team	
James Stuby	ERT – Geophysicist	
Jim Sweeney	DOEE	
Tenkasi Viswanathan	USACE – Washington Aqueduct	
Cheryl Webster	USACE - Baltimore	
Ethan Weikel	USACE - Baltimore	
Nan Wells	ANC 3D Commissioner	
Maya Werner	ERT	
Kellie Williams	USACE - Huntsville	
Bruce Whisenant	USACE - Huntsville	
Rebecca Yahiel	ERT – Community Outreach Team	
Alex Zahl	USACE - Baltimore	

- None

- Sean Buckley, Parsons will distribute an updated and corrected 4825 Glenbrook Road presentation to ERT Community Outreach Team after the meeting. He added the bullet points requested to the Future Activities list: model, potential hazard, distance, and inform the public.

Alex Zahl, USACE Baltimore provided a brief update on the Pilot Project.

The Pilot Project tested 2 Advance Classification (AC) instruments; the Time-domain Electromagnetic Multi-sensor Tower Array Detection System (TEMTADS) and the Man Portable Vector (MPV). The TEMTADS and MPV were tested at 3 properties. The AC instruments experienced some interference effects, including from the radio tower on the nearby American University (AU) campus. Both the

TEMTADS and MPV are able to do the work to meet the requirements of the Site-Wide Decision Document (DD). USACE will leave the choice of technology up to the contractor; but expects the contractors to use an AC instrument. If the contractor chooses to use the AC technology, USACE recommends using the G-858 magnetometer in addition to either the TEMTADS or MPV. The Pilot Project was successful, and provided a great deal of information. The Pilot Project illuminated challenges that may be encountered in the larger Site-Wide Remedial Action (RA) phase, including working with the community, restoration of landscaping, and required permitting. Parking permits and sidewalk access were especially challenging.

On April 19, USACE conducted a site walk for potential Site-Wide RA contractors.

The Pilot Project is complete, and the report will be finalized by the end of April 2017.

Steven Hirsh, Environmental Protection Agency (EPA) Region III inquired about what decisions will be left up to the Site-Wide RA contractor to decide.

USACE explained that USACE told the contractors that either one of the AC instruments works. USACE expects the contractor to choose one of the AC instruments, but in the Performance Work Statement (PWS) process USACE will not instruct the contractor to use AC technology.

EPA Region III asked if that meant the contractor could choose to use only the G-858 magnetometer.

USACE explained that while USACE recommends using the AC technology, if the contractor can prove they can locate and excavate every anomaly using a different method that is most efficient, USACE will accept that method.

In response to EPA Region III's question, USACE explained that the Decision Document (DD) says that USACE knows that AC works, but that USACE can use AC or some equivalent. (As well, USACE would like to point out that the Performance Work Statement, or PWS, for the task also incorporated the Pilot Study Report by reference to highlight the effectiveness of AC.)

Peter deFur, Environmental Stewardship Concepts/RAB TAPP Consultant inquired if there were any alternatives equivalent to the AC technology.

USACE explained that USACE does not anticipate any alternatives.

P. deFur noted that the alternative would not only have to be as effective, but also carry the same level of certainty/uncertainty.

USACE and P. deFur agreed that there is a level of uncertainty involved with either AC technology or methods requiring excavation of all anomalies.

USACE explained that USACE did not dictate that the contractors have to use the AC technology, but provided the contractors with the Pilot Project Report, which indicates that the AC is effective. As part of the PWS process for contract acquisition, USACE contacts an expert pool of candidates; in this case the military munitions contracting pool. USACE then describes to the candidates what is required, and shares the results of the effective instruments tested.

In response to a question from EPA Region III, USACE explained that if the contractor chooses to use AC, the additional use of the G-858 magnetometer is not optional.

In response to questions from EPA Region III, USACE explained that the awarded contractor has to be accredited, and that a few candidates are already accredited.

Sean Buckley, Parsons confirmed that Parsons was the first to pass the accreditation, and believed that Black Tusk has also passed.

EPA Region III commented that if the contract requires accreditation for AC, then it seems AC will be used.

USACE explained that the contract requires that if AC is in the proposal, then the contractor must be accredited to perform AC.

USACE added that the contractor does not need to be accredited at the time of the award, but must be accredited when AC survey work begins.

USACE Baltimore explained that his understanding was that several contractors will be accredited by the end of summer.

P. deFur inquired if there have been any public queries about the Pilot Project leading into the Site-Wide RA other than prioritization. He wondered if the Pilot Project may be difficult to understand by the general public.

USACE Baltimore explained that the full Pilot Project Report will be available to the public and posted on the USACE website.

Rebecca Yahiel, ERT Community Outreach Team further explained that a Pilot Project fact sheet with pictures is in development. USACE and ERT reached out to neighboring homeowners of properties that are part of the Site-Wide RA, and were able to meet with a few of them and describe the project in greater detail and how it relates to those homeowners.

B. Site wide Remedial Action (RA)

Dan Noble, USACE Baltimore briefly reviewed the Site-Wide Remedial Action (RA).

On April 19, USACE conducted a site visit for interested Site-Wide RA contracting vendors.

The 4 hour site visit toured areas including the Public Safety Building and other locations on AU campus, the Woodway Lane area, the Spaulding Captain Rankin Area (SCRA), and a sample residential property in the Site-Wide RA neighborhood. The residential property had a diversity of landscape examples that the potential contractors might encounter during the Site-Wide RA. The property consisted of sloped terrain, different types of landscaping, patios, and an artificial stream in the backyard.

USACE Baltimore expects to award the Site-Wide RA contract by June 30 to carry out what the Site-Wide DD requires.

C. Site-Wide Decision Document (DD)

USACE Baltimore provided a brief update on the Site-Wide DD.

The Site-Wide DD has left the USACE Baltimore District and is now with the USACE North Atlantic Division. USACE Baltimore expects USACE North Atlantic Division to forward the Site-Wide DD to USACE Headquarters (HQ) before the end of April. The document will be signed by the 2-Star General at USACE HQ, and then on to the Deputy Assistant Secretary of the Army (DASA).

