

MEMORANDUM FOR RECORD

SUBJECT: Fort Detrick Restoration Advisory Board (RAB) Meeting Summary,
7 AUGUST 2019

1. Summary Contents

Items addressed at the meeting are listed below, with corresponding section numbers indicated in the column on the right.

SUBJECT/ACTION TYPE	SECTION NUMBER
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Please note: PowerPoint presentations were utilized during the RAB meeting. A copy of the presentations is attached to these minutes and is incorporated into these minutes by this reference.

Text contained within brackets [] has been added for clarification purposes.

2. Attendees

Members Present:

Dr. Gary Pauly, Community RAB Member, Co-Chair
Mr. Joseph Gortva, Army Co-Chair, Fort Detrick, Chief, Environmental Program
Mr. Barry Glotfelty, Frederick County Health Department
Dr. Elisabeth Green, Maryland Department of the Environment
Ms. Jennifer Hahn, Community RAB Member
Mr. Cliff Harbaugh, Community RAB Member
Ms. Elizabeth Law, Community RAB Member
Mr. Rob Thomson, US Environmental Protection Agency

Others Present:

Mr. John Buck, US Army Corps of Engineers
Mr. John Cherry, Arcadis
Ms. Rosemarie Potocky, Arcadis
Mr. Rob Wasserman, ECC
Mr. Brandon Fleming, USGS
Ms. Shelly Morris, On-Site Contractor to Fort Detrick Environmental Restoration Program
Mr. Gary Zolyak, Fort Detrick, SJA
Mr. Robert Law
Mr. Robert Ladner
Ms. Sofia Verheyen, Clean Water Action
Ms. Jennifer Konze, Clean Water Action
Ms. Lanessa Hill, Fort Detrick, Public Affairs Office
Ms. Katrina Harris, Bridge Consulting Corp.

Members Absent:

Mr. Rolan Clark, Community RAB Member
Mr. Eli DePaula, Community RAB Member
Dr. Henry Erbes, Community RAB Member
Ms. Karen Harbaugh, Community RAB Member
Mr. Barry Kissin, Community RAB Member

3. Meeting Opening / Remarks

Mr. Gary Pauly, Community Co-Chair opened the meeting and welcomed everyone. He explained the purpose of the RAB, noting it is a venue for community involvement. He thanked members of the public for attending the meeting. Mr. Pauly invited all present to introduce themselves. Mr. Joe Gortva, Army Co-Chair, reviewed the general ground rules for the meeting, noting after each presentation RAB members will be offered the opportunity to ask questions and make comments, followed by members of the public being invited to ask questions and make comments.

Mr. Gortva stated that one of the RAB's community members, Mr. George Rudy, had passed away earlier in the year. Mr. Gortva said he wanted to take a few minutes to recognize Mr. Rudy for his contributions to the community and to the RAB. Mr. Gortva stated: "As a nuclear systems expert, Mr. Rudy applied his expertise in assessing risks with many environmental projects within our community. He gave much of his time to attending County and City meetings, in addition to our RAB meetings. He asked questions and was an active participant in discussions here at the RAB, and his voice and opinions will be missed. The Smarter Growth Alliance member organizations recognized Mr. Rudy with a tree planting at which he also was awarded posthumously, the Frederick County Lifetime Achievement Sustainability Award. On behalf of Fort Detrick, I wanted to publicly recognize and thank Mr. Rudy for his years of service on the RAB and his dedication to our community."

4. Meeting Minutes/Standard Operating Procedures/New Member Vote presented by Mr. Joseph Gortva, Fort Detrick

Mr. Gortva noted minutes from the August 2018 meeting had been sent out and asked for any comments.

Ms. Jennifer Hahn said she had questions on statements made in the minutes:

- Page 3, When will data be available from the new monitoring wells discussed by Mr. Buck?
- Page 4, Will sampling results be shared tonight? Mr. Gortva responded the results will be part of the presentations tonight.
- Page 4, Has Fort Detrick received any plans for the proposed new road? Mr. Gortva responded he has not received any plans.
- Page 5, Has any information been received on who the other consultants are who will be subcontractors to Fox and Associates? Are these consultants required to be cleared through EPA or any other agency? Mr. Thomson indicated he had not received any information.
- Page 5, The RAB was told they would receive the work plan for the pilot study after the regulators' review. Ms. Hahn said she expected to receive the work plan prior to the work starting. Mr. Gortva said he would distribute the work plan to the RAB members.
- Page 6, Will the pilot study take two and a half years or does that timeframe include implementation of the remedy? Mr. Gortva responded the pilot study would take two and a half years.
- Page 7, What exactly is being injected during the bioaugmentation? Mr. Gortva responded the bioaugmentation will be discussed during the presentations.

