



SPRING VALLEY FORMERLY USED DEFENSE SITE PROJECT
RAB Meeting

**May 9, 2017
7:00 – 9:00 p.m.**

**UNDERCROFT MEETING ROOM
ST. DAVID'S EPISCOPAL CHURCH
5150 MACOMB ST. NW, WASHINGTON, DC**

Agenda

- 7:00 p.m. I. Administrative Items**
Co-Chair Updates
 ▪ Introductions, Announcements
Task Group Updates
- 7:05 p.m. II. USACE Program Updates**
Site-Wide Decision Document
Pilot Project
Glenbrook Road
Groundwater Study
- 8:30 p.m. III. Community Items**
- 8:40 p.m. IV. Open Discussion & Future RAB Agenda Development**
Upcoming Meeting Topics:
 ▪ (Suggestions?)

 *Next meeting: July 11, 2017
- 8:50 p.m. V. Public Comments**
- 9:00 p.m. VI. Adjourn**

**Note: The RAB meets every odd month.*

SPRING VALLEY FORMERLY USED DEFENSE SITE

Restoration Advisory Board Meeting 9 May 2017

“The USACE Mission in Spring Valley is to identify, investigate and remove or remediate threats to human health, safety or to the environment resulting from past Department of Defense activities in the area.”

“The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation.”



AGENDA REVIEW

Co-Chair Updates

- Introduction, Announcements

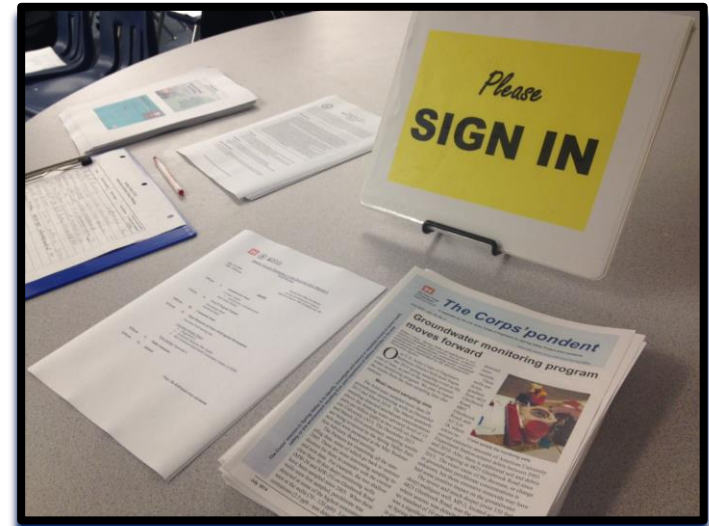
USACE Updates

- Site-Wide Decision Document
- Pilot Study
- Glenbrook Road
- Groundwater Study

Community Items

Open Discussion & Future RAB Agenda Development

Public Comments



CO-CHAIR UPDATES

Introductions



CO-CHAIR UPDATES

Announcements

– Website Updates:

- January through April Monthly Site-Wide Project Updates
- Weekly 4825 Glenbrook Rd Project Updates with photos
- January RAB meeting minutes
- December and February Partner meeting minutes
- February 2017 Corps'pondent newsletter
- Final Pilot Study Advanced Classification report and factsheet

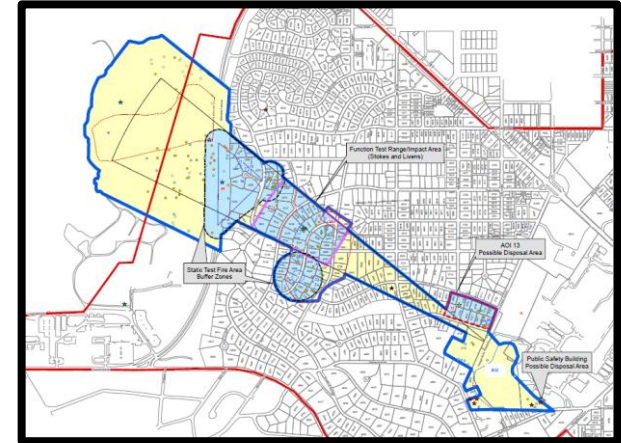


US Army Corps
of Engineers.



TASK GROUP UPDATES





SITE-WIDE DECISION DOCUMENT

USACE Updates



SITE-WIDE DECISION DOCUMENT

The regulatory Partners (the Environmental Protection Agency, the Department of Energy & Environment, and our independent technical consultant Dr. Peter DeFur) completed their review of the Decision Document. Their comments were addressed and approved.



Upon receiving Partner approval in April, the Site-Wide Decision Document was submitted to the Army Corps' Headquarters for final review and approval signatures.



**US Army Corps
of Engineers.**

SITE-WIDE REMEDIAL ACTION CONTRACTOR SITE VISIT

A site visit was held on April 19th for the companies who plan to bid on the Remedial Action contract work.

A Spring Valley site history overview was provided, along with a question and answer period.

The group participated in a site tour of American University including the Public Safety Building and southern AU campus, a private residential property, and the Spaulding and Captain Rankin Area.

Spring Valley FUDS May 2017 RAB Meeting



SITE-WIDE TENTATIVE SCHEDULE

Spring 2017	Prepare and sign the Decision Document .
Summer 2017	Contract acquisition work. Goal for Contract Award: June 30.
Fall 2017	Begin Remedial Design .
~2017-2020	Conduct Remedial Action .



**US Army Corps
of Engineers.**

SPRING VALLEY FUDS

On April 28th, the debris from an old Livens round was found in a landscaped area near the American University President's office building.

It was discovered by an AU landscaping crew while digging just below the surface. USACE evaluated the situation, carefully dug up the item and mitigated the area in order to return to perform soil sampling if necessary.

The munition debris was immediately double-bagged and transported to Federal Property.

We will perform further testing for the presence of WWI chemical agent. Any findings will be reported to the RAB.



GEOPHYSICAL PILOT STUDY

USACE Updates



**US Army Corps
of Engineers**

FINAL PILOT STUDY ADVANCED CLASSIFICATION REPORT

Our team finalized the Pilot Study report, which includes a full analysis of all of the data from the three Advanced Geophysical Classification instruments performed at three private properties in 2016.

The report examines how well these instruments detected and identified the metallic objects under the soil in these three pilot project yards.



TEMTADS



US Army Corps
of Engineers.

FINAL PILOT STUDY ADVANCED CLASSIFICATION REPORT

13



G-858 Magnetometer

The draft-final report was submitted to our Partners for review in early March. Once the regulatory Partners' comments were addressed, the Pilot Study report was finalized and made available to the public at the Information Repository and on our project website.

This report concluded that either the MPV or the TEMTADS would be capable of meeting the Spring Valley FUDS remedial action objectives if used in concert with a G-858 Magnetometer.

The findings of the report and lessons learned will be incorporated into the Site-Wide Remedial Design, which will form the basis for the upcoming Site-Wide Remedial Actions, to be performed from late 2017 through 2020.



US Army Corps
of Engineers.

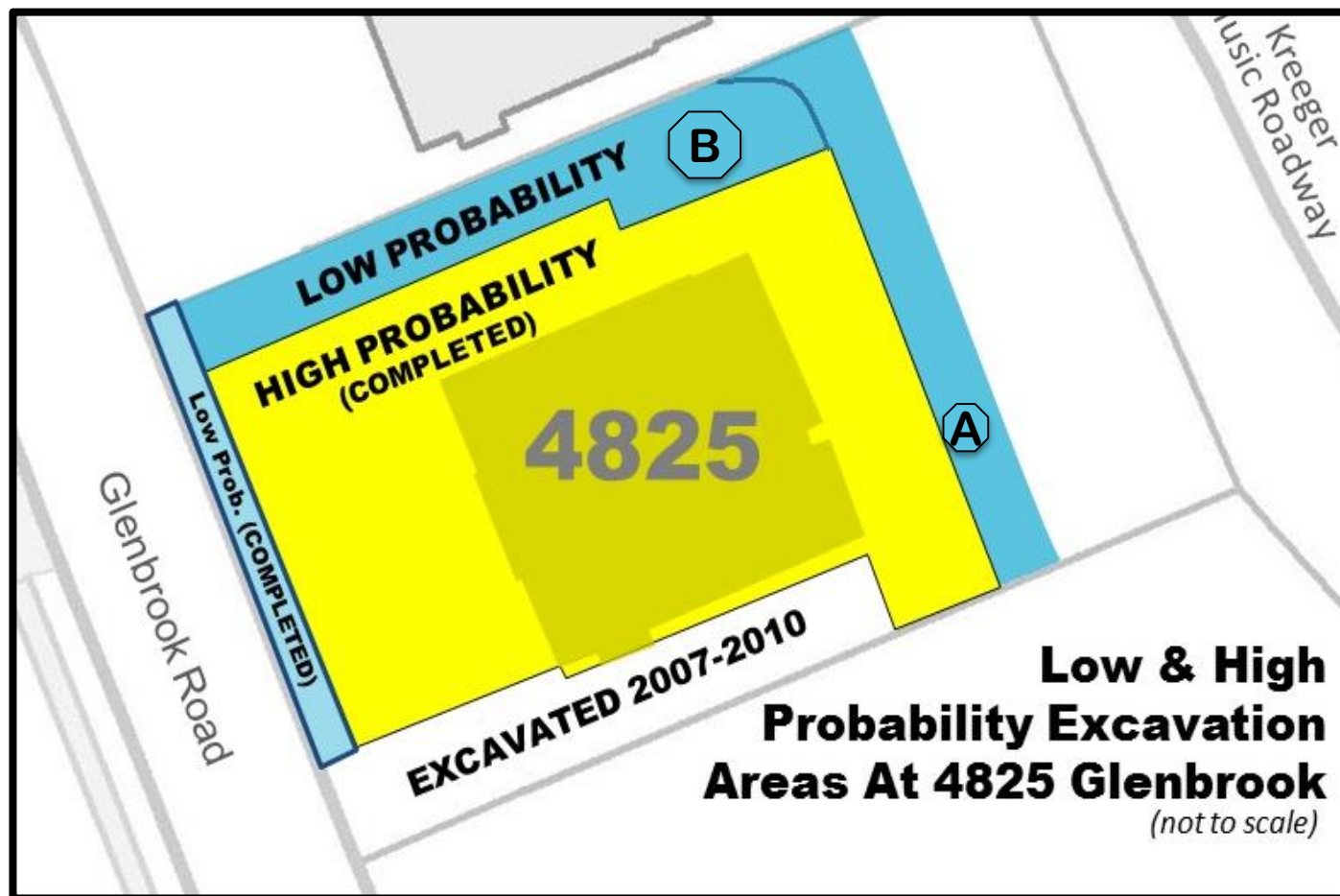
4825 GLENBROOK ROAD

USACE Updates



LOW PROBABILITY

Low probability remedial action operations have continued in the previously identified areas of potential concern for soil contamination.



US Army Corps
of Engineers.

LOW PROBABILITY – ALONG THE SHARED PROPERTY LINE

Numerous utilities have been encountered. The team must hand dig around them to avoid damaging the utilities. In some cases, the utilities have been rerouted.



US Army Corps
of Engineers.

LOW PROBABILITY

On February 23rd, crews encountered a small solid black substance as they started digging in the former retaining wall bump out, further up the driveway from the fully excavated area along the property line.



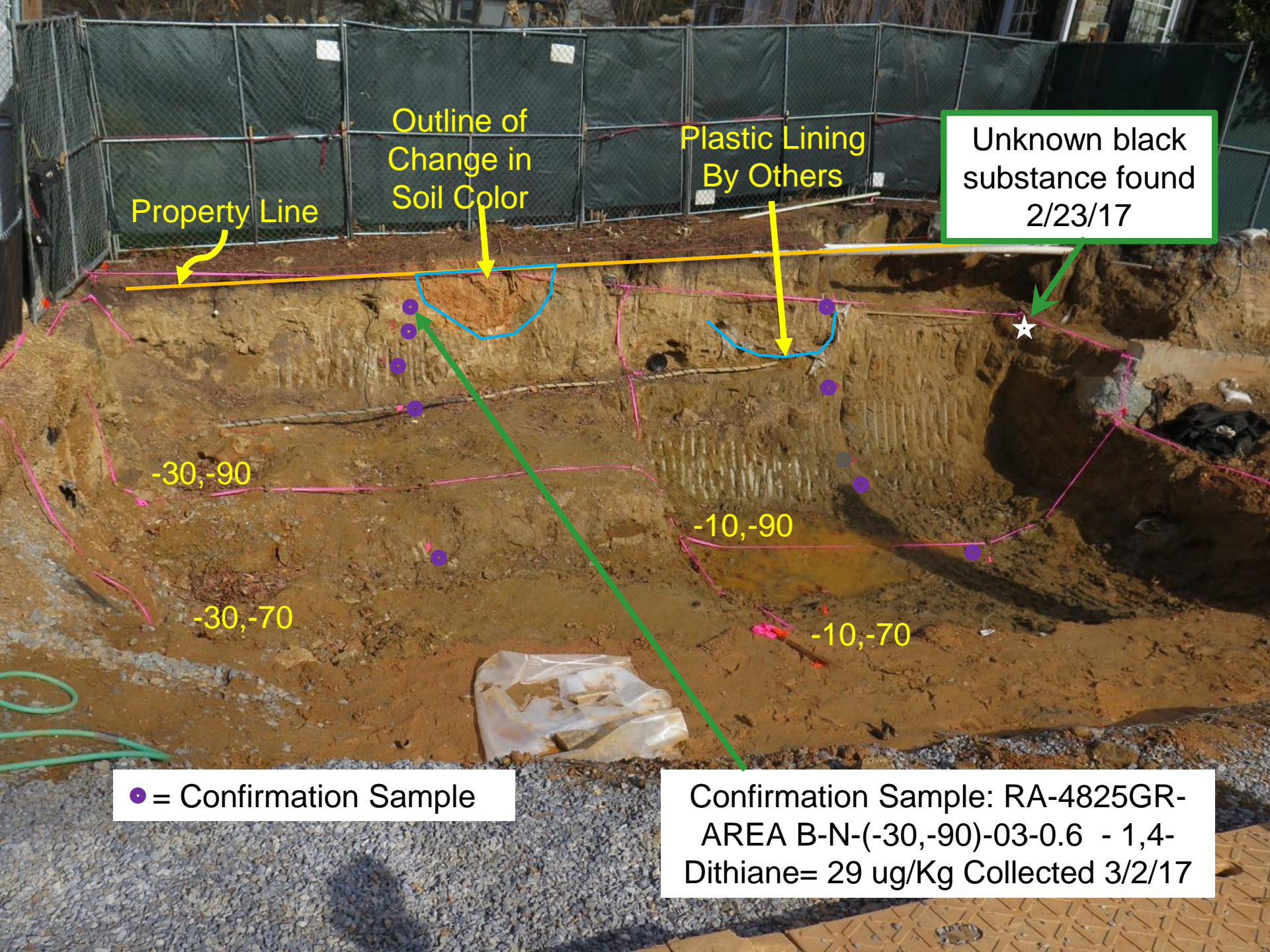
Preparations for taking confirmation samples.

On March 1st, the CENAB geologist was on site to confirm we were in Saprolite, and had completed excavating the first section of Area B (the area prior to the wall bump out).

On March 2nd, confirmation samples were collected as work continued further up the former driveway.



US Army Corps
of Engineers.