USACE Baltimore has not heard back on the status of the Principal Threat Waste (PTW) language. The PTW language was included in the Site-Wide DD as agreed by USACE Baltimore and P. deFur, Jim Sweeney, Department of Energy and Environment (DOEE), and EPA Region III.

When USACE Baltimore is notified that the Site-Wide DD is at USACE HQ, they will contact HQ staff in the Formerly Used Defense Site (FUDS) program to gain insight on a possible timeline and any issues the Site-Wide DD document may be encountering.

USACE Baltimore did not believe that the Site-Wide DD would have to be signed before an award is made, but there would be very little work that the contractor would be authorized to do until the Site-Wide DD is signed.

In response to a question from EPA Region III, USACE Baltimore explained that USACE will conduct the work of obtaining access to the private properties involved in the Site-Wide RA.

EPA Region III noted that the work of obtaining Right of Entries (ROEs) could probably start.

USACE Baltimore confirmed this, however ROEs are only requested for 6 month intervals, so USACE must be fairly confident that intrusive work is about to begin within that 6 months.

EPA Region III suggested that obtaining ROEs might be a way to determine which residents would go to the top of the priority list.

A. Zahl explained that USACE plans to have a contractor on board before prioritization of the properties in order to give the contractor a chance to analyze the project and possibly suggest the most efficient way of conducting the Site-Wide RA. In the absence of any prioritization tools, an efficient plan suggested by the contractor may guide the prioritization.

USACE Baltimore added that residents are still contacting USACE asking to be prioritized, and USACE is maintaining a list of those residents.

USACE explained that while USACE is targeting the contract award at the end of June, a date for the beginning of field operations cannot yet be determined.

USACE and Sherri Anderson-Hudgins, USACE Huntsville discussed possible scenarios involving beginning intrusive work in winter, which would be difficult for transplanted trees; or in spring, when plants are in bloom and homeowners will feel reluctant to transplant at that time.

EPA Region III suggested that the homeowners should be given the option of when to begin work on their property.

USACE agreed that the homeowners' wishes will be taken into consideration.

Sean Buckley, Parsons provided a brief update on the status of the remedial action at 4825 Glenbrook Road.

Work began in Area B near the entrance to the property and moved forward up the driveway. There are a lot of utilities including drain lines for the gutter, electrical lines associated with the lights that have been turned off, water lines, and an irrigation system.

In response to a question from Paul Chrostowski, CPF Associates, American University Consultant, Parsons confirmed all the utilities encountered serve 4835 Glenbrook Road.

In response to a question from EPA Region III, Brenda Barber, USACE explained that the water lines are the same water lines discussed in previous meetings, but appear to meander all over the 4825 Glenbrook Road property.

Saprolite was achieved at the excavation in the first section of Area B prior to the bump-out. While waiting for a geologist to confirm that the first section excavation had reached saprolite, Parsons encountered a suspicious-looking black substance in the area of the former retaining wall bump-out. Parsons handled the substance according to low probability protocols. On March 1 the U.S. Army Corps of Engineers, Baltimore District (CENAB) geologist visited the site to confirm the first area excavation had reached saprolite and collected confirmation samples on March 2.

Parsons utilized a lot of hand excavation, especially when glass was encountered. A lot of scrap glass was encountered in Area B, but no intact glass bottles.

In response to a question from EPA Region III, Parsons explained that up to this point there was no Miniature Chemical Agent Monitoring System (MINICAMS) alarm triggered.

The unknown solid black substance was later analyzed by Edgewood Chemical Biological Center (ECBC). The sample was free of Lewisite. Mustard (HD) and HD break-down products were detected. ECBC also analyzed for Tentatively Identified Compounds (TICs), and the top 20 compounds found were associated with HD and HD break-down products. The soil grab sample associated with that substance did not have any detected quantities of agent or agent break-down products.

The MINICAMS alarm presented a false positive on the March 27. At the time of detection, no intrusive work was occurring. If work had been occurring in this area, the MINICAMS intake would have been located at the excavation point. The MINICAMS had been moved out of the way because the team was not downrange. The team had just finished a roll-off and the roll-off was covered, there were no personnel in the inclusion zone, the next MINICAMS cycle did not show any detects, the Depot Area Air Monitoring System (DAAMS) tubes for that day came back 'no detects of agent,' and no agent was detected in the soil characterization samples.

In response to a question from P. Chrostowski, CPF Associates, Parsons explained that the cause for the false positive was not determined. He added that the instruments are purposely sensitive. A false positive is an acceptable occurrence in terms of quality control/quality assurance language, whereas a false negative would be an unacceptable condition. No information could be gleaned from that detection indicating the cause.

One of the confirmation samples did come back with a detection for Dithiane, which is an HD break-down product. Since there was a Dithiane detection, the sample will not be forwarded to the Hazardous and Toxic Waste (HTW) laboratory. The area where the confirmation sample was found will undergo further excavation. The Dithiane was detected in the top 6 inches of the confirmation sample from grid -30, -90. The confirmation sample passed head space testing on-site, but low levels of Dithiane were detected.

Plastic lining in the side wall from a previous excavation was found, which may have been from the Apex investigation. A change in soil coloration was also noted.

In response to a question from P. Chrostowski, CPF Associates, Parsons confirmed that all the other confirmation samples tested clean, but added that excavation will be advanced further followed by another round of confirmation samples.

In response to a question from EPA Region III, Parsons explained that when there is evidence of agent related contamination, the protocol is to conduct additional excavation. Once the excavation reaches clear for agent related contamination through confirmation floor and wall samples, then the HTW samples may be obtained.

In response to a question from EPA Region III, USACE explained that the two grids where the clear confirmation samples were taken were located prior to the curved retaining wall.

Parsons agreed, and added that the excavation had reached saprolite and there was no evidence of the black substance prior to that instance. That is why excavation goes to saprolite, because once saprolite is achieved, the team may be confident it is not an area of disturbance that would have a greater likelihood of contamination.

P. Chrostowski, CPF Associates inquired if USACE or Parsons had any reason to believe that the different orange soil color was contamination, or if the orange soil appeared natural.

USACE and Parsons explained that the different color in the soil was likely introduced through landscaping. The soil may have been part of a root ball, soil from a potted plant, or backfill during planting.