- Page 10, Will the additional vapor intrusion testing for Area A be discussed tonight? Mr. Gortva said additional vapor intrusion testing would only be conducted if the Site Inspection found additional areas where TCE was used, and data showed vapor intrusion testing is warranted.
- Page 10, Will recent results from USGS' work be discussed tonight? Mr. Gortva responded the USGS work will be discussed at a future RAB meeting.
- Page 12, Has Fort Detrick's Public Affairs Office issued a press release regarding the pilot study? Mr. Gortva responded that the pilot study was just getting started. [note: the pilot study infrastructure installation. (e.g., pumping/injection well and surface water aerator installation) is underway the pilot study has not begun]
- Have the RAB members received the Site Management Plan? Ms. Shelly Morris said Fort Detrick is preparing the Final FY20 Site Management Plan for distribution and will provide electronic or hard copies as requested. [note: the FY18 Site Management Plan was emailed to the RAB members on 8/2/18]

Mr. Gortva asked for a vote on the Operating Procedures which had been distributed, and the RAB members approved the procedures.

Mr. Gortva stated the RAB members had received a copy of an application for membership from Ms. Elizabeth Law. The RAB members voted to approve Ms. Law's application to be a community member.

5. Areas A and B Groundwater Monitoring presented by Mr. Robert Wasserman, ECC/Watermark

Mr. Wasserman stated ECC/Watermark has a contract to perform monitoring and maintenance at Areas A and B.

Mr. Wasserman first discussed Area A and stated the focus is on Building 568, where trichloroethene or TCE was used, a common solvent, from 1953 until the 1970s. He explained there were three five hundred gallon tanks present and documented spills which impacted groundwater quality.

Mr. Wasserman noted the long-term monitoring program consists of sampling six downgradient monitoring wells along the perimeter of Area A and two extraction wells located at Building 568. He explained the sampling is only for volatile organic compounds, and the results are reported to Maryland Department of the Environment on a semi-annual basis. He stated the most recent round of sampling was just completed, and results will be sent to Maryland Department of the Environment soon.

Mr. Wasserman reviewed the sampling from late 2018 and noted eight wells were sampled. He said the results showed the continued detection of low levels of volatile organic compounds in certain wells with TCE being detected above the maximum contaminant level of 5. He said the

November 2018 data shows there is hydraulic containment with the TCE being contained in the groundwater on Fort Detrick property.

Ms. Law asked if the recent extensive rainfall has had any effect. Mr. Wasserman said no impact was seen at Area A on concentrations seen in the groundwater. He noted at Area B there was also little impact seen, and sampling at Robinsons Spring has actually shown a slight decrease in concentrations detected.

Mr. Wasserman next discussed ECC's work at Area B. He explained there are multiple sampling programs at Area B, including a semi-annual landfill sampling and monitoring program, a quarterly sampling program, and the newer lysimeter moisture sampling program.

Mr. Wasserman advised the semi-annual sampling and monitoring program involves sampling and gauging of 48 landfill area wells. He noted there are varying analytical parameters; some compounds are sampled and analyzed for during every event and some, such as PCBs, pesticides and herbicides, are sampled bi-annually. He said under the monitoring program multiple landfill areas are inspected for signs of erosion and overgrowth; the signage is also inspected to look for missing or damaged signs. Mr. Wasserman stated the landfill caps are maintained including mowing, the application of herbicides, and rodent control activities.

Mr. Wasserman reviewed the 18-month monitoring program that started in late June to use lysimeters to measure the moisture content and to see how effective the landfill caps are at preventing moisture from entering the cap. He explained lysimeters were installed under the caps and outside the caps to gain comparison data during weekly gauging. Mr. Wasserman said there is no data to present yet, but it will be presented at a future meeting.

Ms. Law asked how long the caps had been in place and the lifespan of the caps. Mr. Gortva responded the caps were completed in 2010 to prevent exposure to the waste. Mr. Gortva said since waste is still in place, there is a requirement to do long-term monitoring as well as a comprehensive review every five years to look at the performance of the caps and determine if they are still effective or whether another remedy is needed. Mr. Gortva explained the caps involved placing a plastic liner over the area with a mesh geofabric on top, and then covering with soil and then topsoil and grass to prevent exposure.

Mr. Wasserman gave an update on the Area B quarterly sentinel well sampling program. He advised there are 15 wells which are monitored for volatile organic compounds. Mr. Gortva said the monitoring program was established to have wells around the caps to monitor the effectiveness of the caps. Mr. Gortva explained the sentinel program looks for any changes in the groundwater plume so if a shift or something occurred, the sentinel program would alert the Army to the change.