Property Line

Outline of
Change in
Soil Color

Plastic Lining
By Others

Unknown black
substance found
2/23/17

-30,-90

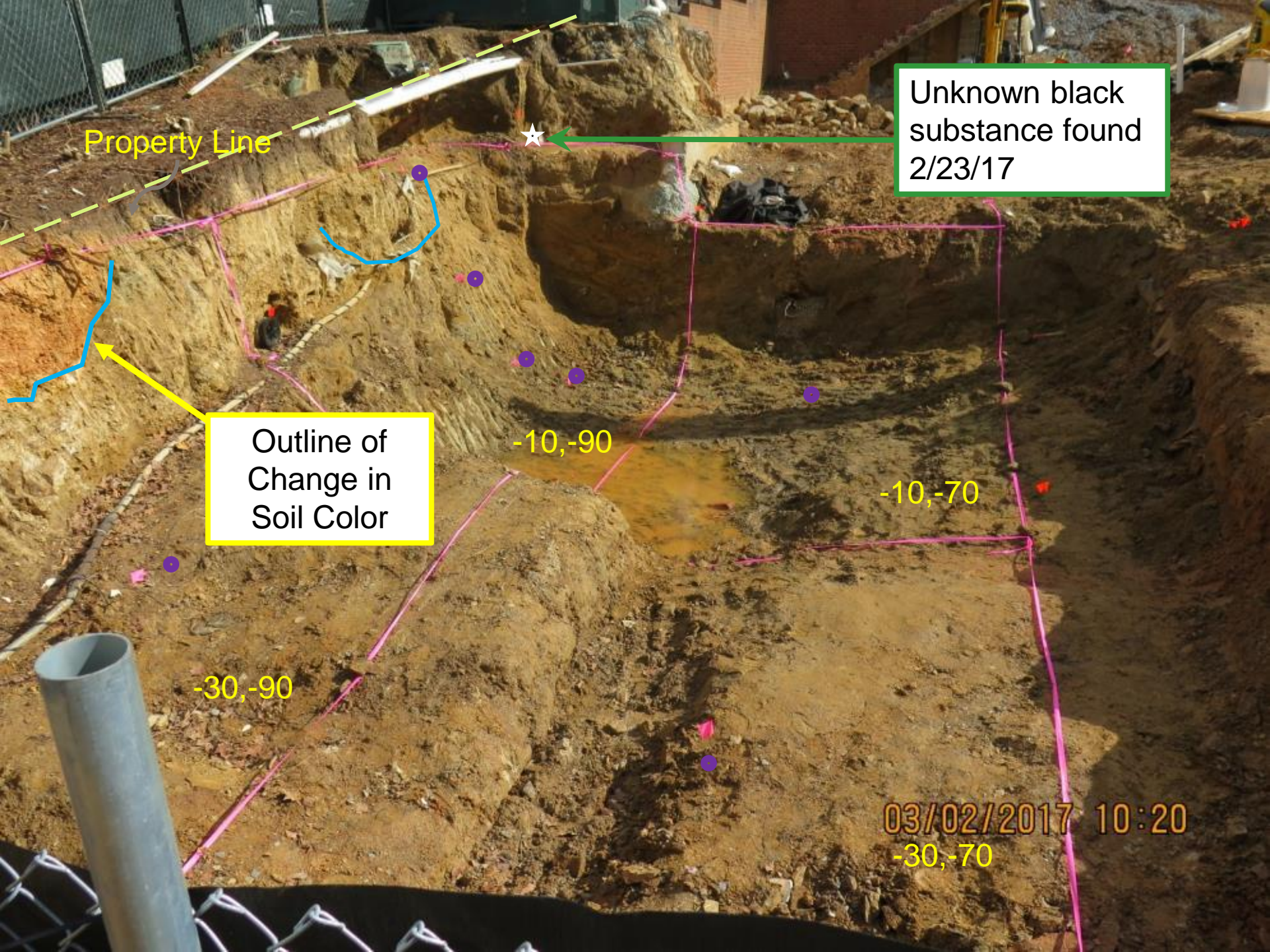
-30,-70

-10,-90

-10,-70

● = Confirmation Sample

Confirmation Sample: RA-4825GR-
AREA B-N-(-30,-90)-03-0.6 - 1,4-
Dithiane= 29 ug/Kg Collected 3/2/17



Property Line

Unknown black
substance found
2/23/17

Outline of
Change in
Soil Color

-10,-90

-10,-70

-30,-90

03/02/2017 10:20
-30,-70

4825 GLENBROOK ROAD

The unknown solid sample found on February 23rd was analyzed for chemical agent and agent breakdown products. The sample was free of Lewisite to the laboratory Limit of Detection. Mustard, 1,4-Dithiane, and 1,4-Thioxane were detected in the sample at concentrations above the Detection Limit.

The soil grab sample associated with the substance did not have any detectable quantities of agent or agent breakdown products.

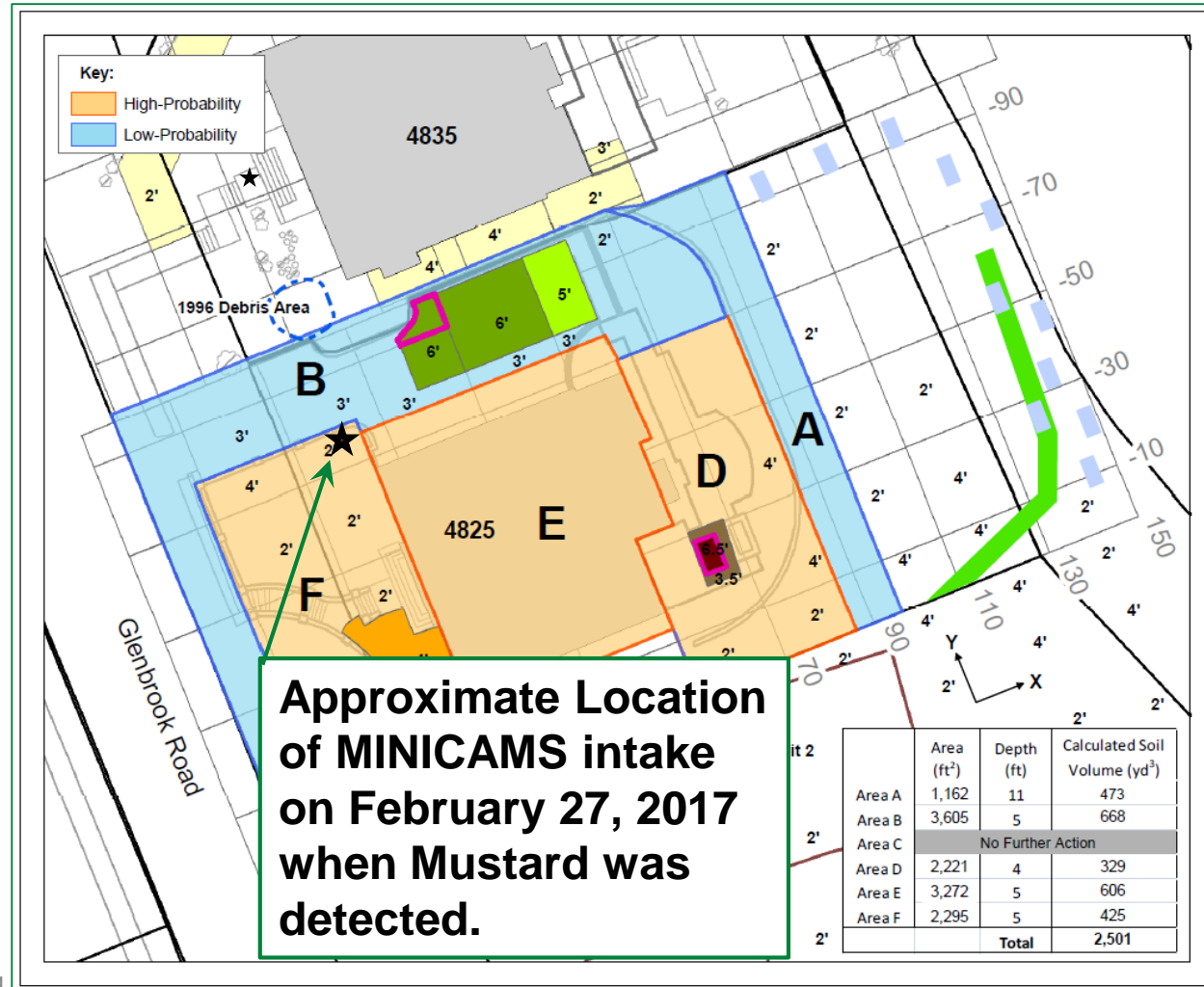


ONGOING AIR MONITORING

On February 27th, Mustard was detected. At the time of the MINICAMS detection there was no intrusive work occurring.

The DAAMS Tubes for that day came back with no detects of agent.

No agent was detected in the disposal characterization samples.



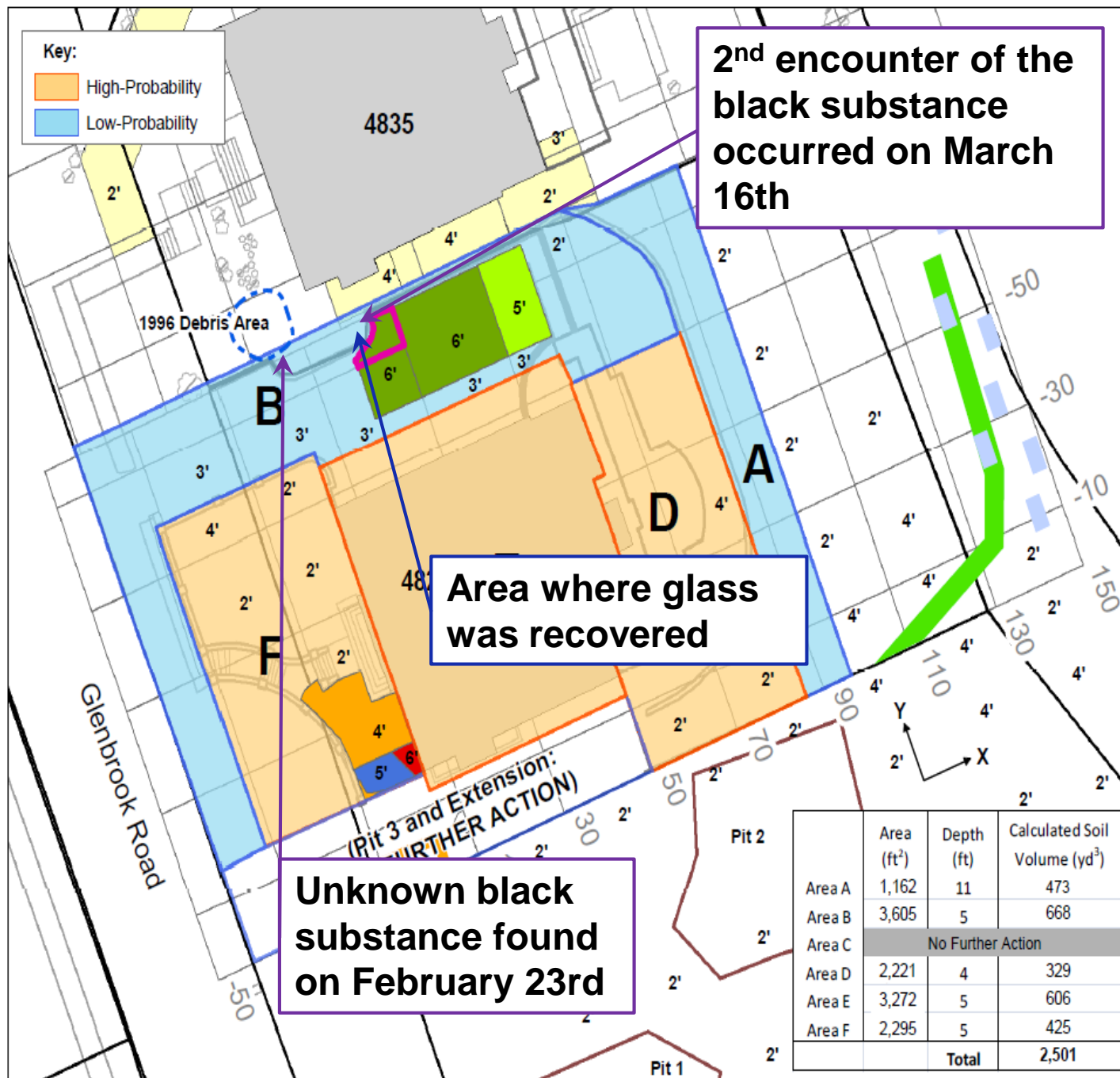


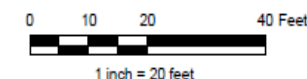
Figure 3-1
Proposed Remedial Action
4825 Glenbrook Road

Spring Valley
Washington, D.C.

Legend

- Buildings
- Property Boundaries
- 20' Grid
- Pits 1 and 2
- Test Pit 23 (Burial Pit 3)
- Arsenic Exceedance to be Further Excavated
- Trench for Rerouted Sewer Line
- Additional Low Probability Investigation**
 - Test Pits
- Arsenic Soil**
 - Arsenic Grid Previously Removed [5'] (2009)
 - Arsenic Grid Previously Removed [8'] (2009)
- Soil Excavation**
 - Excavation Depth [3.5'] (2009)
 - Excavation Depth [4'] (2010)
 - Excavation Depth [5'] (2010)
 - Excavation Depth [8'] (2010)
 - Excavation Depth [8.5'] (2009)
- 1996 APEX Tree Removal (Debris Area) Perimeter
- Previously Excavated Arsenic: Adjacent Properties

Note:
Excavation depths shown from previous
arsenic removal.



Scale: 1:245
Created By: Parsons
File: 20120301 4825 Glenbrook Road HI-Lo Areas.mxd
Date: 3/01/2012
Figure Number: 3-1
Page Number: -

PARSONS

	Area (ft ²)	Depth (ft)	Calculated Soil Volume (yd ³)
Area A	1,162	11	473
Area B	3,605	5	668
Area C	No Further Action		
Area D	2,221	4	329
Area E	3,272	5	606
Area F	2,295	5	425
	Total		2,501

**Beginning of New
Section of Wall**

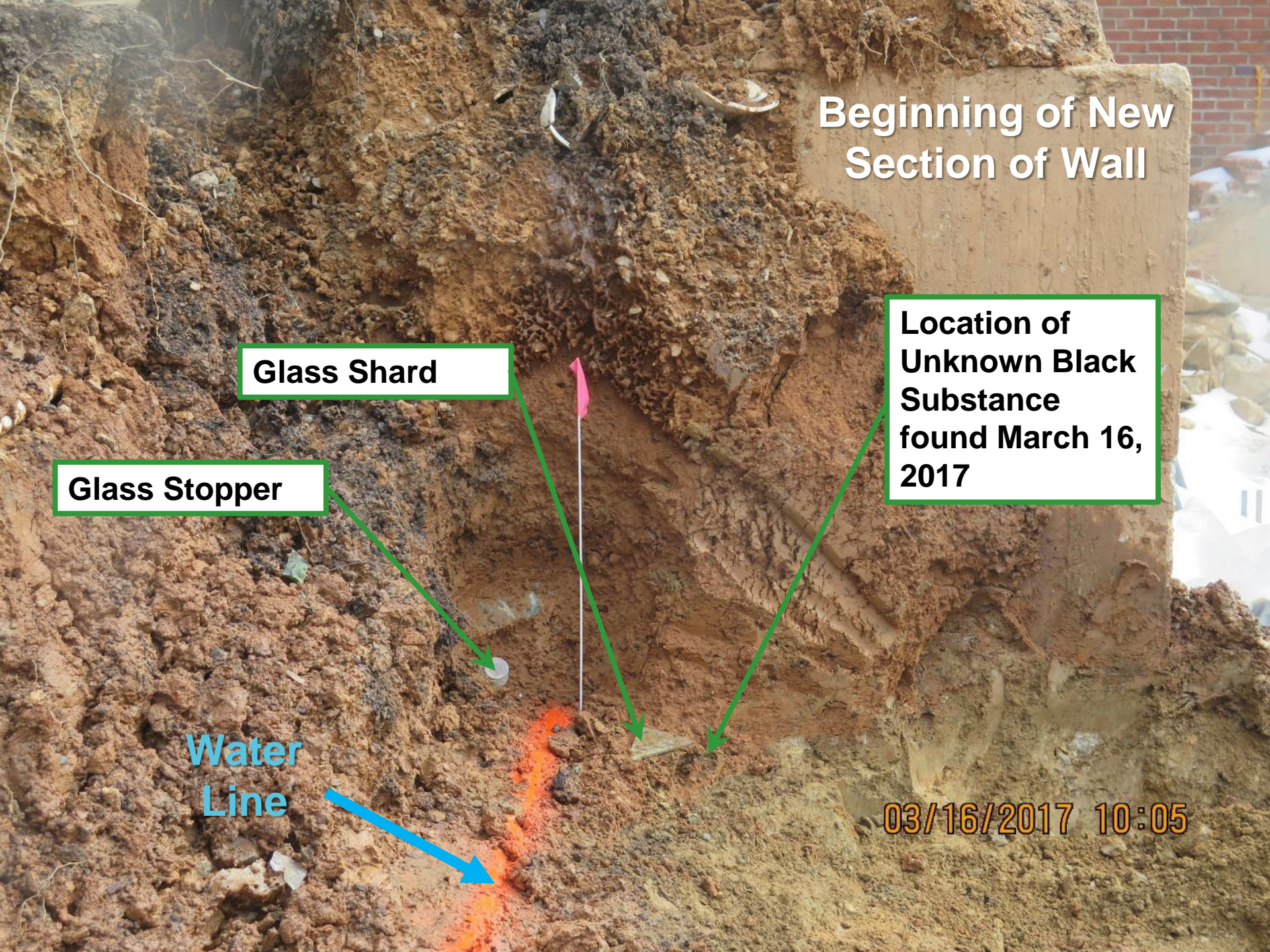
Glass Shard

Glass Stopper

**Location of
Unknown Black
Substance
found March 16,
2017**

**Water
Line**

03/16/2017 10:05



4825 GLENBROOK ROAD

From March 21st to April 3rd, the team swapped the Interim Holding Facilities & temporarily reinstalled the 4835 Glenbrook Road AC units near the former driveway entrance.



4825 GLENBROOK ROAD

The unknown solid found on March 16th was sampled and analyzed, and Mustard, 1,4-Dithiane, and 1,4-Thioxane were detected at concentrations above the Limit of Quantitation. As there were no breathing zone detections of agent it was decided to continue work.

The crew continued with Modified Level D (construction site standard safety attire), and added enhanced personal protective equipment for the dig team, which included a paper Tyvek suit, booties and an extra pair of gloves.



US Army Corps
of Engineers.

4825 GLENBROOK ROAD

On April 5th, a third occurrence of the black substance was encountered near the location of the second occurrence.

The excavation was covered and the MINICAMS placed under the plastic sheet. There was an alarm for Mustard but it was not confirmed by the DAAMS.

On April 7th, the Edgewood Chemical Biological Center (ECBC) crew collected a sample of the substance.

Mustard, 1,4-Dithiane, and 1,4-Thioxane were again detected.



PATH FORWARD AFTER FINDS

Our crews will continue digging under Low Probability Protocols with a heightened awareness for encountering unknown substances, doubly ensuring proper decontamination procedures and proper hygiene on site.