In response to a question from P. deFur, USACE Baltimore explained that it is not uncommon to encounter soil of different coloration due to root balls, root baskets, and backfill.

After the discovery of the black substance, excavation continued under low probability protocols with a heightened awareness for encountering the black substance. A high level of hygiene was maintained onsite; including hand washing, washing outer gloves, and the use of a shuffle pan. As work continued up the driveway, the area was lined with geocloth and backfill was added to ensure the geocloth stayed in place. The geocloth was used in order to prepare for collection of additional wall confirmation samples at a later time.

Gutter drains were rerouted as work continued. Since typical winter weather conditions were still occurring, including a snowstorm on March 14, heat traces were maintained on water lines during excavation.

A second occurrence of black substance was discovered at the juncture of the former curved retaining wall bump-out and the new brick retaining wall. A glass stopper and a glass shard were found in the same area.

The second occurrence of the black substance was also analyzed and tested positive for Mustard (HD), Dithiane, and Thioxane. The sample was analyzed for the TICs as was done before. The TICs identified compounds associated with HD and HD break-down products. In accordance with the work plan, work continued in Mod D since there were no detections in the breathing zone. Parsons relied on the MINICAMS and DAAMS and other industrial monitors on site. Parsons added paper Tyvek to the excavation team's Personal Protection Equipment (PPE) as the quantities of the black substance encounters started to increase. Paper Tyvek was used to prevent cross-contamination. Coveralls were accepted gear, but Parsons made sure workers kept their arms and legs covered, and an extra pair of gloves was added.

P. Chrostowski, CPF Associates inquired if Parsons knew what the detection limits for HD are for the various monitors used.

Tom Rosso, ECBC explained that for the MINICAMS, the detection limit is a quarter of the short-term exposure limit (STEL). The MINICAMS can detect to a lower level, but the confidence is also lower when the results are very low. The MINICAMS is a detector that is scanning halogenated compounds. The MINICAMS detects everything in a chromatograph, but is only identifying HD or Lewisite for this project.

A third occurrence of black substance was discovered on March 16 near the location of the second occurrence. This excavation was a little deeper than the other two occurrences. The excavation was covered with plastic and the MINICAMS was placed under the plastic sheet. The MINICAMS detected HD during four consecutive cycles. Parsons performed an in-situ head space of the black substance for confirmation. Parsons had a high degree of confidence that the black substance would contain HD. ECBC came back to the site and collected a sample of the substance. HD, Dithiane, and Thioxane were detected in the sample.

In response to a question from P. Chrostowski, CPF Associates, Parsons confirmed that there was nothing detected in the air outside the plastic; all of the detections were confined.

In response to a question from EPA Region III, Parsons explained that the detections were known to be confined because there were other MINICAMS and DAAMS tubes monitoring the excavation. There is a set of DAAMS tubes that are run for confirmations and also DAAMS tubes that are run to prove that there were no detections.

In response to a question from EPA Region III, Parsons confirmed there was a DAAMS tube set up at the site of the third occurrence of the black substance. There is a DAAMS tube positioned at the A station, which is the point of excavation, and then there are 4 perimeter sets of DAAMS tubes.

P. deFur inquired if there are any compounds that would commonly be expected to cause a false positive.

ECBC explained that ECBC commonly encounters issues with diesel engines for that type of detector. Certain operations that occur around diesel engines can cause a false positive. ECBC's experience with false positives has shown what triggers to avoid. This false positive is likely triggered by some sort of compound that is coming out of the ground and setting off the MINICAMS. ECBC has not identified the source at this time.

ECBC explained that Parsons mentioned HD related compounds in the TICs because the compounds look like HD. The detected compounds are chlorinated compounds, but instead of 1 Sulphur the compound is perhaps 4 Sulphur, or there is a compound that is half HD. These compounds will not result in a GC-mass spec, which is the definitive analysis indicating HD, but may cause a deflection to the MINICAMS that is very similar to the HD itself.

Parsons reiterated that when Parsons had stopped monitoring at the breathing zone, Parsons placed the MINICAMS under plastic, creating a form of in-situ headspace. There was no detection in the atmosphere or the breathing zone, the detection was underneath the plastic.

USACE added that the MINICAMS was placed under the plastic in the sun for 2 to 3 hours.

Bruce Whisenant, USACE Huntsville noted that the black substance and the surrounding soil was placed in a 30-gallon drum and moved to hazardous waste storage on federal property.

Because of the detections by the MINICAMS, Parsons decided to pause excavating in the area of the third occurrence until a path forward could be determined. Parsons had a high degree of confidence that there was Chemical Agent Contaminated Media (CACM) in the soil. The black substance is not considered Chemical Warfare Materiel (CWM); the substance is considered CACM, a specific distinction in military terms. Work was paused to allow Parsons to ascertain that the work plans allowed Parsons to excavate and address CACM. Work was begun behind the retaining wall that had steps that led up to the first level. Parsons removed the steps and brick façade. Because the excavation was close to the house next door and vibration monitoring was being conducted, Parsons excavated behind the wall to ensure that no vibrations were being transmitted to the house. Parsons scored and softened the wall before removal with a jackhammer. The work moved toward the junction of Area A-B.

On April 18 the team began intrusive operations in the Area B grids.

At 9:43AM the MINICAMS reported a .55 STEL detection for Lewisite, which is just under half the STEL. The readings reached as high as .78. A reading of .86 occurred, but that reading is believed to be the result of the MINICAMS line being moved, since the MINICAMS is sensitive to movement. The excavation was covered and the DAAMS tubes were analyzed. The DAAMS tubes were negative for Lewisite and an interferent was detected. No further detections were encountered.

In response to a question from P. Chrostowski, CPF Associates, Parsons explained that the interferent was not identified because the DAAMS tubes were already analyzed for the agent and could not be re-analyzed.

A similar situation with an interferent during high probability under the tent at 4825 Glenbrook Road. Because of the large number of DAAMS tubes on the filtration system Parsons was able to run some DAAMS tubes to detect the interferent. ECBC detected Dichloronaphthalene on the DAAMS tubes, and Parsons drew the correlation that Dichloronaphthalene and Lewisite had a similar response.