Mr. Wasserman displayed a table showing the results of the sentinel monitoring back to 2017. He noted the concentrations have been relatively stable with some slight decreases, perhaps due to more groundwater coming into the system and reducing concentrations. He stated there were no spikes as a result of heavy precipitation events. Mr. Gortva said the data for Robinsons

Spring has historically shown concentrations relatively stable for more than a decade with TCE concentrations around 10 parts per billion.

Mr. Rob Thomson explained that the maximum contaminant level is EPA's enforceable level, while the regional screening level is more conservative. Ms. Green noted the maximum contaminant level on the slide for TCE should be 5 parts per billion not 6 parts per billion. Ms. Hahn suggested it would help the public to understand the data if the same measurements were used consistently and expressed a preference for parts per billion.

Ms. Hahn asked how long the monitoring will continue, and Mr. Gortva responded that it will continue until there is a remedy in place and concentrations have dropped consistently below the maximum contaminant level throughout the entire plume which could take 20 years or more.

Mr. Wasserman reviewed the summary of the data and trends, noting the concentrations have been relatively stable or slightly decreasing.

Ms. Law asked about the spike in the data. Mr. Gortva said there was a spike in 1997 when there was field work occurring which may have disturbed the contents of a drum in the landfill. Mr. Gortva said there have not been any other spikes but relatively consistent concentrations over time.

Ms. Hahn asked about the difference in the work being done by ECC versus the work being done by USGS. Ms. Morris noted the work being done by USGS was looking at the groundwater system as a whole, while ECC's work was to monitor certain areas on a regular basis. Mr. Buck added that data was shared across all the groundwater sampling programs being done by different contractors.

6. Area B Groundwater Pilot Study presented by Mr. John Cherry, Arcadis

Mr. Cherry advised he would be discussing a groundwater pilot study which is in the very early stages of implementation.

He explained the pilot study will be looking at some potential remedial actions to assess their effectiveness so informed decisions can be made down the road during the Feasibility Study, Record of Decision, Remedial Design, and Remedial Action phases of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) process being followed by the environmental program. Mr. Cherry stated with the complex karst geology and a number of challenges with the nature of the contamination, a collaborative effort was undertaken to think about what can be tried and what gives the best shot of achieving the overall objective of mass removal to improve conditions. Mr. Cherry explained the purpose of the pilot study is not to try and clean up the whole plume which will be the objective of a full-scale remedy; the pilot study is the initial step to consider what options might be most effective.

Mr. Cherry displayed an aerial photograph showing the monitoring wells across Area B. He explained the pie charts are used to convey the magnitude or concentrations of volatile organic compounds, with bigger pie charts denoting monitoring wells with the higher concentrations of contamination of the four primary contaminants: trichloroethene (TCE), tetrachloroethene

(PCE), chloroform, and cis-1,2 dichloroethane (DCE). He stated there are landfills across Area B contributing to the impacts to groundwater, with the primary source area, Area B-11, being on the western side of Area B. He noted groundwater flow is generally to the east or southeast, with contamination starting at the western disposal area and migrating to the east/southeast until it discharges at Robinson Pond and Carroll Creek. Mr. Cherry stated the concentrations in the groundwater go from tens of thousands parts per billion near the source area to just above the maximum contaminant level of five parts per billion as it gets closer to Robinson Pond.

Ms. Hahn asked if the property off-post next to Area B were to be purchased, would the owners be required to conduct vapor intrusion testing prior to building houses or would any disclosures be required. Mr. Cherry said it was possible testing would need to be done. Ms. Green said new developers would be aware of the groundwater use restrictions.

Mr. Cherry showed a graphic of the conceptual site model and noted he would be talking about both groundwater and surface water components of the pilot study. Mr. Cherry discussed the conceptual site model and explained the goal is to improve conditions at the source area which will improve conditions throughout the study area.

Mr. Cherry stated for the groundwater component the two remediation technologies to be tested are pump and treat and enhanced reductive dichlorination. He said the technology to be tested during the surface water component will be pond aeration using several techniques.

Mr. Cherry discussed the general schedule for the pilot study, noting the drilling work and surface water aeration began in June 2019, with the implementation of all the options taking about 2.5 years. He noted the groundwater technologies will be done sequentially with the pump and treat test done first; this will allow the results to be independently assessed.

Mr. Cherry explained the pump and treat technology involves installing two pumping wells downgradient from the monitoring wells with the highest concentrations of contaminants, pumping the water out of the ground, treating the water, testing the water to confirm it is clean using the full suite of analytes used during the remedial investigation, and discharging the water to local streams. Mr. Cherry said the wells would be drilled to depths of approximately 200 feet, and three pairs of nested monitoring wells would be installed; this work is underway. Mr. Cherry explained that because of the karst environment the pumping rate would be in the range of 20 to 40 gallons per minute. He stated the groundwater sampling will be used to design the treatment process.