The excavated walls of the area where the black substance was recovered were lined with geo-cloth and temporarily covered.

After additional excavation for the failed confirmation sample, another round of wall confirmation samples will be collected at a later date.



US Army Corps
of Engineers.

4825 GLENBROOK ROAD

On April 10th, the team began intrusive operations in Area B.

On April 18th, the MINICAMS detected a low level reading for Lewisite.

The excavation was covered and DAAMS tubes were analyzed:

- DAAMS tubes were negative for Lewisite.
- An interferent was detected and reported by ECBC.

No further detections were encountered and the excavation was mitigated.





**Approx. 4'
section of wall
remaining**

Footer

04/18/2017 10:25



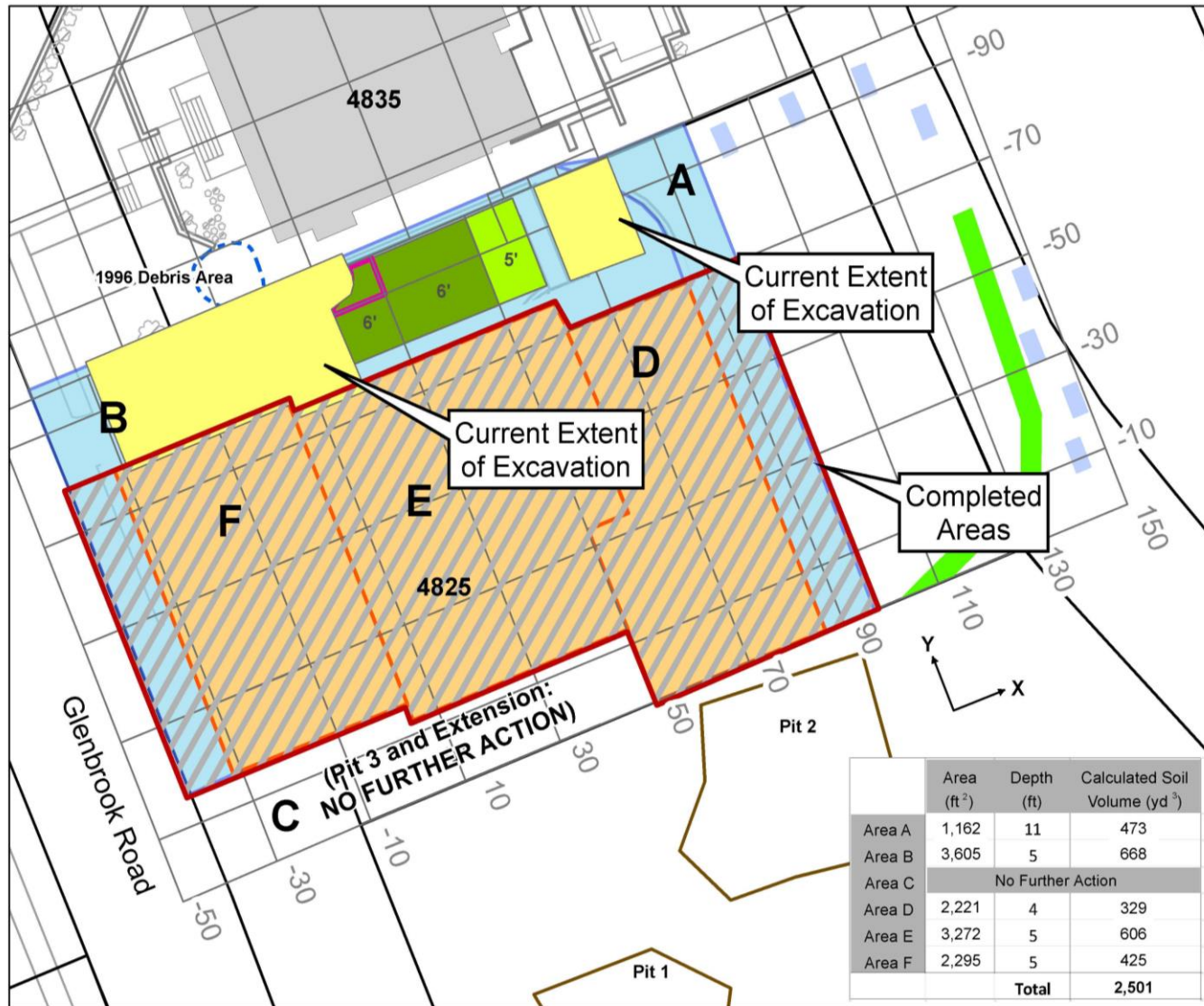
**MINICAMS
Sample Line**

**Old French
Drain**

Saprolite

**DAAMS
Tubes**

04/18/2017 10:24



4835 GLENBROOK ROAD

In 2008, USACE recovered items in two test pits at 4835 Glenbrook near the current excavation area, and both cleared headspace.

- Test Pit 67 – Small glass pipette at 6 ft. deep (bgs)
- Test Pit 92 – Broken glass stopper at 1.5 ft. deep (bgs)

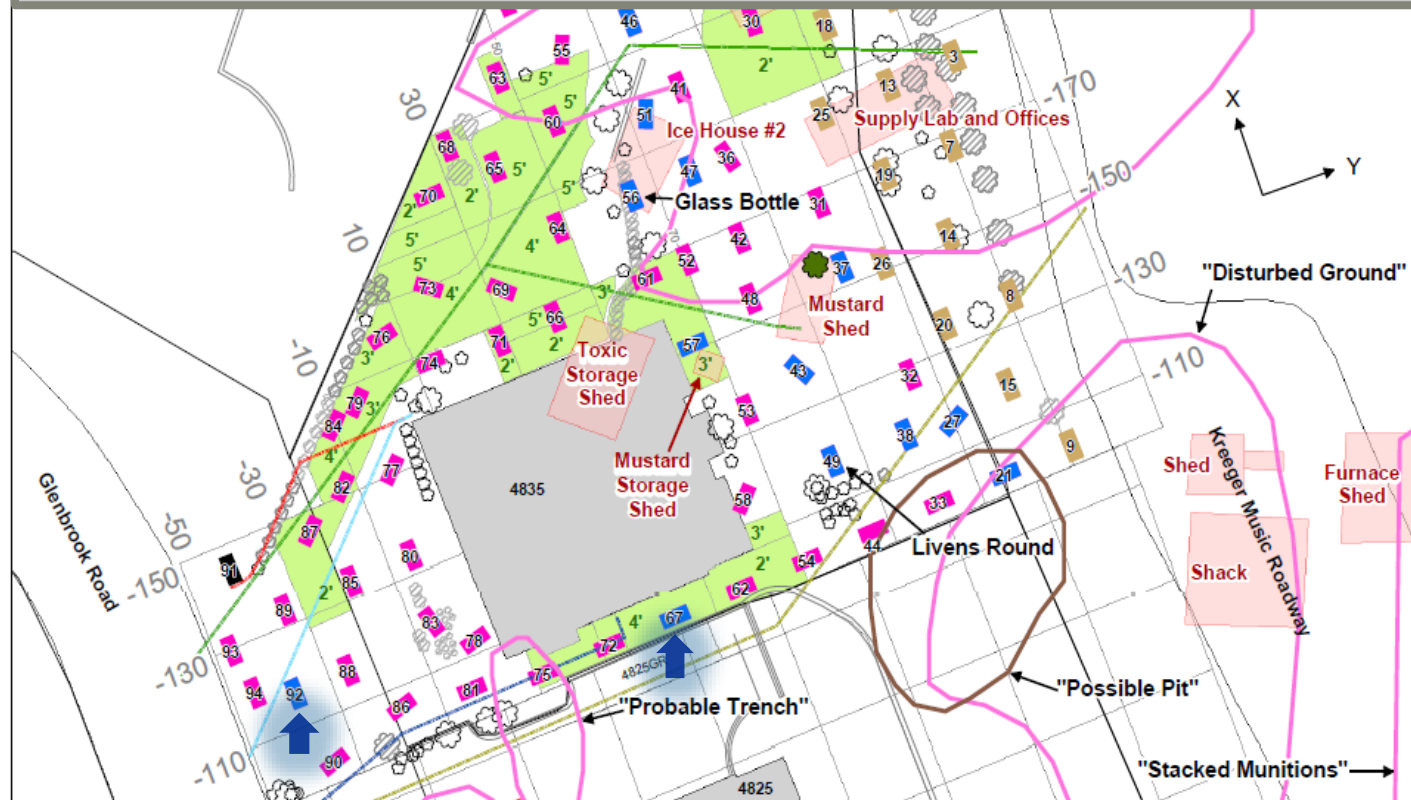


Figure 2-2
Locations of the Test Pits and
Areas of Arsenic-Impacted Soil
4835 Glenbrook Road

Spring Valley
Washington, D.C.

Legend

Test Pits Containing Possible
AUES Related Items

Test Pit 91 Not Excavated
Due to Proximity to Utility

Excavated Test Pits

Test Pits Not Excavated
Due to >12' Fill Material

Arsenic Contaminated Soil
Excavated in 2008

Property Boundaries

Buildings

20' Grid

Gas Line

Electric Line

Water Line

Sanitary Sewer Line

Storm Sewer Line

Historic Buildings/Structures

Ground Scars

1927

1918

Trees & Vegetation

Surveyed Location

Estimated Location

Vegetation Trimmed to Allow Access

0 12.5 25 50 Feet

1 inch = 25 feet

Scale: 1:300

Created By: Parsons

File: 20101216 4835 Glenbrook-Orchardway Arsenic Extent.mxd

Date: 12/16/2010

Figure Number: 2-2

Page Number: 2-5

PARSONS



FUTURE ACTIVITIES

- Revise work plan to include Level C and Level B contingency operations for Low Probability digs.
- Revise work plan to include the excavation for Chemical Agent Contaminated Media (CACM).
- Perform waste packaging operations at the Federal Property.
- Continue informing the community and RAB with weekly updates and additional notices.



US Army Corps
of Engineers.

WHAT IS CHEMICAL AGENT CONTAMINATED MEDIA (CACM)?

CACM is **any mixture** of detectable concentrations of chemical agent(s) **with soil, water, debris, or other solid or liquid media.**

Note: Chemical agent contaminated media (e.g., Soil, water), as well as any debris also containing measurable amounts of chemical, is not Chemical Warfare Material (CWM) and will be managed in accordance with applicable federal, state and local laws.



US Army Corps
of Engineers.

MODEL FOR THE POTENTIAL HAZARD DISTANCE FOR MUSTARD RELATED CACM

- **Model inputs based on very conservative assumptions**
 - 60-minute continuous evaporative release of 1.02 grams of Mustard with an Atmospheric Stability of D, 1 m/s wind speed, and maximum temperature of 95 degrees F.
 - The quantity of agent, 1.02 grams of Mustard, is based on the combined concentrations of the largest detected concentration of Mustard and Agent Breakdown Products (ABPs) detected in the black substance to date.
 - The quantity of agent is also based on the combined concentration Mustard and ABPs contained in a soil filled 30-gallon poly drum (405 lbs.).
- **The modeled release is too small to produce an exposure amount that reaches the Acute Exposure Guideline Levels (AEGL-2) at any distance from the source.**
- **The Exclusion Zone (EZ) boundary will remain the same.** The EZ for low probability areas is the work area perimeter, as defined by the SSHO based on worker and public safety.



US Army Corps
of Engineers.

EXAMPLES OF LEVEL B AND LEVEL C PERSONAL PROTECTIVE EQUIPMENT

Level B Personal Protective Equipment (PPE)



Level C Personal Protective Equipment



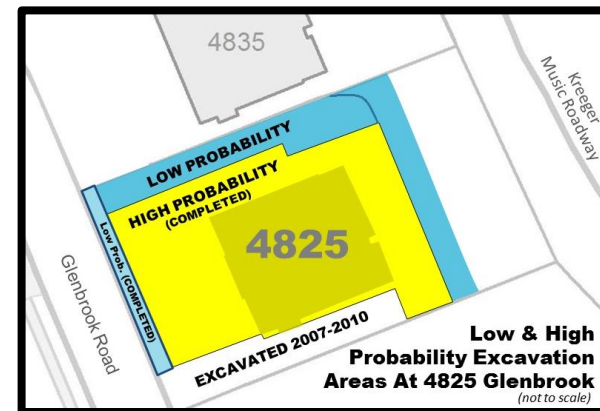
US Army Corps
of Engineers.

TENTATIVE SCHEDULE

- ✓ December 2012 through May 2013
Site Preparation/ Initial Low Probability Work
- ✓ May 2013 through September 2013
ECS Set Up, High Probability training, & Pre-Operational Exercises
- ✓ September 2013 through June 2016
High Probability Excavation (Shelter-in-Place program ended May 27)
- ✓ Summer 2016
Tent Demobilization & Site Preparation for Final Low Probability Excavation

➡ **September 2016 through Summer 2017**
Final Low Probability Excavation

Late-Summer 2017
Site Restoration



GROUNDWATER STUDY

USACE Updates

Bill Eaton (AECOM)

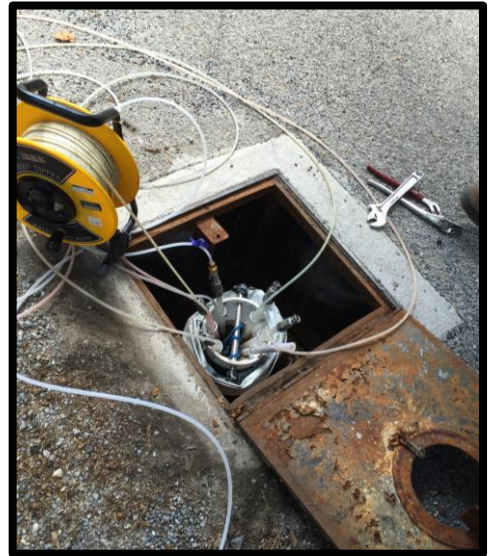


US Army Corps
of Engineers

GROUNDWATER FEASIBILITY STUDY

The Army Corps completed their review of the draft Groundwater Feasibility Study (FS). The regulatory Partners are currently reviewing the Draft Final Groundwater FS.

The purpose of the FS is to develop, screen, and provide a detailed analysis of remedial alternatives to mitigate potential risks identified in the Final Groundwater Remedial Investigation (RI).



Agenda:

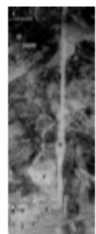
- Project status within the CERCLA process.
- Review the Groundwater RI conclusions / recommendations.
- Feasibility Study process.
- Spring Valley FUDS Feasibility Study Findings.



US Army Corps
of Engineers.

The CERCLA Process

(The Comprehensive Environmental Response, Compensation, and Liability Act)



Preliminary Assessment

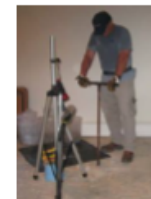


Site Inspection



Remedial Investigation

General Purpose: Collect data to characterize site conditions; Determine the nature of the waste; Assess risk to human health and the environment; & Evaluate treatment options.



Feasibility Study

General Purpose: To develop, screen, and evaluate alternatives for clean-up.

Information gathered as part of the RI influences the development of the FS which, in turn, may require further data collection and field investigations.

Decision Document



General Purpose: Select the alternative as well as provide an overview of the project. This would include site history, previous and current investigations, and characterization of contamination.



Proposed Plan

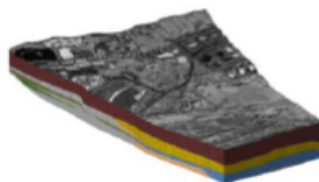
General Purpose: Presents the evaluation of clean-up alternatives and provides a recommendation for the preferred alternative.

This document is made available for public review and comment.



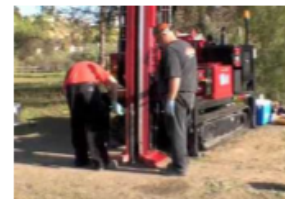
Removal Action

General Purpose: If prompt action is deemed appropriate prior to the completion of the RI/FS process, USACE will begin removal of the contaminants of concern.



Remedial Design/ Remedial Action

General Purpose: Implementation of the action determined in the Decision Document.



Long Term Monitoring

General Purpose: To conduct any long term monitoring necessary and conduct five year reviews of the Formerly Used Defense Site.

GROUNDWATER REMEDIAL INVESTIGATION CONCLUSIONS / RECOMMENDATION

Conclusions:

- No unacceptable risk for current land use.
- Unacceptable risk if groundwater is used as potable water in the future in Exposure Unit 2 (EU2).