ECBC added that ECBC was unable to procure Dichloronaphthalene. The closest compound available did not result in a detection.

In the past there have been detections due to chlorobenzene.

P. Chrostowski, CPF Associates noted that he would not be surprised if the substance had the compound dichlorobenzene used in mothballs. Chemically speaking there is a high probability, and may be a source of the detection.

Industrial monitors are present as well. None of the photoionization detectors (PIDs) had detections. The MINICAMS may be more sensitive than the PIDs. Parsons reiterated that a false positive is an acceptable occurrence, whereas a false negative is not.

In response to a question from P. Chrostowski, CPF Associates, Parsons explained that the period of time represented by the MINICAMS is a 10 minute cycle, which is a shorter time period than the STEL cycle of 15 minutes.

There is a 4-foot section of wall remaining which is the downslope toe of the footer. There is some footer that was part of the former curved retaining wall that Parsons believes was removed by the residents and redone.

In response to a question from P. deFur, Parsons explained that the third occurrence of the black substance was found at a depth of 4 to 5 feet.

There is a French drain that appears to run behind the retaining wall, so water in the deepest part of the excavation is associated with the French drain. Water is expected to come into the excavation during rain because of the French drain, not necessarily ground water percolating into the excavation. There was a quarter inch of water in the excavation.

P. Chrostowski, CPF Associates inquired if the water in the excavation was coming from 4835 Glenbrook Road.

USACE explained that the exact location of the French drains is not known, but there is a known connection of French drains linking 4825 Glenbrook Road and 4835 Glenbrook Road. The location of the terminations of the French drains is not known.

In response to a comment by P. deFur, USACE confirmed that the French drains are buried deeply. USACE noted that the French drains are located along the retaining wall.

In response to a question from P. deFur, USACE explained that the French drain found in the front of the property was corrugated black plastic, and others have been small PVC pipe.

USACE noted that some pooling of water may occur on the property that was originally taken care of by all of the drains between the two properties. There will not be a barrier between the properties with the wall removed; the area will all be backfilled.

In response to a question from DOEE, Parsons confirmed the entire wall will be removed.

The Interim Holding Facilities (IHFs) were replaced because the current IHFs onsite needed to be serviced. Beginning March 21, Parsons began the process of replacement, which included disconnecting the electricity, intrusion detection system, filtration system, and lightning protection. Once the new IHFs were in place re-installation of the intrusion detection system and filtration system began. In this case the lightning protection system needed service and parts replaced, which caused delays.

In April the weather began to turn warmer, with 80 degree days. Since the residents of 4835 Glenbrook Road may have wanted to use the air conditioning system, Parsons built a pad to temporarily position the air conditioning units at the previous level against the house. The pad will prevent the need for the air conditioning heat exchange fluids to pump uphill.

- No substantial glass was being encountered.
- There was less than an inch of water in the hole from the old French drain.
- Work was about to begin exposing the footer on the uphill side.

- 67 roll-offs removed out of this area, which include the 16 roll-offs removed in 2013.
- 2 roll-offs of rubble removed.
- 67 disposal characterization samples with 2 pending headspace that have cleared since this presentation was created.
- 4 grab-samples and 3 ECBC grab samples.

- 10 confirmation samples.
- 112.42 lbs. scrap glass.
- 536 cubic yards out of the 668 cubic yards expected have been excavated, or 80.2% complete.

- Pause in intrusive operations until Parsons can revise workplan to include Level C operations for low probability excavations. Parsons will develop a stand up Personnel Decontamination Station and add additional teams able to go downrange in Level C.
- Revise work plan to include CACM.
- Preparation for transport of filtration charcoal packages in Department of Transportation (DOT) approved box containers.
- Re-sample HTW confirmation samples that failed Quality Control (QC), including some of the wall and the former high probability areas.

Packaging and sampling will take about 3 or 4 weeks to complete, so Parsons is revising the work plan during that time. The work plan will then be sent to USACE for approval and shared with the regulators for concurrence.

EPA Region III commented that the Future Activities list should include informing the community.

USACE confirmed this and added that after receipt of the regulators' concurrence, public messaging would be handled as a team effort.

EPA Region III commented that he would like to see the description, guidance and protocols associated with CACM included as well.

P. Chrostowski, CPF Associates commented that he would like to see the modeling USACE mentioned. He noted that it is difficult for the president or whoever is in occupancy of that building to deal with the concept of a STEL, but if AU has the modeling it may be easier to communicate. P. Chrostowski, CPF Associates also requested a picture of what Level C personal protection looks like.

USACE explained that Level C protection looks very similar to Level D protection, with the addition of a respirator mask.

Lowell (J.R.) Martin, USACE Site Operations Officer (SOO) explained that the Level C respirator is a full-faced mask respirator, and offered to bring one in to show the Partners.

P. Chrostowski, CPF Associates responded that he wants a photo of the Level C protection to distribute.

In response to a question from P. Chrostowski, CPF Associates, USACE explained that the timeline for the work plan revisions is 3 to 4 weeks.

Bethany Bridgham, American University (AU) commented that for any of the partners not aware, the university is about to transition to a new President. The new President coming in has two small children.

P. Chrostowski, CPF Associates commented that the outgoing President had been educated on this project. The new President will be entirely new to the project.

EPA Region III inquired if AU had any conversations about 4825 Glenbrook Road with the new President.

AU explained that the new President has been briefed on 4825 Glenbrook Road, and AU is in the process of scheduling a meeting with the chief of staff, P. Chrostowski, CPF Associates, and AU.

P. Chrostowski, CPF Associates noted that he and AU would like to say the sooner this project is all done the better, and that USACE has put the proper precautions in place to preclude any exposure. The sooner the work plans are available the better.

USACE SOO offered a site visit to the incoming President of AU if she wishes.

USACE requested USACE Huntsville send Standard Operating Procedures (SOPs) and any available information concerning CACM as soon as possible.

In response to a question from USACE Huntsville, Parsons confirmed that he will note the re-sampling of the high probability areas that failed QC on the Future Activities list.

In response to a question from P. deFur, USACE confirmed that USACE will send out a revised work plan.