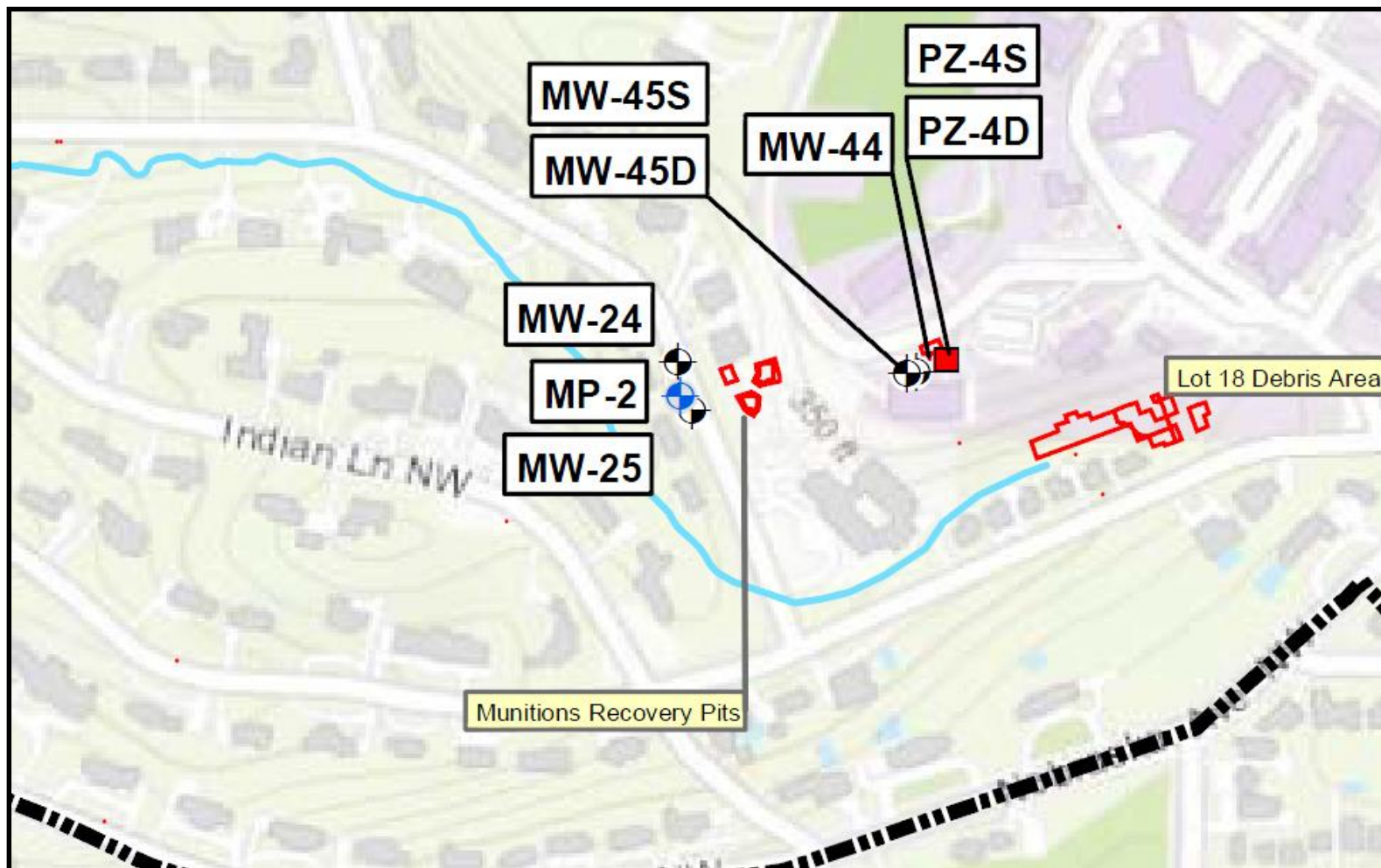
Recommendation:

- Conduct an Feasibility Study to determine the best alternative to remediate the groundwater risk to future residential users at EU2 (vicinity of American University and Glenbrook Road)



US Army Corps
of Engineers.

ARSENIC AND PERCHLORATE IN EU2



ARSENIC AND PERCHLORATE IN EU2: *MP2

MP2-1		
Date	Arsenic	Perchlorate
06/30/14	6.9	1.39
06/30/14 FD	6.65	NT
12/11/13	6.6	3.08
04/30/13	7.6	5.82
07/20/12	8.4	6.3
05/03/12	7.4	4.5
03/30/12	7.5	5.8
3/30/2012 FD	7.6	7

MP2-2		
Date	Arsenic	Perchlorate
06/30/14	12.4	3.84
12/11/13	11	0.403
12/11/13 FD	7.1	NT
05/13/13	12.6	9.74
07/20/12	16	12
05/03/12	15	12
03/30/12	15	12

MP2-3		
Date	Arsenic	Perchlorate
07/01/14	13.7	0.783
12/11/13	15.2	6.89
05/13/13	11	2.57
07/20/12	18	18
05/03/12	18	17
03/30/12	15	17

MP2-4		
Date	Arsenic	Perchlorate
07/01/14	7.6	ND
12/11/13	9.9	8.09
05/13/13	9.2	1.57 J
07/20/12	12	25
05/03/12	15	25
03/30/12	12	21

MP2-5		
Date	Arsenic	Perchlorate
07/01/14	9.8	ND
12/11/13	10.3	5.07
05/13/13	9.1	2.67
07/20/12	14	26
7/20/12 FD	15	24
05/03/12	15	26
03/30/12	13	24

MP2-6		
Date	Arsenic	Perchlorate
07/01/14	10.8	ND
12/11/13	10.2	2.43
05/13/13	11	9.05
07/20/12	16	25
05/03/12	17	25
5/3/2012 FD	17	26
03/30/12	15	27

MP2-7		
Date	Arsenic	Perchlorate
07/01/14	11.8	0.245 J
12/11/13	12	8.18
05/03/13	12	16.6
07/20/12	16	24
05/03/12	17	25
03/30/12	14	20

MP2-8		
Date	Arsenic	Perchlorate
07/01/14	11.9	0.917
12/11/13	10.3	3.67
05/13/13	12.6	17.9
07/20/12	15	25
05/03/12	16	24
03/30/12	14	24

*MP2 is a 'multi-port' well located on Glenbrook Road NW



US Army Corps
of Engineers.

ARSENIC AND PERCHLORATE IN EU2:

*MWS 24 & 25

44

MW-24		
Date	Arsenic	Perchlorate
06/30/14	4.2	1.69
12/12/13	1.8	ND
12/12/13 FD	1.7	ND
04/30/13	16.8	ND
02/06/12	7.9	1.6 J
11/07/11	3.9	2.4
08/02/11	4.6	3
05/17/11	3.7	2.3
11/02/09	5 J	3.1
06/13/07	9.3 J	18.5
07/11/06	10.5	62.6
12/22/05	10.4	70

MW-25		
Date	Arsenic	Perchlorate
06/30/14	4.2	4.05
12/11/13	6.7	4.04
04/30/13	4.5	3.12
02/06/12	2.2 J	ND
11/07/11	3	2.5
08/02/11	3	2.8
05/10/11	3.1	2.9
11/03/09	8.4 J	25
11/03/09 FD	8.2 J	23
06/13/07	8.1 J	74.1
07/11/06	9.5 J	124
12/22/05	5 J	60

*MWs 24 & 25 are 'monitoring wells' located on Glenbrook Road NW



US Army Corps
of Engineers.

ARSENIC AND PERCHLORATE IN EU2:

*PZ-4S AND PS-4D

45

PZ-4S		
Date	Arsenic	Perchlorate
09/16/14	5.7	4.16
09/16/14 FD	5.5	4.44
07/02/14	6.2	8.58
03/20/14	2.8	10.9
12/13/13	3.6	6.75
07/24/13	1.4	ND
07/24/13 FD	1.5	ND
05/03/13	0.22 J	5.57
02/08/12	2.4 J	28
11/09/11	ND	25
08/04/11	ND	19
7/28/2011 (a)	NT	18
05/16/11	2.6 J	30
11/10/09	NT	50
06/13/07	ND	146
07/07/06	ND	71.8

PZ-4D		
Date	Arsenic	Perchlorate
09/16/14	6.1	13.8
07/02/14	7.8	16.7
03/20/14	3.9	44.5
12/13/13	1.8	39.8 D
07/24/13	1.5	5.59
05/03/13	NT	NT
04/09/12	NT	36
02/07/12	2.7 J	39
11/08/11	ND	45
08/05/11	ND	39
7/28/2011 (a)	NT	9.8
05/16/11	2 J	39
11/11/09	NT	41
06/13/07	ND	41
07/07/06	0.6 J	34.7

*PZs 4S & 4D are 'piezometers' located near Kreeger Hall on AU campus



ARSENIC AND PERCHLORATE IN EU2:

*MWS 44, 45S AND 45D

46

MW-44		
Date	Arsenic	Perchlorate
09/16/14	0.55 J	40.1
07/01/14	1.2	49.8
03/20/14	0.69 J	42.3
03/20/14 FD	0.78 J	40.5
12/12/13	0.75 J	40.2
12/12/13 FD	0.85 J	39.8
04/29/13	0.15 J	40.5
09/06/12	ND	35
9/6/12 FD	ND	36
03/29/12	ND	34
03/29/12 FD	ND	33

MW-45S		
Date	Arsenic	Perchlorate
09/16/14	1.2	2.55
07/01/14	1.8	5.74
03/20/14	1.2	5.86
12/13/13	1.5	1.28
05/03/13	0.53 J	31.1
05/03/13 FD	0.32 J	30.9
09/06/12	ND	6

MW-45D		
Date	Arsenic	Perchlorate
09/16/14	3	0.22 J
07/01/14	1.5	ND
03/20/14	1.3	ND
12/12/13	1.3	5.3
12/12/13 FD	1.4	5.26
05/03/13	ND	54.3
05/03/13 FD	0.16 J	52.9
09/06/12	ND	3.6

*MWs 44, 45S & 45D are 'monitoring wells' located near Kreeger Hall on AU campus

FEASIBILITY STUDY PROCESS

- 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).
- Identify and screen technologies.
- Assemble technologies into remedial alternatives.
- Alternatives evaluation & comparative analysis.



US Army Corps
of Engineers.

GROUNDWATER REMEDIATION ARARS / RAOS

48

- Prevent human ingestion of groundwater exceeding:
 - Maximum Contaminant Levels (MCLs) of 0.010 mg/L* for *arsenic*.
 - Interim Drinking Water Health Advisory level (IDWHA) of 0.015 mg/L for *perchlorate*.

* mg/L = parts per billion



GRAS AND TECHNOLOGY SCREENING

- General Repose Actions (GRAs)
 - No action (a required baseline that must be evaluated)
 - Land Use Controls (LUCs) to prevent potential exposure
 - Long-term management (LTM) of groundwater to determine when LUCs can be removed.
 - Groundwater treatment to expedite achieving Remedial Action Objectives.
- Technology Screening
 - Effectiveness
 - Implementability
 - Cost



US Army Corps
of Engineers.

GROUNDWATER REMEDIATION TECHNOLOGIES

50

- Land Use Controls (LUCs)
 - Physical: fences & signs
 - Legal: well drilling prohibitions
 - Educational: notices
 - Proprietary: private landowner agreements
- Long Term Monitoring (LTM)
 - Environmental monitoring
 - Remedial action maintenance



US Army Corps
of Engineers

SPRING VALLEY FUDS GROUNDWATER REMEDIATION TECHNOLOGIES

51

- Groundwater Treatment
 - Bioremediation
 - Chemical oxidation
 - Ion exchange
 - Adsorption
 - Precipitation/Co-precipitation
 - Membrane Filtration



SPRING VALLEY FUDS GROUNDWATER REMEDIATION TECHNOLOGIES

52

- In-situ Groundwater Treatment
 - Permeable reactive barrier (trenching)
 - Permeable reactive barrier (direct push injections)
 - Permeable reactive barrier (injection & recirculation wells)



US Army Corps
of Engineers

SPRING VALLEY FUDS GROUNDWATER REMEDIATION TECHNOLOGIES

53

- In-situ Groundwater Treatment
 - Chemical oxidants (Arsenic)
 - Traditional zero-valent iron (Arsenic)
 - Nano zero-valent iron (Arsenic)
 - Microbial substrates and nutrients (Perchlorate)



TECHNOLOGIES SCREENING SUMMARY

Technology/Process	Ranking				Screening Result	
	Effectiveness		Implementability		As	ClO ₄
	As	ClO ₄	As	ClO ₄		
Land Use Controls (LUCs):						
Physical Barriers: Fences and Signs	medium	medium	low	low	Not Retained	Not Retained
Legal Controls: Well Drilling Prohibitions	high	high	low	low	Not Retained	Not Retained
Administrative Controls:						
Private Landowner Agreements	medium	medium	low	low	Not Retained	Not Retained
Educational Controls	medium	medium	high	high	Retained	Retained
Long Term Management (LTM)	high	high	high	high	Retained	Retained
Groundwater Treatment:						
Bioremediation	low	high	medium	medium	Not Retained	Retained
Chemical Oxidation	high	low	high	low	Retained	Not Retained
Ion Exchange	high	high	high	high	Retained	Retained
Adsorption	medium	low	medium	low	Retained	Not Retained
Precipitation/Co-precipitation (Fixation) (a)	high	low	high	low	Retained	Not Retained
Membrane Filtration	high	high	high	high	Retained	Retained
In-situ Treatment: Permeable Reactive Barrier Construction by Trenching	low	low	low	low	Not Retained	Not Retained
In-situ Treatment: Permeable Reactive Barrier Construction by Injections (Direct Push)	low	low	low	low	Not Retained	Not Retained
In-situ Treatment: Medium Injection (Injection and Recirculation Wells)	high	high	high	high	Retained	Retained
In-situ Permeable Reactive Barrier Medium: Chemical Oxidants for Arsenic	low	na		na	Not Retained	na
In-situ Permeable Reactive Barrier Medium: Traditional Zero Valent Iron for Arsenic	low	na	low	na	Not Retained	na
In-situ Permeable Reactive Barrier Medium: Nano-Zero Valent Iron for Arsenic	medium	na	medium	na	Retained	na
In-situ Permeable Reactive Barrier Medium: Microbial Substrates and Nutrients for Perchlorate	na	high	na	high	na	Retained
Ex-situ Treatment Offsite	high	high	low	low	Not Retained	Not Retained
Ex-situ Treatment Onsite	high	high	medium	medium	Retained	Retained
Ex-situ Groundwater Extraction	high	high	medium	medium	Retained	Retained
Ex-situ Treated Groundwater Management	high	high	medium	medium	Retained	Retained

SPRING VALLEY FUDS GROUNDWATER REMEDIATION ALTERNATIVES

55

- Alternative 1: No Action.
- Alternative 2: Educational Land Use Controls (LUCs) and Long-term management (LTM).
- Alternative 3: In-situ Permeable Reactive Barrier (PRB) to Effect Arsenic Sequestration Using nano Zero Valent Iron (nZVI) and Perchlorate Destruction by Bioremediation.
- Alternative 4: Ex-situ Pump and Treat: Arsenic by Oxidation and Ion Exchange and Perchlorate by Ion Exchange.
- Alternative 5: Ex-situ Pump and Treat: Arsenic by Oxidation and Reverse Osmosis and Perchlorate by Reverse Osmosis.



US Army Corps
of Engineers.

ALTERNATIVES / TECHNOLOGIES MATRIX

56

Retained Technology/Process	Alt 1 No Action	Alt 2 LTM & LUCS Only	Alt 3 In-Situ PRB As: Fixation (nZVI) ClO4: Bioremediation	Alt 4 Ex Situ Pump & Treat As: Oxidation & Ion Exchange ClO4: Ion Exchange	Alt 5 Ex Situ Pump & Treat As: Oxidation & RO Membrane ClO4: RO Membrane
LUCs in the form of Educational Controls	--	X	X	X	X
Long Term Management (LTM) (a)	--	X	X	X	X
Groundwater Treatment:					
Bioremediation (perchlorate only)	--	--	X	--	--
Chemical Oxidation (arsenic only)	--	--	--	X	X
Ion Exchange	--	--	--	X	--
Adsorption (arsenic only)	--	--	X	--	--
Precipitation/Co-precipitation (Fixation) (arsenic only) (b)	--	--	X	--	--
Membrane Filtration	--	--	--	--	X
In-situ Treatment: Medium Injection (Injection and Recirculation Wells)	--	--	X	--	--
In-situ Permeable Reactive Barrier Medium: Nano-Zero Valent Iron for (arsenic only)	--	--	X	--	--
In-situ Permeable Reactive Barrier Medium: Microbial Substrates and Nutrients (Perchlorate only)	--	--	X	--	--
Ex-situ Treatment Onsite	--	--	--	X	X
Ex-situ Groundwater Extraction	--	--	--	X	X
Ex-situ Treated Groundwater Management	--	--	--	X	X

(a) Includes groundwater monitoring, site inspections and 5-year reviews.

(b) Arsenic "fixation" is a consequence of these combined processes: precipitation and adsorption.



US Army Corps
of Engineers.

GROUNDWATER REMEDIATION ALTERNATIVES

Screening Criteria		Alt 2 LTM & LUCS Only	Alt 3 In-Situ PRB As: Fixation (nZVI) ClO4: Bioremediation	Alt 4 Ex Situ Pump & Treat As: Oxidation & Ion Exchange ClO4: Ion Exchange	Alt 5 Ex Situ Pump & Treat As: Oxidation & RO Membrane ClO4: RO Membrane
Threshold	Overall Protection of Human Health and the Environment	●	●	●	●
	Compliance with ARARs	●	●	●	●
Balancing	Long-Term Effectiveness	●	■	●	●
	Reduction of Toxicity, Mobility and Volume Through Treatment	Arsenic: ○ Perchlorate: ○	Arsenic: ■ Perchlorate: ●	Arsenic: ● Perchlorate: ●	Arsenic: ● Perchlorate: ●
	Short-Term Effectiveness	●	■	■	■
	Community/Worker Protection	●	○	○	○
	Adverse Environmental Impacts	●	○	■	■
	Time Required to protect public health (a)	●	●	●	●
	Acceleration of PRGs Attainment	○	○	■	■
	Implementability	●	○	■	■
	Technical Feasibility (LUCs)	●	●	●	●
	Technical Feasibility (Construction)	●	■	■	■
	Administrative Feasibility	●	○	○	○
	Availability of Materials and Services	●	■	●	●
	Cost (x1,000)	\$1,384	\$8,028	\$13,249	\$13,654
Modifying (b)	State Acceptance	pending	pending	pending	pending
	Community Acceptance	pending	pending	pending	pending

● Favorable ('YES' for threshold criteria)

■ Moderately Favorable

○ Not Favorable ('NO' for threshold criteria)

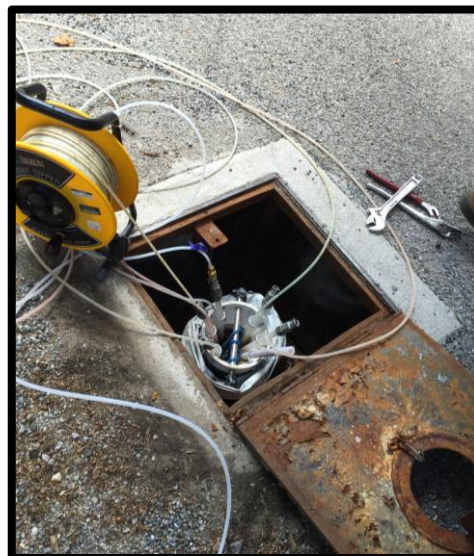
(a) The remedial action objective of protecting public health is currently achieved by all of the alternatives because SVFUDS groundwater is not currently used as drinking water and all alternatives include educational LUCs to control exposure to groundwater in the future.

(b) The Modifying criteria of state and community acceptance are 'To Be Determined' following review and input from these parties.

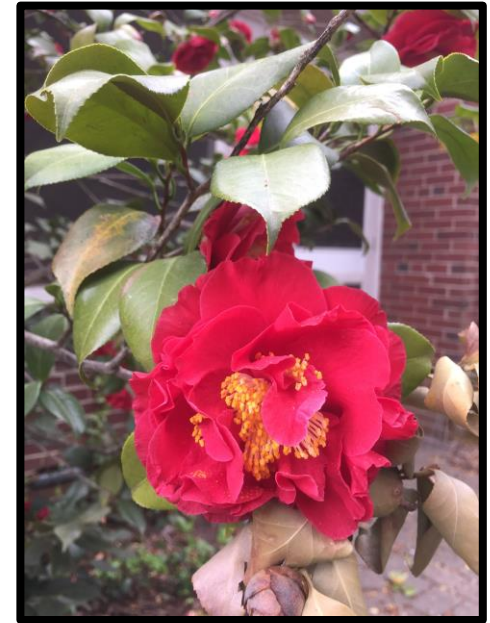
GROUNDWATER FEASIBILITY STUDY SCHEDULE

58

- Address Partner comments and Finalize Feasibility Study in Summer 2017.
- Proposed Plan, public comment period, public meeting - Fall 2017.
- Final Decision Document - Summer 2018.



SPRING VALLEY FUDS RESTORATION ADVISORY BOARD



59

Community Items



**US Army Corps
of Engineers.**

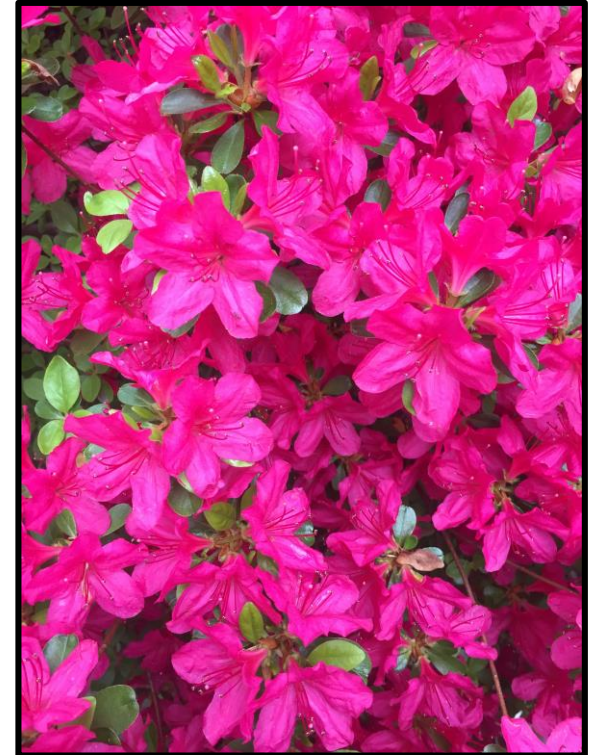
SPRING VALLEY FUDS RESTORATION ADVISORY BOARD

Reminders:

- The next RAB meeting will be
Tuesday, **July 11th**

Upcoming Agenda Items:

Suggestions?



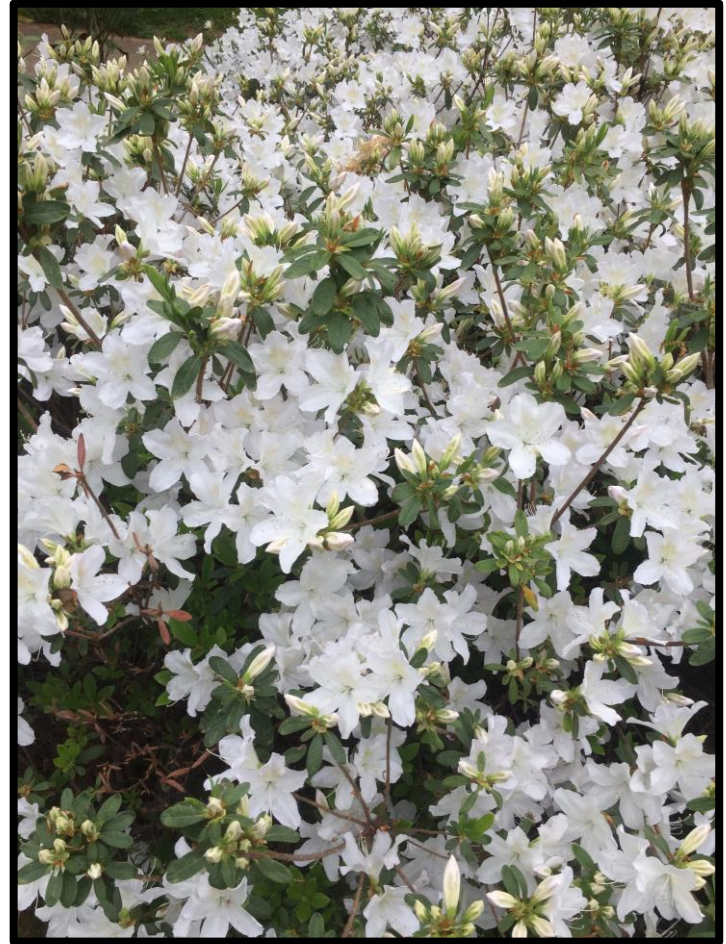
US Army Corps
of Engineers.

SPRING VALLEY FUDS RESTORATION ADVISORY BOARD

61

Public Comments

Wrap-Up



**US Army Corps
of Engineers.**

**U.S. Army Corps of Engineers
Spring Valley Restoration Advisory Board
St. David's Episcopal Church
Minutes of the May 9th 2017 Meeting**

RESTORATION ADVISORY BOARD MEMBERS PRESENT AT THIS MEETING	
Dan Noble	Military Co-Chair/USACE, Spring Valley MMRP Manager
Greg Beumel	Community Co-Chair
Linda Argo	At Large Representative - American University
Alma Gates	At Large Representative - Horace Mann Elementary School
Steve Hirsh	Agency Representative - US Environmental Protection Agency, Region III
Lawrence Miller	Community Member
John Wheeler	Community Member
James Sweeney	Agency Representative - Department of Energy & Environment
Mary Bresnahan	Community Member
Tom Smith	Community Member
Malcolm Pritzker	Community Member
Kathleen Connell	Community Member
William Krebs	Community Member
Dr. Peter deFur (represented by Laura Williams)	Environmental Stewardship Concepts/RAB TAPP Consultant
RESTORATION ADVISORY BOARD MEMBERS NOT PRESENT AT THIS MEETING	
Paul Dueffert	Community Member
Ralph Cantral	Community Member
Mary Douglas	Community Member
Lee Monsein	Community Member
George Vassiliou	Community Member
ATTENDING PROJECT PERSONNEL	
Brenda Barber	USACE, Spring Valley Project Manager
Alex Zahl	USACE, Spring Valley Technical Manager
Todd Beckwith	USACE, Spring Valley Project Manager
Rebecca Yahiel	Spring Valley Community Outreach Program

Carrie Johnston	Spring Valley Community Outreach Program
Holly Hostetler	ERT, Inc.
Chris Gardner	USACE, Corporate Communications Office
Carlos Lazo	USACE, Government Affairs Liaison
Bill Eaton	AECOM

HANDOUTS FROM THE MEETING

- I. Final Agenda for the May 9, 2017 RAB Meeting
- II. Army Corps of Engineers Presentation
- III. February 2017 *Corps' pondent*
- IV. April 2017 Monthly Project Summary
- V. Spring Valley Project Overview Fact Sheet
- VI. Geophysical Pilot Project Summary and Next Steps
- VII. USACE Spring Valley website and contact information
- VIII. Groundwater Feasibility Study Charts

AGENDA

Starting Time: The May 2017 Restoration Advisory Board (RAB) meeting began at 7:05 PM.

I. Administrative Items

A. Co-Chair Updates

Dan Noble, Spring Valley Project Manager and Military Co-Chair, welcomed everyone and opened the meeting. He noted that the RAB schedule skipped the March meeting, so there has been a four month interval between meetings. He reviewed the agenda including the Groundwater Study, Site-Wide Decision Document, 4825 Glenbrook Road, and the Pilot Project.

1. Introductions

D. Noble introduced Todd Beckwith, USACE, Spring Valley Project Manager, and Bill Eaton, AECOM, who gave a presentation on the Groundwater Feasibility Study.

2. General Announcements

D. Noble reviewed website updates which included the April monthly project update, the weekly 4825 Glenbrook Road updates and photos, the January RAB meeting minutes, the December and February Partner Meeting Minutes, the February 2017 *Corps' pondent*, and the Final Pilot Project Report and Fact Sheet.

B. Task Group Updates

No task group updates were presented.

II. USACE Program Updates

A. Site-Wide Decision Document

D. Noble briefly reviewed the Site-Wide Decision Document (DD).

U.S. Army Corps of Engineers (USACE) received comments on the Site-Wide Decision Document (DD) from US Environmental Protection Agency (EPA) Region III, Department of Energy & Environment (DOEE), and Dr. Peter deFur, Environmental Stewardship Concepts/RAB TAPP Consultant. USACE incorporated those comments into the Site-Wide DD and forwarded the document to USACE Headquarters (HQ) in April. The two signatory authorities on the document will be a 2-star general at USACE Headquarters and Eugene Collins, Deputy Assistant Secretary of the Army (Environment, Safety and Occupational Health). Once signed at USACE Headquarters, the document will be forwarded to the Office of the Director of the Army Staff (DAS) at the Pentagon for final signature. The signature phase is expected to take 30 to 60 days.

1. Contractor Site Visit

In the meantime, the project team is beginning to work on the acquisition for the environmental services needed. Government procurement can take a while, so USACE is working on acquisition before the document is signed in order to be in a position to award a contract once the signatures are in place. USACE hosted a site visit on April 19 for interested contractors.

The site visit group met at the Federal Property for an initial briefing and pre-site visit question and answer period. The group then toured the federal property to give the contractors an idea of the space and facilities available for operations. The tour then continued at the Public Safety Building at American University (AU), the Spaulding/Captain Rankin area, and finished at one of the properties that will be part of the remediation effort.

Question from Kathleen Connell, Community Member - How many contractors attended the Site-Visit?

D. Noble confirmed that there was more than one contractor at the site visit, but was not allowed to give information on the total number of contractors that attended.

Question from K. Connell, Community Member - Do you think it will be a competitive bid?

D. Noble confirmed this.

Question from K. Connell, Community Member - Are you comfortable with the quality of the contractors, because I understand a lot of contractors are overwhelmed and not bidding?

D. Noble confirmed that USACE is comfortable with the quality of the contractors. All of the contractors are on Indefinite Delivery/Indefinite Quantity (IDIQ) base contracts with USACE, which means the contractors have already undergone a rigorous selection process. Now USACE is issuing a task order against the base contract, so there is a known pool of contractors that are eligible to compete.

The contractor bids are due to USACE by the end of May and USACE expects to award the contract by June 30. Then the Remedial Design (RD) will begin. USACE expects to begin work on the remedy before the end of calendar year 2017. USACE will keep the RAB informed on how the project is progressing throughout the year.

2. Munitions Debris (MD) Item Found

On April 28, USACE received a call from American University (AU) that a grounds crew working on the landscaped area in front of the AU President's office on campus had found an unusual metal object in the ground. The USACE explosive safety expert was able to go investigate the find quickly because he was overseeing the 4825 Glenbrook Road project. The USACE explosive safety expert examined and further excavated the item. The item was identified as an expended Livens projectile from the American University Experiment Station (AUES). USACE bagged and transported the item for storage at the Federal Property. At the earliest opportunity, USACE will conduct the normal assessment process of headspacing the item to make sure there is no presence of chemical agent residue. USACE will wait for the headspace results before making the final decision on what exactly the soil may need to be analyzed for where the find was made.

In the area where the projectile was found there are no areas or points of interest. This area is considered

more closely related to Camp Leach than the AUES. Since the area is near the president's office which is directly on Massachusetts Avenue, it is unlikely that the area would have been used for testing.

Question from Tom Smith, Community Member - When excavation was done for what is now Bender Arena at AU, were there not things found in the area right behind the AU president's house?

D. Noble recalled that there was an item found on the soccer field and another item was found when the media building was being built.

Comment from T. Smith, Community Member - I thought that there were things that were found when they were excavating to build what is now Bender Arena. I know that there were reports in the Northwest Current and the Washington Post at the time that items were found.

Question from T. Smith, Community Member - Does USACE or AU make the decision about whether a soil sample is taken?

D. Noble confirmed that USACE will make the decision.

Question from T. Smith, Community Member - I do not recall seeing a reference to this in the weekly email report?

D. Noble explained that the weekly report is focused on 4825 Glenbrook Road operations, not the site wide project. The projectile is a Munitions Debris (MD) item, and the only issue now is whether or not there is chemical residue on the item.

Comment from T. Smith, Community Member - I think if you can, if you do find things like this it would be good to include those in the weekly reports even if they are not about 4825 Glenbrook Road.

Question from William Krebs, Community Member - Was the soil ever tested in the area around the object?

D. Noble explained that the soil has not been currently tested. No samples have been collected yet. The item needs to be headspaced first. Since there is a pause in operations at 4825 Glenbrook Road there are no assets for headspacing on site. Once operations resume the item can be headspaced.

Question from John Wheeler, Community Member - Does that mean if the headspacing is negative, then there is no reason to believe that the soil is contaminated?

D. Noble confirmed this and explained that headspacing is the first step in the process of what needs to be done and how the soil sample needs to be collected. That is why the area is mitigated, meaning that the area is under plastic until the headspace result is obtained. USACE typically sends an item like this to an USACE laboratory first to have the soil cleared for low level chemical agent to make sure there is no chemical agent present. Then USACE would send a portion of the soil sample to a commercial laboratory to analyze for metals and explosives.

Question from W. Krebs, Community Member - Was anything found when the north campus was built?

D. Noble explained that he did not believe there were any finds when the new north campus was built.

Comment from Linda Argo, At Large Representative - American University - There was nothing found up there.

Comment from Audience Member 1 - The item does not look to be very deep in the ground.

D. Noble confirmed that the item was very near the surface.

Question from Audience Member 1 - So if you thought the dirt was hauled in, should you not be finding out where they hauled dirt in from so you can check those areas as well?

D. Noble explained that USACE has no records of where the fill dirt originated. Fill dirt and borrow moves back and forth on construction sites a great deal.

Question from W. Krebs, Community Member - But there is speculation that the fill dirt came from the grounds of the FUDS?

D. Noble confirmed this and explained that the item is definitely a WWI item which was the type of item that was being tested at this facility. The item likely came from the immediate area or was left there by the soldiers.

Question from T. Smith, Community Member - You do not have any records of what was excavated previously where Bender Arena is?

D. Noble explained that he does not recall the things found when Bender Arena was being constructed. That does not mean there is not a record.

Comment from Steve Hirsh, Agency Representative - US Environmental Protection Agency, Region III - You are talking about 1986; there is probably a record of that.

USACE will update the RAB on the further assessment of the item when information is available.

3. Site-Wide Tentative Schedule

- Spring 2017 - Prepare and sign the Site-Wide Decision Document.
- Summer 2017 - Contract acquisition work. Goal for contract award is June 30.
- Fall 2017 - Begin Remedial Design.
- ~2017-2020 - Conduct Remedial Action.

B. Pilot Project

Alex Zahl, Spring Valley Technical Manager, briefly reviewed the Geophysical Pilot Project.