- Completion of low probability operations by early July of 2017. Adjustments to the schedule will be made as work progresses.
- Complete restoration of 4825 Glenbrook now by late summer of 2017 as previously scheduled

EPA Region III inquired if there is a definition of what low probability is.

USACE SOO and USACE Huntsville explained that low probability is designated by decision, not by definition; the Low Probability Assessment. If any intact chemical items are found, the area is reassessed and the designation may be changed to high probability.

If there is a single glass item anomaly and not a glass pit, the work may be determined to continue under low probability after the anomaly is packaged up. Low probability would then continue with a heightened awareness that if another item is found, work would stop again and another determination would be made. If a glass pit, intact items, or intact munition are found, work would stop for a determination. If the items are found to have mustard, lewisite, or arsine, then the determination would be high probability.

USACE SOO noted that an example would be a 75mm item found during rerouting of a sewer line. The item was a closed cavity item, so the appropriate protocols were followed. There was no liquid line in the item, so the item was deemed empty. Work continued under low probability.

AU inquired if any work was going to be conducted at the site while the work plan is being revised and transportation packaging is prepared.

Parsons explained that Parsons may re-sample in the area that has already been cleared for agent and has been excavated to saprolite. Parsons may scrape that area to achieve fresh exposure because the area was rained on, but that would be the only type of intrusive operations conducted at the site until the work plan is revised.

In response to a question from P. Chrostowski, CPF Associates, Parsons explained that the re-sampling will not be in Level C because the excavation will be in confirmed saprolite and the area has been cleared for agent and agent breakdown products.

In response to a question from AU, Parsons confirmed that security guards are still on site. There will be an operations presence during work hours and then security guards at night.

The draft final Groundwater FS has been sent to the regulators for comments. The original due date for comments was mid-May, but DOEE requested an extension. The new due date for comments is June 1, 2017.

The Spring Valley FUDS groundwater project is currently in the Remedial Investigation (RI)/Feasibility Study (FS) phase under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. The next phase will be the Groundwater Proposed Plan (PP).

The basic conclusions and recommendations of the Groundwater RI were:

- No unacceptable risk for current land use.
- Unacceptable risk if groundwater is used as potable water in the future associated with Exposure Unit (EU) 2. EU2 is an area where the wells had higher concentrations of arsenic and perchlorate, approximate to Glenbrook Road and AU.

The recommendation of the Groundwater RI was to conduct an FS to identify the best alternative to remediate the groundwater so the risk to future users will be below the acceptable threshold.

The risk drivers at EU2 are perchlorate and arsenic. The perchlorate Non-Cancer Hazard Index (HI) numbers for adult residents, child residents, and AU students in the EU2 area all exceed 1. Therefore perchlorate is a driver of a problem at EU2. With regard to cancer risk, arsenic is the driver. The arsenic risk for EU2 is right at the upper threshold point of 1E-04, which can cause debate.

AECOM confirmed EPA Region III's comment that the 1E-04 level is the upper end of a range.

P. Chrostowski, CPF Associates noted that there are risks associated with exposure to contaminated soil at the same site that are added to the risk level.

AECOM confirmed this, and explained that this report is strictly focused on groundwater and does not include cumulative effects of an individual exposed to groundwater and soil.

The EU2 monitoring wells include the following. (There is a bias towards the wells that had higher concentrations of arsenic and perchlorate in the past.)

- Multiport (MP) 2.
- Monitoring wells (MW) MW-24 and MW-25.
- Clustered wells MW-44, MW-45S, and MW-45D; intended to assess different vertical intervals near Kreeger Hall.
- Original monitoring points Piezometer PZ-4S and PZ-4D.

MP-2 has 8 different vertical intervals that are monitored at a single location. They are referred to as MP 2-1, which is the most shallow interval; MP2-2, MP2-3, and so on. MP2-8 is at 200 feet below ground surface. Any measured concentrations of arsenic above the arsenic maximum contaminant level (MCL) of 10 parts per billion (ppb) were highlighted; and any concentrations of perchlorate above the Interim Drinking Water Health Advisory (IDWHA) for perchlorate of 15 ppb. Going forward, the 15ppb value for perchlorate is likely to become much lower. The reassessment for that level has been active for quite some time and AECOM did not know the current status.

P. Chrostowski, CPF Associates noted that the Health Advisory reassessment for perchlorate is not going to be complete before implementation of the RA.

The data from wells MW-24 and MW-25 shows exceedances and concentrations occurred during early monitoring, which began in 2005. That data might suggest that perhaps the concentrations are decreasing with time. The Groundwater RI report performed a rigorous evaluation of the concentration trends in all of the wells. The results of the evaluation indicated that not all of the wells showed a decrease in concentration with time; and in some instances there is evidence of the concentration going up. PZ-4S and PZ-4D are also nested wells near Kreeger Hall. PZ-4S showed similar data results to MW-24 and MW-25, while PZ-4D was different.

MW-44 is consistently higher for perchlorate and has not shown an issue with regard to arsenic. The same is true for arsenic and perchlorate levels at the nested deeper intervals at that same location. Although arsenic and perchlorate frequently occur simultaneously at elevated levels at a single location, that is not always the case. There is a general sense that the higher concentrations of arsenic are found in the wells near Glenbrook Road and higher concentrations of perchlorate are found near Kreeger Hall on the AU

campus. This information is important because of the chemistry of the way arsenic and perchlorate behave in the groundwater and what treatment may be used.

The elevation of the groundwater table in EU2 generally mimics that of the topography. In some locations the groundwater table and land surface intersect and the groundwater discharges into the surface water. Therefore East Creek has been monitored rigorously for both arsenic and perchlorate, and was shown not to have a problem relative to either contaminant.

- Identify Applicable or Relevant and Appropriate Requirements (ARARs) and 'To Be Considered' (TBC) criteria.
- State the Remedial Action Objective (RAO).
- State the General Response Actions (GRAs) that are attentive to and achieve the RAO.
- Identify and screen groundwater technologies that could attain the GRAs and RAO.
- Assemble technologies into different remedial alternatives.
- Perform detailed evaluation and comparative analysis of the assembled alternatives with the intent of giving the regulators partners and the public fundamental information that can be used to make an informed decision.