The purpose of the Pilot Project was to test recently developed geophysical equipment, using a process called Advanced Classification (AC). Using an extensive library of possible munitions, AC can detect an item in the ground and determine with a high degree of certainty whether or not the item is a munition, what type of munition the item is, how deep the item is buried, and how the item is positioned in the ground. The new devices are smaller, but had not been proven in the type of terrain encountered in Spring Valley. USACE selected 3 properties from out of the 95 that will require munitions investigation. The 3 properties were chosen based on a number of different conditions, including sloping areas, electrical interference effects, and other obstacles that may be encountered at the remaining properties. Both instruments, the Time-domain Electromagnetic Multi-sensor Towed Array Detection System (TEMTADS) and Man Portable Vector (MPV), were successful. Blind seeds were buried at all 3 properties to test the instruments. The two instruments were able to detect and identify the blind seeds. From the data received, USACE concluded that either instrument would meet the Decision Document (DD) requirements for the evaluation of the remaining properties, but determined that either instrument should be used in combination with a standard 858-Magnetometer.

The Pilot Project Report was sent to the regulatory partners, comments were received and addressed, and the report was finalized. The finalized report was part of the package shared with prospective Remedial Action (RA) contractors, who now have all the information concerning the new geophysical equipment.

The new instruments will decrease the need to cut down landscaping vegetation because the smaller devices can fit into more areas. The new instruments will also decrease the number of excavations needed to inspect anomalies because there will be a higher degree of certainty of identification of munitions and common metal items.

The report and fact sheet is available online and at the Information Repository.

Question from Audience Member 2 - Will the piece of equipment you are showing only scan in between the 4 tires as it rolls around?

A. Zahl confirmed this.

Question from Audience Member 2 - How deep will the instrument detect?

A. Zahl explained that the depth is up to 2 feet. In order to determine the quality control limit for the devices, USACE chose the smallest munition item to show the greatest depth of detection for the devices. The 858-Magnetometer will detect objects at a deeper level, which is why USACE decided the 858-Magnetometers should be used in conjunction with one of the other devices.

Question from Audience Member 1 - How deep will the 858-Magnetometer detect?

A. Zahl explained that depth of detection depends on the object. A large metal mass can be detected to 5 feet or more, a smaller metal mass can be detected at less than 5 feet.

Question from Audience Member 1 - So it detects metal, what about glass bottles full of things?

A. Zahl explained that all of the geophysical equipment used can only detect items with a metal component. If a large anomaly with a large metal mass is detected, USACE will excavate a trench instead of a single anomaly removal. At that point if there is glassware associated with the metal mass, USACE will investigate.

Question from W. Krebs, Community Member - Does USACE rent the instruments to the contractors or do they have to buy their own?

A. Zahl explained that the instruments are newly developed. One of the instruments is commercially available, and the other will likely be commercially available soon. There is no straightforward answer at this time. The contracting pool consists of the foremost experts in this industry; a fairly small group of geophysicists that USACE relies on to achieve results.

C. 4825 Glenbrook Road

Brenda Barber, Spring Valley Project Manager, provided a review of the 4825 Glenbrook Road project.

Operations are in low probability at the site; high probability is over. Work is conducted in open air with monitoring. Work began in Area A. The area behind the backyard retaining wall up to the curved section has been cleared, and then operations moved into the former driveway area, along the shared property line between 4825 Glenbrook Road and 4835 Glenbrook Road.

Near the fence along the shared property line, workers encountered numerous utilities which meant that excavation had to be done by hand. The utilities serve 4835 Glenbrook Road and USACE has been able to continue those services with little disruption. There were drainage, irrigation, and water lines that had to be worked around and rerouted as part of the excavation efforts.

1. First Discovery of Unknown Black Substance

Excavation work continued up the driveway and adjacent to the property line to the curved bump-out section of the retaining wall. On February 23 workers encountered a small, solid, black mass mixed in the soil at the curved bump-out section of the retaining wall. USACE stopped work at that time and facilitated a Project Delivery Team (PDT) call. USACE decided to pull samples and pause work in that particular area of the site pending sample analysis.

In the interim, USACE continued to excavate in the driveway area. On March 1 the USACE geologist and the contractor's geologist confirmed that the excavation had achieved competent saprolite. On March 2 USACE collected confirmation samples in that area.

[Ed. B. Barber pointed out on slide 18 of the USACE presentation the location of the confirmation samples and the property line.] USACE observed some soil discoloration and plastic, possibly from former work in the area. The white star illustrates where the unknown black substance was found on February 23. B. Barber pointed out the grid layouts where competent saprolite was achieved, and noted that the small purple circles indicate confirmation samples. One of the confirmation samples along the property line failed testing. The sample contained low levels of agent breakdown products. According to the workplan,

USACE will have to over-excavate that area. Because of sequencing at the site, USACE will perform the over-excavation to remove the soil contamination later in the project.

Question from Mary Bresnahan, Community Member - What do you mean by over-excavate, and which property line are you referring to?

B. Barber explained that the property line is between 4825 Glenbrook Road and 4835 Glenbrook Road. In the agreements and partnerships between the property owner and USACE, USACE has right of entry up to 8 feet onto 4835 Glenbrook Road property. USACE may excavate onto 4835 Glenbrook Road in accordance with the agreements with the property owner. USACE workplans require over-excavation of 2 more feet to clear that confirmation sample, at which time additional confirmation samples will be taken and analyzed, and USACE will assess accordingly.

The unknown black substance sample found on February 23 was analyzed for chemical agent and agent breakdown products. The sample did not test positive for lewisite but did test positive for low levels of HD (mustard) and agent breakdown products. USACE collected a soil sample in the same proximity that the substance was found that did not test positive for agent or agent breakdown products.

On February 27, HD was detected by one of the ongoing air monitoring systems, the Miniature Chemical Agent Monitoring System (MINICAMS). USACE eventually dismissed the detection as an anomaly because the Depot Area Air Monitoring System (DAAMS) tubes did not detect any agent that day and there was no intrusive work occurring that day. Edgewood Chemical Biological Center (ECBC) also visited the site and inspected all of the MINICAMS. ECBC made the assessment that interference from radio frequencies in the area was occurring. To address the issue USACE swapped out all of the MINICAMS onsite on March 15.

2. Second Discovery of Unknown Black Substance

Work resumed after taking appropriate precautions. On March 16 the black substance was found again in the same proximity as the first incident, behind the curved section of retaining wall. Excavation in the area was paused again. In this instance glassware was found with the substance. The PDT was convened to discuss the incident.

While work was paused pending results of the second incident, USACE utilized the time to replace two units at the interim holding facility (IHF) on Federal Property from March 21 to April 3. Also during this time the weather was warming up, so USACE temporarily reinstalled the air conditioning units for 4835 Glenbrook Road in the former driveway of 4825 Glenbrook Road.

The second unknown black substance sample found on March 16 was shown to be similar to the first find. The substance contained HD and agent breakdown products. There was no indication from the lab or from the air monitoring equipment on site that any issues were experienced within the breathing zone. The PDT decided to return to work in Modified Level D (construction site standard safety attire) with enhancements to the safety attire, which included paper Tyvek suits, booties, and an extra pair of gloves. This added level of protection could ensure that workers were not taking any soils off property on their clothes.

3. Third Discovery of Unknown Black Substance

Work resumed again. On April 5 the unknown black substance was discovered again. This time the team mitigated the area, and there was an odor. The area was covered with plastic, and the MINICAMS was placed under the plastic. The MINICAMS detected HD. USACE continued mitigation and pulled the DAAMS for confirmation. There was no confirmation, so no detection of HD on the DAAMS. Because there was more of the substance mixed with the soil, and there was a positive detection on the MINICAMS, ECBC visited the site to collect samples on April 7. The samples were analyzed and returned results of HD and agent breakdown products. USACE decided to leave this area for a period of time to make adjustments to safety protocols and ensure that operations onsite continued to be safe for workers and for the community. USACE mitigated the entire area with geo-cloth, and filled the area in to temporarily support the air

conditioning units. USACE will return to this area at the end of the project to perform the over-excavation and to clear the confirmation sample that had a hit for agent breakdown products.

While safety adjustments were being made prior to removing further soil from the curved section of the retaining wall, work resumed in the backyard. This section included the former steps that led up to the back patio. On April 10 the team demolished the stairwell and began to excavate the backyard retaining wall area. On April 18 as excavation work continued to clear the area behind the retaining wall, the MINICAMS detected lewisite. There were detections at low levels for lewisite. The DAAMS tubes were pulled, and there was no confirmation of lewisite. ECBC reported an interferent was detected during the DAAMS analysis. The area was then fully mitigated.

USACE reviewed information from the original 4835 Glenbrook Road remedial investigation (2007-2009) to assist the RAB in understanding what had been discovered during the previous investigation at the property line area. [Ed. B. Barber referred to Figure 2-2 on slide 32 of the presentation.] The pink areas are the test pits that had no issues. The blue squares are the test pits where there was potential AUES debris. The closest test pits to the shared property line are Test Pit 67 and Test Pit 92. In Test Pit 67 one small glass pipette was recovered at ~ 6 feet below grade, and in test Pit 92 a broken glass stopper was recovered at ~ 1 ½ feet below grade.

D. Noble requested that B. Barber point out where the black substance has been found.

The black substance has been found primarily in the retaining wall bump-out. All of the finds have been on 4825 Glenbrook Road; excavation has not crossed the property line. All of the black substance incidents have been found in the backfill associated with the small curved retaining wall.

Question from T. Smith, Community Member - When you perform the over excavation, will the excavation extend 8 feet over the property line?

B. Barber explained that the over-excavation is in the driveway area near the front. The over-excavation will extend 2 feet, and then confirmation samples will be collected. If the confirmation samples come back clear, the excavation will be complete.

Question from Audience Member 1 - Will you go 2 feet past the wall?

B. Barber explained that the over-excavation will extend 2 feet past the current excavation point, which will be on 4835 Glenbrook Road.

Question from Audience Member 1 - Where you found all the black substances, you are going to go two feet past all of that?

B. Barber explained that the excavation will go all the way up to the foundation of the home, and then cannot go any further.

Question from G. Durrin, Audience Member and producer, Durrin Productions, Inc. - Which is how many feet?

B. Barber explained that the distance is eight feet.

Question from Lawrence Miller, Community Member - What does interferent mean?

B. Barber explained that an interferent is another chemical that was present when the DAAMS tubes were analyzed. The interferent was confirmed to not be lewisite, but may have been an industrial solvent or a mixture of chemicals that were present.

Question from Audience Member 2 – Are you going to use the metal scanners you spoke about before in this area?

D. Noble explained that the Advanced Classification instruments will be used in the RA areas, which are 95 other houses. In this area of 4825 Glenbrook Road all of the soil will be excavated, so there will be

nothing to look at 4825 Glenbrook Road.

Question from Audience Member 2 - What about 4835 Glenbrook Road?

D. Noble and B. Barber explained that USACE already conducted extensive test pitting at 4835 Glenbrook Road instead of geophysical classification because there were a lot of problems with the quality of the data that came back from the geophysical instruments.

Question from Audience Member 2 - The reason I was asking is that everything that you are finding is in glass, and the instruments will not pick up glass.

D. Noble confirmed this.

Question from Audience Member 1 - On 4825 Glenbrook Road, how far back to the university property did you go? Because there was a fence many years ago up there to separate the two properties.

B. Barber explained that the excavation went 10 feet beyond the backyard retaining wall. The retaining wall runs along the area called Area B. USACE chose to excavate 10 feet back, with the caveat that if USACE encountered debris then the excavation would go further; if not, that would be the limit of the excavation. USACE did not find extensive debris, and there was nothing to indicate that there was a burial pit. There was a small amount of debris in that area, but nothing that substantiated excavating further.

4. Future Activities

- During the ongoing pause at the site, the teams are at Federal Property conducting limited maintenance, packaging the used CAFS filters for proper disposal, and performing repairs to the IHF next week.
- Revisions are in place with the contractor to include contingency operations for level C and Level B Personal Protective Equipment (PPE) operations for low probability. USACE also plans to revise the work plans to include recovering more Chemical Agent Contaminated Media (CACM).

5. Chemical Agent Contaminated Media (CACM):

Because the black substance was found on numerous occasions in varying volumes, USACE Baltimore consulted with USACE Huntsville, which is the USACE Chemical Warfare Design Center that investigates and remediates chemical weapons remnants. As a result, USACE will add CACM to the workplans. CACM is any mixture of detectible concentrations of chemical agents in soil, water, debris, or other solid or liquid media. CACM is anything that has debris and measurable amounts of chemical. CACM is not classified as Chemical Warfare Materiel (CWM) but USACE will manage CACM in accordance with all applicable federal, state, and local laws. All of this material is being segregated, drummed separately, and will be shipped to the incinerator.

Question from W. Krebs, Community Member - What is the distinction between CWM and CACM, and why is it not CACM?

B. Barber explained it is considered CACM because the chemical is at such low levels.

In addition to making workplan modifications, USACE also reviewed the data on the various sampling efforts and used a model to calculate the potential hazard distance with worst case assumptions. USACE used that information to work with ECBC to run air modeling with a 60-minute continuous evaporative release. The highest sample resulted in a very conservative mass of 1.02 grams of HD. USACE included not only the HD, but also the agent breakdown in the analysis. The model indicated that the mass was too small an amount of HD to produce an exposure amount that reaches Acute Exposure Guideline Levels (AEGL-2). The exclusion zone for work at the property will continue to be the same. USACE will make adjustments to on-site operations. The exclusion zone will be the excavation area within the site boundary.

USACE is utilizing contingencies where the teams can upgrade their PPE above Modified D to potentially Level C, which is a full Tyvek chemical suit and a full face respirator. That would be triggered if detections continue on the MINICAMS. USACE would have a team on standby that will go in and mitigate the area

and potentially do some limited work in Level C. USACE is also writing into the plan the ability to use Level B, which is chemical Tyvek suit with supplied air to perform a rescue if necessary.

Question from K. Connell, Community Member - With the MINICAMS reporting on several occasions a false positive, have you thought of going back and tightening up the MINICAMS metrics so that you have a better relationship between MINICAMS alerts and what you are finding?

USACE directed ECBC to do a fairly extensive review the second time the black substance was found. USACE asked ECBC to run the MINICAMS and DAAMS tubes in a controlled environment at Edgewood to determine that very fact. False positives on the sensitive MINICAMS are an accepted result, and the DAAMS tubes are present for confirmation. The MINICAMS are operating fully within operational standards, and ECBC does not recommend any changes to the operation of MINICAMS at this time. When the MINICAMS detect a substance, USACE considers that a trigger to analyze the DAAMS tubes. If the DAAMS tubes confirm an issue, the teams will be protected; if the DAAMS tubes do not confirm an issue, the team can downgrade again and resume work.

Question from Gerry Barton, Audience Member - Did you have any neighborhood alarms?

The detection equipment is on-site, not beyond the property. B. Barber explained that is why USACE ran the conservative model to assess if there could be potential exposure outside of the site perimeter. The model indicated there was no potential for off-site exposure.

Question from K. Connell, Community Member - Is the reverse also true that you have not had any circumstances where the MINICAMS failed to identify a potential problem and then you found that there was a substance that was concerning?

B. Barber explained that no, the only time there was a hit was the confirmation sample and there was hardly anything in that detection. The MINICAMS would not have the capability to detect that small an amount.

Question from Audience Member 1 – How do you think that with so many MINICAMS detections that there is nothing there?

B. Barber explained that every time the MINICAMS detect a substance, the DAAMS tubes are analyzed for confirmation. For the MINICAMS, USACE went back and looked because USACE was asking the same questions that you are asking. The MINICAMS has false positives up to a dozen times on any given day. The false positives keep the teams on alert and constantly monitoring the MINICAMS.

Question from K. Connell, Community Member - Is there a potential that because there may be false negatives that you might miss something? Are you checking these monitors so that you are not only checking the false positives but you are checking the potential of the false negatives being accurately recorded as well?

B. Barber explained that USACE challenges the MINICAMS with agent every morning, mid-day, and at the end of the day. USACE also runs the DAAMS tubes every day, even if there is no detection by the MINICAMS. The DAAMS tube will indicate if the MINICAMS missed anything. If the MINICAMS does not pass the challenge with agent then work is not resumed until the MINICAMS does pass the challenge. The MINICAMS has to detect the agent 3 times a day to make sure that the equipment is fully functional.

Question from G. Durrin, Audience Member and producer, Durrin Productions, Inc. - Have you found anything that would make anything go off on the 4835 Glenbrook Road property?

Question from B. Barber, USACE - What do you mean 'go off'?

Question from G. Durrin, Audience Member and producer, Durrin Productions, Inc. - Has there been something that you have to deal with, any black substance or any chemicals?

B. Barber explained that nothing has been found to date. All finds have been on 4825 Glenbrook Road.

Excavation has not begun at 4835 Glenbrook Road.

USACE will excavate on 4835 Glenbrook Road up to the foundation of the home. USACE needs to excavate in order to remove the retaining wall that runs along the driveway area. There is no other physical way to remove the retaining wall without doing some excavation on 4835 Glenbrook Road.

Question from G. Durrin, Audience Member and producer, Durrin Productions, Inc. – Will you only go until you hit the house, and then you will stop?

B. Barber confirmed this. The area around the foundation and footers of the retaining wall will have to be removed in order to remove the retaining wall that runs along the property line.

B. Barber explained further that no other excavations are planned on 4835 Glenbrook Road, except in the front yard area as we discussed earlier.