AECOM identified the arsenic MCL as an ARAR. There is also an ARAR indicating that any hazardous waste generated during groundwater treatment would have to be properly managed.

The TBC criterion captures the IDWHA for perchlorate of 15ppb. Both DOEE and EPA Region III will have the opportunity to comment on what ARARs will be necessary in the draft FS report.

Neither the MCL of 0.010 mg/L for arsenic nor the IDWHA of 0.015 mg/L for perchlorate are strictly health based, whereas when the risk assessment is performed and risk levels are identified during the RI, those levels are strictly health based. One can identify concentrations that might drive elevated risk when performing a risk assessment, but the concentrations may actually correspond to values of concentrations that are below MCLs. The risk assessment may indicate the conclusion to clean up groundwater, and when the clean-up work begins the levels will be almost immediately compliant with the MCL. This scenario is what is naturally going on at this site to some extent.

- No Action alternative to serve as a baseline that must be evaluated.
- Land Use Controls (LUCs) to prevent potential exposure to ground water.
- Long-term Management (LTM) of groundwater to determine when LUCs can be removed. The LUCs are not placed indefinitely. The LUCs are in place so long as there is potential for people to be exposed to groundwater that is not compliant with the law. Once the groundwater is compliant, which can only be determined through long term management, the LUCs may be removed.
- Identify groundwater treatment alternatives that can expedite achieving the RAOs.

- Effectiveness - Each technology considered potentially relevant to treat arsenic and perchlorate is screened by effectiveness of the treatment. Not all treatments are equal in terms of effectiveness.
- Implementability - how easy or difficult the technologies are to implement.
- Cost.

- LUCs:
  - Fences and signs - no longer considered. Difficult to keep people away from the groundwater.
  - Legal: well drilling prohibitions - no longer considered. Very difficult to legally prevent people in Spring Valley from drilling on their own property.
  - Educational: notices - considered a passing alternative. Rigorously advise people of the groundwater situation; that drilling a well and using the groundwater as drinking water is not in their best interest.
  - Proprietary: private landowner agreements - no longer considered. Judged not workable for all residents of the area.

P. Chrostowski, CPF Associates noted that the legal LUCs puts the ball in AU's court to ensure that there are institutional procedures in place that prohibit anyone in the future from drilling a well on campus for drinking water purposes. So rather than coming from the regulatory agency, the responsibility is on AU.

EPA Region III agreed that is a complicated area.

USACE Huntsville, EPA Region III, and P. Chrostowski, CPF Associates discussed the 200 ft. irrigation well installed on the Republic of Korea Ambassador's property, part of a sovereign nation.

- LTM (technological alternatives):
  - Environmental monitoring - considered a passing alternative.
  - Remedial action maintenance - considered a passing alternative.

The following are basic categories of technologies that were considered. Each technology is considered appropriate and useful, but not necessarily for both arsenic and perchlorate. Each technology is appropriate for at least one, and in some cases it is appropriate for both arsenic and perchlorate:

- Bioremediation.
- Chemical Oxidation.
- Ion exchange.
- Absorption.
- Precipitation/Co-precipitation.
- Membrane Filtration.

AECOM considers whether or not in-situ treatment of contaminated groundwater is viable because there are advantages to in-situ treatment over ex-situ treatment. Ex-situ treatment requires the extraction of the groundwater and delivery to an above ground groundwater treatment system. The in-situ technologies include:

- Permeable reactive barrier (trenching) - no longer considered. There are problems with this treatment concerning the occurrence of bedrock.
- Permeable reactive barrier (direct push injections) - no longer considered.
- Permeable reactive barrier (injection and recirculation wells) - considered a passing alternative.

Given the clay-rich nature of the saprolite there will not be much distribution beyond the push point. Distribution of any reactants has to be encouraged through a recirculation method.

- Chemical oxidants (arsenic) - no longer considered.

- Traditional zero-valent iron (arsenic) - no longer considered.
- Nano zero-valent iron (arsenic) - considered a passing alternative.
- Microbial substrates and nutrients (perchlorate) - considered a passing alternative.

Perchlorate can be remediated in-situ through inducing reducing conditions, and there are certain microorganisms that will degrade perchlorate. For arsenic, oxidizing conditions is preferred; not reducing conditions. When reducing conditions are present at sites such as landfills, where organics are released and cause reduction, arsenic is frequently mobilized. This presents a quandary for developing an in-situ treatment for perchlorate that is compatible with arsenic. As it turns out, although arsenic solubility generally increases under reducing conditions, thus rendering traditional absorbents such as zero-valent iron ineffective, that happens not to be true when dealing with nano zero-valent iron. Nano zero-valent iron is powerful enough to actually sequester the soluble species of arsenic that prevail under reducing groundwater conditions.

EPA Region III inquired if there were places where arsenic and perchlorate are a problem and are co-located. He noted that if the arsenic is separate from the perchlorate, the treatment need not be one size fits all.

AECOM confirmed that separations tend to occur, but the concern is that once a change is induced in the groundwater chemistry, will that changed groundwater migrate to a zone where there is arsenic.

ECBC, EPA Region III, and AECOM discussed the distances from Kreeger Hall to Glenbrook Road and Glenbrook Road to Sibley Memorial Hospital. ECBC noted that the wells in question are in front of Kreeger Hall and MP-2, which is on Glenbrook Road.

EU2 is the exposure unit that was the focus of the Groundwater FS. EU2 is focused on Glenbrook Road and the AU vicinity, so the treatments considered for arsenic and perchlorate are for that location only.

P. Chrostowski, CPF Associates inquired about the reduction potential of the treatments. He noted that the remediation needs to avoid the scenario of arsenic turning into arsine gas and venting out of the ground.

AECOM agreed that reduction potential is a critical consideration. Whenever the reduction and the pH conditions in the groundwater environment are altered, the outcome is unknown. If a treatment were to begin to induce reducing conditions in a perchlorate plume area, stable naturally-occurring arsenic may be mobilized. The perchlorate objective may be achieved, but then there may be problems with arsenic.

The screening summary lists the different technologies and qualitative comments are made about effectiveness and implementability for both arsenic and perchlorate. Within the Groundwater FS report there is a field that has comments to provide insights to the reader as to why AECOM ranked each technology high or low. The Groundwater FS report contains abundant text that gives a primer on the chemistry of arsenic and perchlorate relative to treatment. These technologies were carefully considered in the context of usefulness for arsenic and perchlorate.

After passing initial screening, the technologies were assembled into alternatives:

- Alternative 1: No action - baseline.
- Alternative 2: Educational LUCS and LTM - does not involve any treatment at all.
- Alternative 3: In-situ Permeable Reactive Barrier (PRB) to effect arsenic sequestration using nano zero-valent iron (nZVI) and perchlorate destruction by bioremediation. The only in-situ alternative.
- Alternative 4: Ex-situ pump and treat: arsenic by oxidation and ion exchange and perchlorate by ion exchange. Groundwater is pumped from the subsurface and delivered to a treatment plant. When oxidizing conditions are created for arsenic, arsenic soluble and ion exchange reactive species are created. Ion exchange is a common technique to remove perchlorate.

- Alternative 5: Ex-situ pump and treat: arsenic by oxidation and reverse osmosis and perchlorate by reverse osmosis. Groundwater is pumped from the subsurface and delivered to a treatment plant. Arsenic oxidation produces insoluble species that can be filtered out with a very fine filter. The perchlorate also needs to be removed, and perchlorate is very small and needs very tiny pores, so reverse osmosis is used. Byproducts such as brine must be managed. The treated water in both instances also must be managed. Typically, the treated water may be injected, discharged into surface water, or discharged into Publicly Owned Treatment Works (POTW).

In response to a question from P. Chrostowski, CPF Associates, EPA Region III and AECOM explained that Educational LUCs and LTM is not Monitored Natural Attenuation (MNA), which is a whole process with associated obligations. Alternative 2 touches on attenuation with in-situ treatment. MNA intends that the remediation takes action to encourage or accelerate the natural attenuation. Some of the MNA guidance specifically states that the remediation is not open-ended. The MNA has to work within a set period of time. If the MNA has not worked within that time, there is an obligation to do something else. LTM does not have the specific time frame for remediation.

ECBC explained that the identified RAO was to prevent the ingestion of groundwater, not to restore the aquifer to beneficial use. That is why there is no MNA alternative.

DOEE inquired about the known locations of arsenic and perchlorate. Point data has been collected from installed wells, and asked if AECOM has attempted to bound those locations for groundwater.

AECOM identified locations in Spring Valley where various chemicals have been detected at elevated levels, and the monitoring well program was designed to assess the distribution of the contaminants encountered. The possibility that the perchlorate at AU is associated with the perchlorate at Sibley Memorial Hospital was considered, and there seemed to be the possibility of a connection. The risk assessment focuses on threshold exceedances. Bounding depends on scale. The question of what is happening here versus 18 inches over is a level of understating that is beyond the typical requirements of the CERCLA process. In terms of performing the necessary actions to define the occurrence and distribution of the contaminants to be compliant with the Groundwater RI obligations under CERCLA process; yes, that has been accomplished.

DOEE commented that AECOM believes the extent of the plume has been delineated based on a very large area and has EU2 as an arbitrarily drawn line. DOEE inquired about the wells used to determine whether all of EU2 will need treatment versus parts of EU2. DOEE asked if only the exceedance point data will be used. DOEE noted that AECOM does not know how far the plume went out and, under CERCLA, the extent of the plume must be delineated.

ECBC explained that was the intent of the Groundwater RI Report. ECBC believes they did delineate the nature and extent of the plume, which was included in the Groundwater RI report.

In response to a question from DOEE, AECOM explained that EU2 is a somewhat arbitrary polygon line on a map, intended to encompass the wells with the highest perchlorate concentration approximate to Sibley Memorial Hospital. EU2 was biased towards higher concentrations. AECOM intentionally avoided drawing a boundary in the Sibley Memorial Hospital area that was too broad. When the boundary is too broad, results for wells that never detected perchlorate are included. Bringing in clean wells creates a mathematical low bias dilution. The EU1 polygon was kept small to focus on the known hotspot well, and even then the EU1 risk assessment findings did not drive a requirement for a Groundwater FS. That same procedure at AU which is referred to as EU2 does obligate a Groundwater FS.

DOEE commented that the explanation does not say exactly where the perchlorate needs to be treated except point locations. DOEE inquired when AECOM will delineate how far action needs to be taken.

AECOM explained that the Groundwater FS report and specifically the Remedial Action Cost Engineering and Requirements System (RACER) estimates provide details on the number of extraction wells and

injection wells that were conceptually considered in the context of Alternative 3. EU2 is a broad zone of treatment and is not focused on individual wells.

D. Douglas commented that monitoring wells are necessary to know if any treatment is working. She inquired how success will be determined, where the cut off will be located, and where the groundwater will meet the criteria of 0.010 mg/L for arsenic and 0.015 mg/L for perchlorate.

AECOM explained that topic will be illuminated in the Groundwater Remedial Design (RD) documents for the alternative. The points that would be monitored in the in-situ Alternative 3 or any active groundwater treatment would include the existing monitoring wells, extraction wells, and the combined extraction wells. If necessary, at that time additional monitoring wells may be constructed.

ECBC pointed out that obtaining homeowner approvals for additional wells would be very challenging.

DOEE reiterated that if there is a well that definitely exceeds and there is no well in the vicinity, there may be overlooked material that the treatment is not remediating. Once the treatment is finished there may still be a mass of contaminant. There have to be independent monitoring wells. Independent monitoring wells are typically outside the boundary of the known contaminated area to confirm the boundary.

AECOM explained that only well with a MCL exceedance for arsenic is MP-2. In the future, during the Remedial Action phase, the decision would need to be made when to close out treatment. Even for that well the level would be so close to being compliant with the MCL that the system could be turned off almost immediately. To use the word plume is not appropriate in the context of arsenic. What is appropriate is to ask the question, 'what about beyond MP-2?' The answer to that would be yes, beyond MP-2 is an important consideration, which is why MW-24 and MW-25 were installed. Those two wells are immediately adjacent to MP-2.