Comment from Audience Member 1 - The majority of what you are planning on digging is behind that wall and foundation, that is backfilled. You have part of the retaining wall between 4825 Glenbrook Road and the foundation for the basement of 4835 Glenbrook Road. I know. I built those houses. I know a lot more than you all think.

Comment from Audience Member 2 - Under 4835 Glenbrook Road there is all kinds of stuff. Believe me, I was there.

Question from K. Connell, Community Member - Under where?

Audience Member 2 replied 4835 Glenbrook Road. The next house beside of it. There is just as much under there.

Comment from Audience Member 1 - I know more than you all have ever said or put out to the public. You sugar coat and cover up so much, you only put out what you think people want to hear. And the worst part is you did not even notify us, when all of this come through with Lawrence Brandt's records and everything else. Even though someone at USACE set up a place in Morgantown, West Virginia knowing there were West Virginia workers, to go and get checked by doctors, but you never notified us. Not by letter, not by phone, or anything. And you can find every record on any employee who worked on that property. There was a payroll, there is a federal government, and you are tied into the federal government. I know so much that you all are not exposing. I have proof beyond a shadow of a doubt about what came off of 4835 Glenbrook Road.

B. Barber explained that USACE has been seeking out and trying to discuss the matter with the former workers. USACE does not have access to Mr. Brandt's payroll records. USACE has been attempting to gain access to the records. As soon as USACE had any potential contact information for the workers, USACE did begin the process of reaching out to the former workers. USACE cannot investigate under [Ed. B. Barber was interrupted by Audience Member 1]

Question from Audience Member 1 - How did you reach out to us? You have never sent us a letter. Not one time have you sent a letter. Not one time have you called. You do not even know how many employees were in West Virginia, or who they were, or where they lived. I am a lot further ahead than you all think I am.

B. Barber explained that she spoke to Audience Member 1 at the RAB and on several occasions afterwards.

Comment from Audience Member 1 - You spoke to me. But you still do not know how many employees were from West Virginia, their names, where they live, or what we were put through and what we were told. And once this first started, and it went through with Lawrence Brandt's people that bought the house originally, once you found out there were really a lot of contamination and problems there, all the employees should have been the first people notified and took care of. You are not the one that has the health issues. You are not the one that suffers, and neither are the rest of the people right here sitting here on this Board and involved with the government.

B. Barber explained that she did not want to downplay any of Audience Member 1's concerns, but USACE has actively been looking for the former workers at the site. USACE has an active and ongoing Potentially Responsible Parties project to find the former workers and to find information on this site. Unfortunately Mr. Brandt was not cooperative, and USACE has spent a considerable amount of time trying to make contact with the former workers. USACE's efforts have run into several roadblocks.

D. Noble explained that USACE continues to be more than happy to speak with any of the former workers as B. Barber indicated.

Comment from Audience Member 1 - They called me. I do not know who the lady was. I have kept everything back and it has built up to the point I cannot stand any more. In October or the first part of November, she called me and said we want to meet with you guys at the job site. She said I will contact you later, as I have to get with my team so we can set up a time that works and there is Thanksgiving. Who cares about Thanksgiving and Christmas, this is a major issue. Those things are beside the point. From that point until now, as I told whoever the lady was that contacted me that day how I felt.

B. Barber explained that the caller that day was B. Barber.

Comment from Audience Member 1 - Lawrence Brandt, AU, and all the government has literally shafted us. And you never contacted me back to this day.

B. Barber explained that USACE had been trying to arrange to have a medical doctor present for your site visit, and unfortunately USACE cannot do that.

Comment from K. Connell, Community Member - I would like to thank the employees for coming, and I would like to make sure that we do not just dismiss this. It is troubling that we are this far along in a project and we are just beginning to hear from some of the people who are most directly affected. There is no one on this board who represents the former employees, so perhaps all of us who are on the board need to attune ourselves to the concerns that are being expressed here tonight. I would like you to feel empowered to continue conversation with the former employees. They are sitting here in the room, so we now have a point of contact that evidently you did not have through their employer, whoever that person was that you referred to. I appreciate the fact that you may have had difficulties to find the employees, but they are now here, they are physically present. It would seem to me that we have an obligation to continue that dialogue at the earliest possible moment to make sure that any additional information that all of you have, to share.

Comment from Audience Member 1 - I was in a meeting a year ago. Across from here, off of New Mexico Avenue at that church, in the basement. I talked to her after the meeting. Again she waited until late October, first of November, then to set everything up, and then pushed off. I had no way to contact her. She never called me. She was supposed to have set up a meeting within the next few weeks for us to come and then find out everything. That is called sugar coating to cover up. She has proof she called me, but she does not follow up. I know how the government works. I have been shafted more than once by them, and I will not be shafted again.

Comment from Malcolm Pritzker, Community Member - The question is how do you convert your concerns and the concerns of this committee to some follow-up. History is not going to help anybody. It is the follow-up. What can we do now to address the concerns and that is what we should be talking about.

Comment from K. Connell, Community Member - I appreciate you defining that because I am concerned that we move forward in a more assertive manner, and make sure that there is a direct contact with these employees and anyone else that they can identify, so that we do not let them slip through the process again and delay another six to eight months, because they are just as much a concern for the community as any person who currently lives or has lived in the community. So I think that we have an obligation to represent them even though they are not on the committee; at least that is my personal view. I would like to have some feedback from you as to how you are going to begin to communicate with them on a regular basis so that their concerns are addressed.

B. Barber explained that USACE will open up communication further. B. Barber emailed Audience Member 1 several times, and can again provide him with her contact information.

Comment from Audience Member 1 - That email has all been lost. Everything I had was lost many months ago. My whole system was hacked, and down and gone. Everything has had to change.

And I am the one who made the first contact to call USACE. When I found out by coming up here for a ball game for my daughter, and I brought my wife by the site to show her what it would look like however many years later, and that is when I discovered the tent.

Question from M. Pritzker, Community Member - This is history, what do we do going forward?

Comment from Audience Member 1 - I think we should know 100% of everything, including what kind of current health issues could be caused from working there, and down the road. There are a lot of different things going on in our life, and we do not know what is causing them.

Question from M. Pritzker, Community Member - What do we do about it now?

Comment from K. Connell, Community Member - I think we are trying to find a forum for you to express that, and a way for the Board to stay on top of it so that we get feedback this time.

Question from Audience Member 2 - You were talking about going two feet past the property line or however far over into the driveway to do tests?

B. Barber confirmed this.

Question from Audience Member 2 - You are being told by the people that worked there, that built that, it is under that house. There is as much if not more under 4835 Glenbrook Road as there was under 4825 Glenbrook Road.

B. Barber explained that without removing the house, USACE does not have a way to go under the house and do any type of investigation.

Question from Audience Member 2 - You found it under 4825 Glenbrook Road and removed it. You know what is there now.

B. Barber explained that USACE did not find debris under the foundation of the house at 4825 Glenbrook Road. The debris was adjacent to the home, but it was not under the basement floor, nor was there any debris under the garage. USACE was very careful and very cautious.

Mrs. Durrin did provide us information, through transcripts where she had been speaking with the former workers. She would not give USACE the former workers' names or contact information, but that she wanted USACE to have the information you shared with her, asking us to be looking in particular areas. USACE has been very cautious while excavating in those areas, and documenting everything. USACE was read in the transcripts that the debris would be in the crawlspace, there was nothing. USACE read that the debris would be under the floor, there was nothing. USACE also read that we should look behind the retaining wall along the 4801 Glenbrook property line, and we did find debris there.

Question from Audience Member 2 - If I set a bottle on a table, will you look at what came out from under 4835 Glenbrook Road?

B. Barber reiterated that USACE cannot physically go under 4835 Glenbrook Road to investigate.

Comment from Audience Member 2 - I am just telling you, I know, because Keith Powell gave me permission to remove the bottle. I took it home with me, and I have got it under lock and key. And it came from under 4835 Glenbrook Road.

Comment from Audience Member 1 - The whole glass bottle. Full.

Comment from Audience Member 2 - I have the whole thing. This is only 1 bottle of thousands that was

crushed.

Comment from M. Pritzker, Community Member - I suggest that from this committee's point of view, it would be appropriate to ask that contacts be made [Ed. M. Pritzker was interrupted by G. Durrin]

Comment from G. Durrin, Audience Member and producer, Durrin Productions, Inc. - The contacts were already made. They were coming of their own volition under threat of PRP [Ed. Potentially Responsible Parties], and coming forward of their own volition a year ago to give information and they did, and they exchanged some information with B. Barber. Then communications fell down. These gentlemen are heroes. They are coming forth; they are driving five hours from West Virginia.

Comment from K. Connell, Community Member - We are trying to mediate the situation here.

Comment from G. Durrin, Audience Member and producer, Durrin Productions, Inc. - I know. We are trying to mediate, and I am saying you should give them a moment.

Comment from K. Connell, Community Member - We currently are not in the open public discussion period. Let the board member state his motion so we can be helpful here and move forward. We are trying to help here; we have to make a formal motion.

Comment from M. Pritzker, Community Member - The motion is that the RAB ask the officers that report to this Board to give the former workers their contact information. The former workers and USACE have an exchange of information. The RAB asks that at the next scheduled meeting, that USACE make a full report to the RAB so the RAB knows what has happened and what is going on. The former workers obviously can give whatever information that they want. None of which the RAB knows. The RAB does not know any of this and the RAB will hear what has happened and the former workers can make comments. At least at that point the RAB will have some facts that the RAB can deal with; right now the RAB has allegations, the RAB does not have facts.

Question from G. Durrin, Audience Member and producer, Durrin Productions, Inc. - But wait a minute. These gentlemen are the horse's mouth. They were there, they built the houses. I mean, what is better?

Question from K. Connell, Community Member - I have an amendment to your motion, M. Pritzker. I would like to second it with the amendment that the RAB tie a timeline for getting feedback from our support team. That the RAB have initial feedback from USACE at our next meeting in two months. Would that be an acceptable amendment for you, M. Pritzker?

M. Pritzker, Community Member confirmed this.

Comment from K. Connell, Community Member - Ok, then I will second it. The motion has been moved and seconded.

Question from W. Krebs, Community Member - I would like to make an amendment. I would be willing to offer these gentlemen a chance to address the RAB. Give them a RAB meeting where they can come and tell us what they know, if they are willing to do so.

Comment from K. Connell, Community Member - I think that should be separate motion.

Comment from K. Connell, Community Member - It is a good motion but I think it should be separate to vote on. Because M. Pritzker is giving instruction to USACE, support that the RAB needs that information. Then you can put forth your motion. Can we call for a vote on Malcolm's motion?

Question from W. Krebs, Community Member - Call for a vote on M. Pritzker's motion, that USACE and the former workers exchange information and speak to them, and that USACE report back to the RAB.

Comment from M. Pritzker, Community Member - That is the sense of it, yes.

Comment from L. Miller, Community Member - And that the report be no later than our next scheduled meeting.

Comment from M. Pritzker, Community Member - The point of the motion is that there is an exchange of information from these gentlemen, this lady, and whoever else wants to exchange information with USACE. That USACE respond to what the information is, and then USACE makes a report to this board at the next meeting.

Question from G. Durrin, Audience Member and producer, Durrin Productions, Inc. - Point of information. At one point they were very close to, USACE was going to organize a day when the men would come down.

Comment from M. Pritzker, Community Member - There is a motion on the floor, the RAB has to vote on it.

Comment from G. Durrin, Audience Member and producer, Durrin Productions, Inc. - Ok, but it was for USACE.

Comment from K. Connell, Community Member - Let us finish the business here.

Question from G. Durrin, Audience Member and producer, Durrin Productions, Inc. - Why do they not just continue having the guys come and go over the site with USACE?

B. Barber explained that the site visit would be part of addressing the motion.

[Ed. The motion was carried with several ayes and no nays]

Comment from K. Connell, Community Member - Now your motion should be the next motion.

Question from W. Krebs, Community Member - My motion is that after that exchange of information happens, that if these gentlemen would like to do so, they can present to the RAB directly. If not the next meeting, the meeting after.

Comment from K. Connell, Community Member - I second that motion.

Comment from L. Miller, Community Member - I would like to speak to the motion for a moment. I would encourage the lady and gentlemen that say they have shocking information about this, that they have been waiting a year to tell the RAB; perhaps to write something out, even if it is a one page sheet, so instead of hearing 'you would not believe what we have' the RAB can get an idea of what the former workers have.

Question from T. Smith, Community Member - What the RAB could do is leave it to the former workers' discretion to provide the RAB with any kind of presentation that the former workers want to make.

[Ed. The motion was carried with several ayes and no nays]

Question from W. Krebs, Community Member - So the RAB would appreciate it and invite the former workers to present whatever the former workers would like to present to the RAB at a time convenient for them. Either at the next meeting or the meeting after. The RAB meets every odd month on every second Tuesday. The next meeting will be July 11.

6. Tentative Schedule

The recent finds will have an impact on the schedule. USACE now anticipates low probability work will likely take three to four months to finish. USACE expects that by working in partnership with the property owner (AU) on some of the restoration, USACE will be able return the restored property to AU in late summer or early fall.

Comment from G. Durrin, Audience Member and producer, Durrin Productions, Inc. - I suggest that at the same time the former workers are going to do their presentation, they also do a walkover of the site as you were planning to do, because it takes them a lot of energy to drive more than five hours to get down here.

B. Barber explained that the reason arranging for the site visit had taken so long was because one of the worker's requested to have a medical doctor present for the site tour. Unfortunately, once the Agency for

Toxic Substance and Disease Registry (ATSDR) finished the Health Consultation, USACE lost the ability to request a medical doctor consultation from them. USACE has been trying to set up a funding approach and set up a way to provide a medical doctor for the site visit, per the former workers request. Unfortunately, USACE ran into too many roadblocks so that is why it has taken so long to get back in touch with the former workers.

Comment from G. Durrin, Audience Member and producer, Durrin Productions, Inc. - But these guys did not know that, they just did not hear from you for months and months.

B. Barber explained that she understands and is owning that. She noted she will set up a meeting with the former workers after this meeting.

D. Noble noted that USACE presents the full information that USACE knows. He understands that people may not agree with USACE's interpretations all the time. He has been coming to the RAB for 10 years, and in those 10 years the team has presented what they know. There is nothing that USACE is holding back. He understands there may be frustration with things that USACE does not know about, and can understand frustration with how USACE interprets the data, the decisions USACE makes from those interpretations, and what USACE thinks are the next steps. USACE is not hiding things.

D. Groundwater Study

Todd Beckwith, Spring Valley Project Manager provided a brief status update on the Groundwater Feasibility Study (FS).

The Groundwater FS is in the draft final phase. The Partners (DOEE, EPA Region III, and P. deFur) are reviewing the document. Today's presentation reflects USACE's position on the Groundwater FS. USACE anticipates receiving comments back from the regulators in June. USACE will report any issues or changes to the RAB.

Bill Eaton, AECOM presented the conclusions of the Groundwater Remedial Investigation (RI) and recommendation of the Groundwater FS.

The Groundwater RI concluded that currently for all individuals who live in the Spring Valley area there is no unacceptable human health risk posed by the low levels of chemicals detected in the groundwater. The primary reason is that the residents do not drink the groundwater. In the future, if someone were to choose to use the groundwater as a drinking water source, and drink it every day for their lifetime, then there would be a potential risk in the future associated with groundwater. That future scenario alone initiates the Groundwater FS phase, where options have to be considered to address that potential future risk.

1. Exposure Unit (EU) 2

The future risk of groundwater consumed as drinking water is associated with a portion of the Spring Valley FUDS project referred to as Exposure Unit (EU) 2. When the risk assessment was performed for groundwater, the wells were grouped into different exposure units. EU2 is the area proximate to AU and Glenbrook Road.

There are three wells located along Glenbrook Road; Monitoring Well (MW)-24 and MW-25 which are a shallow wells; and Multiport (MP) 2, which is a 200 ft. deep well specially constructed to monitor vertical intervals in the subsurface. There are eight specific vertical intervals at MP-2 where groundwater was monitored. Proximate to Kreeger Hall at AU there are paired wells Piezometer (PZ)-4S and PZ-4D at the exact same location with a shallow screened interval and a deeper screened interval. MW-44, MW-45S, and MW-45D are all co-located and similarly monitor different vertical intervals.

These are the only wells where the concentrations of arsenic and perchlorate are slightly above what would be acceptable for drinking water. For some intervals there are no problems with arsenic or perchlorate. At other intervals there is a persistent issue of elevated arsenic relative to the drinking water standard, but at the same interval there is no issue with perchlorate. At some locations there are issues with both arsenic

and perchlorate. At most locations there is an issue with only one of those chemicals.

The data collection began in 2005. At MW-25, the arsenic results never exceeded the drinking water standard for arsenic. In the same time frame there were exceedances of the standard for perchlorate, but more recently there were no exceedances. This indicates there has been attenuation through time, a reduction of the perchlorate concentration at that location.

Question from Audience Member 2 - On the one on the left, the MW-24. In 2005 it [Ed. the arsenic level] was 10.4. How come in 2013 it jumps to 16.8?

B. Eaton explained that sometimes happens.

Question from Audience Member 2 - I did not know if maybe something flowed in and then washed back out so the level instantly drops down within eight months?

B. Eaton explained that the reason for the odd occurrence is unknown. It is noted that at that point in time the arsenic exceeded the Maximum Contaminant Level (MCL) for drinking water standard for arsenic.