DOEE noted that she was thinking more about perchlorate. Looking at MP-2, where the stream is, and where the other wells are located; there need to be wells that are down-gradient. A stream is a controlling factor, but because MP-2 is a vertical well it has ports. If it is assumed that groundwater as a whole is heading towards a reservoir or a river, down-graded wells need to be installed following that flow path.

ECBC noted that the map does not show all of the wells.

AECOM explained that this question was the subject of a Groundwater RI debate a couple years ago. To address that legitimate concern, additional downgraded wells were installed to test the hypothesis that the arsenic encountered at MP-2 is the total extent. MP-3 was the well intermediate between Sibley Memorial Hospital and AU where there were 7 or 9 vertical intervals. Arsenic was clearly not an issue there. MP-5 was another multi-port well installed to track if the arsenic from MP-2 was going in a slightly different direction. Arsenic was not an issue there either. The weight of evidence explained in the Groundwater RI shows that the problem with arsenic is localized, which the monitoring data supports. The project is now in the Groundwater FS phase to determine conceptual ways to address the localized arsenic problem.

AECOM noted that DOEE made some excellent points on the in-situ concept. In his opinion, the larger issue with in-situ treatment is the uncertainty of unintended consequences to the groundwater chemistry with regard to impacts on the naturally occurring things like arsenic.

P. Chrostowski, CPF Associates and USACE discussed that the local property owners and AU will not look favorably on having a treatment plant on campus if one of the ex-situ remedies were to be selected. The institutional problems of having a hazardous waste water treatment plant on university campus would be very difficult.

The very first general screening criteria is called Threshold Criteria. Any alternative considered must achieve both Threshold Criteria:

- Overall protection of human health and environment - if an alternative does not protect human health or the environment it should be screened out or never developed.
- Compliance with ARARs - any alternative must comply with the law. Any alternative that falls short in that regard either has to be embellished or has to be screened out.

- Long Term Effectiveness
- Reduction of Toxicity, Mobility, and Volume Through Treatment
- Short Term Effectiveness
- Implementability
- Cost.

AECOM judged Alternatives 2, 4, and 5 to be comparable with Long Term Effectiveness. Alternative 3 was given a slightly lower rating of moderate versus favorable. The reason for that relates to the scenario of changing the chemistry of groundwater with the intent of changing the valence of arsenic, for example. There can be unintended consequences. If reducing conditions are created for the purposes of treatment of perchlorate, there can be unintended consequences later.

P. deFur commented that he would have described the criteria a little differently and not said that the criteria was Long Term Effectiveness, but would have considered the alternatives in terms of uncertainty, that there is a greater uncertainty of how an alternative is going to be implemented rather than Long Term Effectiveness. Maybe the point had been made that there was no distinction between Long Term Effectiveness and uncertainty.

AECOM noted that P. deFur's point was a good one. He explained that uncertainty was used in the language of the discussion of Alternative 3. Because there is uncertainty, an error is possible. If an error is made and arsenic is mobilized because reducing conditions were created, then groundwater treatment effectiveness has not been achieved.

DOEE commented that data has been collected on Oxidation Reduction Potential (ORP) and dissolved oxygen (DO). She inquired if AECOM had seen a correlation with increased arsenic and less DO and negative ORP, and if some sites showed that arsenic levels increased. She commented that if there has not been a noted increase in arsenic, and there are very deep wells, and there is low DO or negative ORP, then perhaps mobilized arsenic is not such an issue.

AECOM would not agree with that point. There was no hypothesis to test whether arsenic concentration was buried across the site as a function of pH and ORP. He noted that the overall pH conditions are fairly consistent across the site, and yet the arsenic concentrations are high. The arsenic concentrations are correlating to something else. The higher arsenic concentrations seem to correlate well with past disposal areas.

DOEE commented that arsenic may not be such a concern if the remediation is actually dealing with localized enrichment because of historic use. Then the remediation is doing something better, and if negative ORP occurs it will not have the concerning negative impact because when there is negative ORP arsenic is not seen.

AECOM explained that there is no ORP out there right now that would be anywhere close to the ORP that would be induced. Uniquely reducing conditions would be created. The impact on arsenic would have to be assessed by a pilot study test.

AECOM and USACE agreed that it will not be a trivial matter to attempt to do in-situ or ex-situ treatment, simply from the perspective of logistics, short-term risks to workers, receptors, etc.

Typically that type of effort would only be justified if there were a serious health risk. Although on paper there is risk that obligates the remediation, the risk may not be the kind of risk that legitimizes going that far.

P. deFur commented that a pilot test was mentioned, which is standard for a lot of treatment options. There is no data from the last 3 years; the most recent data from July of 2014. He inquired if a pilot study test would require collecting current data.

AECOM confirmed this.

In response to a question from P. deFur, AECOM explained that new data may benefit USACE, EPA Region III, DOEE, and the public in the process of making a decision.

P. Chrostowski, CPF Associates suggested that since all of the remedies require monitoring anyway, any new sampling should be done during the Groundwater RD process in the interest of moving the remediation forward expeditiously.

In response to a question from P. Chrostowski, CPF Associates, USACE and EPA Region III explained that the alternative chosen in the Groundwater DD will be subject to a 5 year review.

In response to a question from P. Chrostowski, CPF Associates, EPA Region III explained that he has never contemplated putting in a treatment plant as a remedy.

DOEE wants restoration of the aquifer to beneficial use language included in the Groundwater FS, which is an ARAR and part of DOEE regulations. She noticed that the language is not mentioned but DOEE has put that in the comments previously.

USACE confirmed this and requested the list of ARARs to be submitted by DOEE.

DOEE confirmed this.

In response to a question from P. deFur, USACE explained that the FUDS definition of a 5 year review is that the review occurs 5 years after the Remedial Action construction begins with the first shovel in the ground. This allows time for the Remedial Design phase.

F. Open Issues and New Data

None

G. Future Agenda Items

1. Groundwater Feasibility Study.

2. 4825 Glenbrook Road.

3. Site-Wide Decision Document.

4. Site-Wide Remedial Action.

5. Pilot Project

H. Agenda Building

The next meeting was scheduled for Tuesday, June 13, 2017.

The meeting was adjourned at 12:32.