2. The Groundwater FS Process

- Identify Applicable or Relevant and Appropriate Requirements (ARARs) and 'To Be Considered' (TBC) criteria. The first step is to identify applicable or relevant laws that must be complied with and less legally binding considerations.
- State the Remedial Action Objective (RAO), or what the project is trying to achieve. In this case the RAO is to achieve the protection of public health in the future by controlling exposure to groundwater that is not compliant with drinking water standards.
- State the General Response Actions (GRAs). These are actions that may be considered to achieve the RAO.
- Identify and screen technologies. Once those actions have been identified, different technologies are screened that may be considered to help implement those actions.
- Assemble technologies into remedial alternatives. Once the technologies have been identified, each technology must be evaluated based on usefulness. Usefulness generally depends on the nature of the chemicals being addressed. When evaluating the technologies for Spring Valley, careful consideration is given to the chemistry of arsenic and perchlorate.
- Alternatives evaluation and comparative analysis. Once the potentially useful technologies are identified, those technologies are assembled into alternatives. Typically there are several technologies that would be utilized simultaneously to achieve the objective. The alternatives are then evaluated so there may be a rational basis to select the preferred alternative.

The overall goal is to protect human health. That can be accomplished by eliminating the contamination or by controlling human exposure to the groundwater, or both. For instance, during the time it takes to reduce arsenic and perchlorate concentrations to some particular level, human exposure to the groundwater would have to be controlled. The ARARs of primary concern are the MCL for arsenic, which is the drinking water standard of 0.010 mg/L; and the Interim Drinking Water Health Advisory level (IDWHA) for perchlorate which is 0.015 mg/L. The IDWHA is roughly the equivalent to an MCL in the sense that it is considered protective of public health. If the arsenic and perchlorate levels are below those numbers, the water is acceptable as drinking water.

3. General Response Actions (GRAs)

- 'No action' is a required baseline that must be evaluated.
- Land Use Controls (LUCs) is a way to prohibit utilization of groundwater as drinking water. If groundwater used as drinking water is prohibited, protection of public health is achieved because there is no human exposure to the contaminants that are in the groundwater.
- Long Term Management (LTM) of groundwater to determine when LUCs can be removed. Whenever there are LUCs in place there is also a requirement for long term management of the groundwater. At

some point in the future the groundwater may become compliant with the MCL and IDWHA and be drinkable, but that would not be known unless the groundwater is monitored.

- Groundwater treatment to expedite achieving RAO of groundwater by reducing the concentrations of arsenic and perchlorate.

LUCs include Physical LUCs such as fences and signs, Legal LUCs such as well drilling prohibitions, and Proprietary LUCs such as private landowner agreements. Physical LUCs work at some sites but would not be viable in Spring Valley. Legal LUCs are considered not applicable in Spring Valley because of private land ownership. Proprietary LUCs would be less demanding than a legal prohibition, but still presume a willingness of landowners to curtail their potential use of the property. The remaining LUCs which passed the screening process are Educational Notices. This would be no more complicated than notifying the public on some recurring basis that the public should not utilize the groundwater as drinking water. Anyone who is planning to use the groundwater as drinking water might take issue with that type of LUC, but it is considered to be the most workable LUC for Spring Valley.

The LTM is consistent monitoring and maintenance of any remedial action that is implemented. For example, if Educational Notices were implemented, the preparation and dissemination of the notices would have to be maintained.

4. Groundwater Remediation Technologies (GRAs)

One of the GRAs was to actually treat the groundwater; to take steps to reduce the arsenic and perchlorate concentrations. There were broad categories of technologies that were considered. Each category was not always applicable to both arsenic and perchlorate.

- Bioremediation - A viable groundwater treatment technology for perchlorate. The perchlorate molecule can be destroyed through biological processes. However, arsenic cannot be destroyed.
- Chemical Oxidation - Influence the solubility of arsenic through this process.
- Ion Exchange - Dissolved substances can be removed from groundwater through an ion exchange process, applicable to both arsenic and perchlorate.
- Absorption is a process using carbon filters to remove dissolved constituents from the groundwater by absorption.
- Precipitation/Co-precipitation - A removal process whereby soluble species are rendered insoluble, formed into a particle, and then leave the groundwater.
- Membrane Filtration - depending on the size of the holes and the filter, molecules can actually be filtered out. A molecule like perchlorate can be removed through filtration, typically referred to as reverse osmosis.

5. In-Situ Scenarios for Groundwater Treatment

In-Situ is the treatment of groundwater while it is still in the ground. There are several in-situ treatment approaches that are typically considered, all of them involving a permeable reactive barrier. The treatment causes the arsenic and perchlorate to be removed from the groundwater so that the drinking water standard is achieved.

- Permeable reactive barrier (trenching) - trenching would not work at Spring Valley because in some instances the depths are too great, and in other instances the bedrock is too shallow.
- Permeable reactive barrier (direct push injections) - there are limitations with regard to how far the reactants can be injected beyond the injection point.
- Permeable reactive barrier (injection and recirculation wells) - from an in-situ permeable reactive barrier point of view, the best approach for Spring Valley would be the use of wells to both inject reagents and to extract and recirculate groundwater to create a reactive zone.

Some of the chemical processes that would occur in the in-situ scenario are:

- Chemical oxidants that have applicability to arsenic.

- Traditional zero-valent iron is a reactant material that changes the oxidation state of arsenic and renders it treatable.
- Nano zero-valent iron is the same thing except the iron is very small particles that tend to be more reactive than traditional zero-valent iron.
- Microbial substrates and nutrients are applicable to perchlorate to try to induce the natural microorganisms present in the groundwater to become more metabolically active and increase the degradation rate of the perchlorate.

Through screening, the evaluated technologies and processes for arsenic and perchlorate were either retained or not retained. For example, bioremediation was retained for perchlorate but was not retained for arsenic. In other situations the scenario is reversed or retained for both.

6. Alternatives

The technologies were identified, evaluated based on site-specific facts, and then assembled into 5 basic fundamental alternatives that will be analyzed.

- Alternative 1 - 'No action' baseline, means doing nothing.
- Alternative 2 - Educational LUCs which involve communications with the public to advise against drinking the groundwater. In addition to LUCs, LTM would involve continued monitoring of groundwater concentration trends.
- Alternative 3 - an in-situ treatment that employs reactive barrier technologies to sequester arsenic using nano zero-valent iron and to destroy perchlorate via biodegradation.

Alternatives 4 and 5 are ex-situ alternatives. Instead of trying to treat the groundwater underground, both of these alternatives involve extracting the groundwater from the subsurface and running that extracted groundwater through a treatment plant that would be constructed on the land surface.

- Alternative 4 - involves ex-situ treatment of arsenic by oxidation and treatment of both arsenic and perchlorate by ion exchange.
- Alternative 5 - ex-situ treatment of arsenic by oxidation and reverse osmosis and perchlorate by reverse osmosis.

Once the alternatives and associated technologies are identified, a formalized evaluation of the alternatives against standard evaluation criteria is performed. There are critical threshold criteria, which include Overall Protection of Human Health and Environment and Compliance with ARARs, which is the protection of public health. If an alternative does not achieve threshold criteria, the alternative is no longer viable.

There are other additional criteria including Long-Term Effectiveness, and Reduction of Toxicity, Mobility, and Volume Through Treatment. Alternatives that involve treatment receive a favorable assessment for reduction of toxicity and mobility through treatment; whereas Alternative 2 receives a less favorable assessment. Short term effectiveness includes adverse environmental effects, and the in-situ alternative does not fare well in terms of potential adverse environmental effects because changing the subsurface chemistry of the groundwater to achieve desired results sometimes leads to unanticipated results. For example, biodegradable perchlorate generally only occurs under low oxygen conditions. To remove a high level of perchlorate, low oxygen conditions would be induced. That treatment, however, could mobilize arsenic. When dealing with the sub-surface and fractured bedrock aquifer there are uncertainties with an in-situ approach. The uncertainties may be avoided by using an ex-situ treatment, which is why Alternatives 4 and 5 have been considered. There are shortcomings associated with those treatments as well, not the least of which would be a large water treatment plant located near these wells.

An important evaluation criterion is cost, which is another factor that would be considered along with all the other factors in the future process of making a decision of the proper alternative to deal with the groundwater situation.

Question from W. Krebs, Community Member - For the pump and treat, you are not going to put it back in

the ground then, are you?

B. Eaton explained that the groundwater would not be replaced in the ground after ex-situ treatment.

Question from W. Krebs, Community Member - So then you have now taken away the groundwater or effectively dammed the groundwater up in that area?

B. Eaton explained that the ex-situ treatment would have the effect of lowering the groundwater elevation.

Question from W. Krebs, Community Member - As I recall we never really found the cause for the perchlorate?

B. Eaton explained that from the scale of the Spring Valley FUDS project map, it is known where the cause is, proximate to Kreeger Hall. From the scale of what particular item, what particular cubic foot of soil is causing the issue, correct, the source is not identified.

Question from W. Krebs, Community Member - This was a perchlorate that came from Latin America or something like that?

B. Eaton confirmed that the isotopic analysis indicated that the perchlorate was imported as opposed to a synthetic, recently manufactured perchlorate.

Question from W. Krebs, Community Member - So solutions 3, 4, and 5 would be ongoing? Is that 13 million dollars per year?

B. Eaton explained that the cost includes consideration of operation over 30 years. The 30-year time estimate is a standard for Feasibility Studies. The estimate is not supported by any detailed modelling to say that if, for example, Alternative 4 were implemented; the treatment would achieve the MCL drinking water standard at 30 years. There are a lot of unknown variables.

Question from W. Krebs, Community Member - Are there any active springs still left in Spring Valley?

B. Eaton confirmed that there are springs in Spring Valley. East Creek, the small stream that borders Glenbrook Road and Rockwood Parkway, does receive groundwater. A spring is where groundwater discharges to the land surface and water flows over the land. East Creek also receives a lot of surface water run-off when it rains, so the water is a combination of groundwater and surface water run-off. That is why the Groundwater RI spent a fair amount of time monitoring East Creek for arsenic and perchlorate. Perchlorate was detected but arsenic was not an issue. Perchlorate was detected at interesting levels, only in the sense that perchlorate was detected, but below the drinking water standard. If someone were to drink water out of East Creek, they would be okay from the perspective of perchlorate concentrations. The perchlorate concentrations were observed to decrease with distance along East Creek away from the active project area.

Question from G. Durrin, Audience Member and producer, Durrin Productions, Inc. - Thank you for this very detailed and very important presentation. It is a lot of material, but it explains what is happening. What percentage of Spring Valley's ground is affected and needs some form of groundwater remediation? An eighth of Spring Valley? Just very roughly.

B. Eaton explained that he would say less than 5% easily. The area that EU2 encompassed, including Kreeger Hall and the Glenbrook Road area is a very small portion of the overall Spring Valley FUDS site. There is just that one hotspot, and even at that one location it is only those wells that have lingering levels of arsenic and perchlorate above drinking water standards. Even that statement makes the problem sound bigger than it actually is. Only MP-2, the deep multiport well, currently has arsenic concentrations at some intervals that are above drinking water standards. That is to say, one could pull groundwater out of any other well in Spring Valley and drink it, and be fine from the perspective of arsenic. The location is right next to a known source area, so it is not too surprising that elevated arsenic is observed at the MP-2 on Glenbrook Road.

Question from M. Bresnahan, Community Member - If I understand this from the past and tonight, you know the source of it, where it is coming from?

B. Eaton confirmed Kreeger Hall is the area where the highest concentrations are observed.

Question from M. Bresnahan, Community Member - Alright. The source of it, the stuff it comes from, came from somewhere else?

D. Noble explained that the isotopic analysis shows that the perchlorate was imported from South America.

Question from M. Bresnahan, Community Member - So if you know where the imported ingredient is, why can you not go and remove it instead of spending time and money cleaning up the mess?

B. Eaton explained that it is not known where within the subsurface the cause is located. If one were to take the current ongoing excavations and multiply them by a factor of 100, and excavate the entire area in front of Kreeger Hall, take Kreeger Hall and the other buildings down, and excavate a hole 70 feet deep, that is what would have to be done in the search and evaluation of every cubic foot of soil in order to find the source of the perchlorate.

Question from M. Bresnahan, Community Member - Now this is why I am asking the question, because if this ingredient came from somewhere else, how did it get there?

B. Eaton explained that the ingredient was used in the manufacture of explosives.

Question from M. Bresnahan, Community Member - Right, so, when they brought the ingredient here, they knew where they put it, did they not? Because it was used for the work that was being done.

D. Noble explained that the Army during WWI did, but USACE does not.

Question from M. Bresnahan, Community Member - So you do not know where that work was being done, is that what you are saying?

B. Eaton explained that he did not know where they took the imported nitrates, which happened to have a little bit of perchlorate as an associated contaminant. He did not know where that material was handled, how it was handled, how it was formulated, how it was mixed, and how it was packaged into shells.

Comment from M. Bresnahan, Community Member - But you have an isolated area where the source is.

B. Eaton explained that there are select wells that happen to be near Kreeger Hall that have the highest concentrations of perchlorate.

Question from M. Bresnahan, Community Member - But we have incredible equipment these days that can drill far down and across in many ways and it cannot be isolated like that?

B. Eaton explained that AECOM conducted a very high density soil boring program in front of Kreeger Hall with the intent of trying to find the source.

Question from M. Bresnahan, Community Member - I do remember that also, that is how you found the source.

B. Eaton explained that the source was stumbled upon through the installation of piezometers that were intended to monitor water levels. While the water levels were being analyzed, the groundwater was also analyzed for perchlorate. As a result of the perchlorate detection, the soil boring program was initiated, but never gave any hint as to the specific cubic foot of dirt that was causing the issue.

T. Beckwith added that the source was not found and there are wells in front of Kreeger Hall that detected perchlorate, but the concentrations have been decreasing over time, which would indicate that there is not a significant source of perchlorate remaining.

Comment from M. Bresnahan, Community Member - Thank you.

Question from W. Krebs, Community Member - But all the other wells are on gradients that go down from Kreeger Hall?

B. Eaton confirmed this and explained that there are many wells that he had not discussed tonight that were part of the process of assessing the extent of the perchlorate and isolated detection of arsenic. Attenuation was confirmed laterally away from the area that is now referred to as EU-2.

Question from Alma Gates, At Large Representative - Horace Mann Elementary School - Where is MW-44?

B. Eaton explained that MW-44 is located to the left of a large tree as one exits from Kreeger Hall.

Question from A. Gates, At Large Representative - Horace Mann Elementary School - Did I not just hear you say that the numbers are going down? According to this they are going up.

B. Eaton explained that the numbers are not going down for all of the wells. MP-44 is an example where the trend is actually up or cannot be shown statistically to be down or not a trend.

Question from A. Gates, At Large Representative - Horace Mann Elementary School - So if you walk back away from the different wells, is it not easier to pinpoint the source?

T. Beckwith explained that MW-44 is at 90 feet below ground surface. PZ-4S and PZ-4D are right next to MW-44, but are shallower. PZ-4S is ~ 40 feet below ground surface and PZ-4D is ~ 60 feet below ground surface. PZ-4S and PZ-4D have cleaned up over time, so that means the shallow groundwater is cleaning up, which would indicate that there is not a significant soil source above it. Detections are still seen at MW-44.

Question from M. Bresnahan, Community Member - That is the deep section, right?

T. Beckwith explained that MW-44 has not had the opportunity to flush out and may take a while longer for concentrations to begin dropping off since the area is fractured rock and there is a limited amount of water that passes through.

The wells in front of Kreeger Hall were tested for hydraulic permeability. PZ-4S allows ~10 feet of water per day through the shallow zone at ~40 feet, which is soil and heavily fractured bedrock. PZ-4D would allow about 1 foot of water per day to pass through, and MW-44 allows an inch per day of water to pass through the zone at ~ 90 feet.

Question from M. Bresnahan, Community Member - So what you are saying is that it is purely geographic-based on that area.

D. Noble and T. Beckwith confirmed that the geology is definitely affecting the flow of water.

Question from Audience Member 2 - On every one of these charts I have looked at it, it stops at 2014. This is 2017; how come they did not add 2015, 2016, and up to date?

B. Eaton explained that the last monitoring was conducted at the beginning of the reporting of the Groundwater RI. He confirmed that there has not been any monitoring that has been considered in this report since those dates.

T. Beckwith added that when monitoring finished in 2014, USACE determined there was sufficient data to write the reports and to come to a conclusion. Further data collections have halted until a final decision is made.

7. Schedule

- Summer 2017 - address any Partner comments to finalize the Groundwater FS report.
- Fall 2017 - the selected alternative will be formally presented in the Groundwater Proposed Plan (PP), which will be available for public view and comment.
- Summer 2018 – after reaching consensus on the Groundwater PP, the final selected alternative to deal

with groundwater will be formalized in the Groundwater Decision Document (DD).

III. Community Items

No community items were presented.

IV. Open Discussion and Future RAB Agenda Development

A. Upcoming Meeting Topics

- Groundwater Feasibility Study
- Site-Wide Decision Document
- Site-Wide Prioritization Scheme
- 4825 Glenbrook Road
- 4835 Glenbrook Road

B. Next RAB Meeting:

Tuesday, July 11, 2017

C. Open Discussion

V. Public Comments

No public comments were presented.

VI. Adjourn

The meeting was adjourned at 8:59 PM.