Mr. Cherry displayed an aerial photograph of the pump and treat pilot test area and discussed the location of the two pumping points and three pairs of nested monitoring points. He advised there would be conference calls with EPA and Maryland Department of the Environment during the field work to discuss data collected and determine which points would be converted to pumping wells and monitoring wells. He said a decision has already been made to convert Point C to a pumping well.

In response to a question, Mr. Cherry said there would be no installation of wells through a landfill cap.

Mr. Cherry stated baseline sampling will be conducted, along with regular testing during the approximate eight-month long study through the end of 2020. He advised treated clean water will be discharged to a nearby Area B stream (stream 2) on Fort Detrick with regular confirmatory testing.

In response to a question from Ms. Hahn, Mr. Cherry said there would sampling conducted after the pilot study ends to see what, if any, rebound occurs.

Ms. Hahn asked how treated water would be held if it was tested and determined not to be clean. Mr. Cherry responded there would be tanks where the water would be held until tested, and the tanks could be hauled away and properly disposed of if the water cannot be discharged.

Dr. Pauly asked how the volume to be discharged would impact the stream. Mr. Cherry said the amount to be discharged to the stream would not significantly impact the stream. He noted a garden hose discharges about 5 gallons per minute, and the planned pumping is 20 to 40 gallons a minute.

Ms. Hahn stated she had submitted a long list of questions which had not been fully answered except for references to previous meetings where the topic had been discussed. She said many of her questions had been answered by Mr. Cherry's presentation, but she still had a few additional questions.

Ms. Hahn asked if the goal of pump and treat is containment or to reduce concentrations or both. Mr. Cherry said at this site the objective is to reduce mass contamination.

Ms. Hahn asked how the treated water is discharged to the stream. Mr. Cherry responded that the treated, clean water is discharged through tubing.

Ms. Hahn asked if the pump and treat technology will have an impact on the flow of contaminants. Mr. Cherry said monitoring will continue throughout the pilot study, including monitoring which includes a broader set of parameters. He noted there may be some fluctuations as contamination is drawn towards the pumping wells, but it should be minimal due to the low pumping rates.

Ms. Hahn asked if there would be any impact to surface water. Mr. Cherry said the removal of mass should have a positive impact on surface water.

Mr. Cherry next discussed the second technology—enhanced reduction dechlorination. He said this technology has been successfully used for several decades. He explained this technology involves drilling 12 shallow injection points, injecting carbon solution (food-grade molasses) and monitoring the ground water. He explained the carbon solution stimulates the growth of the microbial community which degrades the volatile organic compounds. Mr. Cherry noted the pilot study focuses on whether this technology will work in the karst environment present at Area B.

Mr. Cherry advised the second technology would be tested on the north side of the B-11 cap. He stated there is a good network of existing monitoring wells with a long history of sampling data that can be used for comparison purposes. Mr. Cherry said the new injection points have been installed at depths ranging from 33 feet to 53 feet below ground surface. He stated the baseline groundwater sampling will be conducted in September 2019, and the pilot test implementation would begin in 2021 after the pump and treat technology study. He said the work plan calls for up to three injections, about 2,000 gallons, so it will be a robust pilot study including weekly monitoring to assess carbon substrate distribution. Mr. Cherry said this pilot study will last six to 12 months.

Ms. Hahn asked for a list of anything that is being added to the groundwater in addition to the molasses, and Mr. Cherry said he would provide this information. Mr. Gortva stated this technology is used across the United States, and has been for many years, so the additives are not unique to this site.

Mr. Brandon asked if a tracer would be used with the injections. Mr. Cherry responded this was considered, and it was decided to use heavy water.

Dr. Pauly asked about any potential impact to Carroll Creek from the injections, and Mr. Cherry responded there will be surface water monitoring. [No detectable changes in water chemistry are expected in Carroll Creek during the pilot injection program. Previous investigations have demonstrated that significant dilution occurs between the B-11 Area and the springs at Carroll Creek, which are about 1 mile away. We have observed this both in contaminant concentrations and from previously performed dye traces. Based on the quantities of molasses planned for injection, the potential for adversely influencing the chemistry of the springs is minimal. Even so, the plan includes routine monitoring of multiple wells between the injection area and Carroll Creek and at Robinson Spring, which is groundwater discharge point on Carroll Creek.]

Mr. Cherry next discussed the surface water component of the pilot study. He explained the approach is to install and operate aeration technology in an off-post pond (Robinson Pond) to facilitate the removal of volatile organic compounds from surface water. He said the objective is to evaluate the treatment efficiency of two aeration systems (pond fountains and pond diffusers) to reduce volatile organic compounds in the pond water and ultimately Carroll Creek. Mr. Cherry said calculations have been done to estimate the loading of contaminants detected in Robinson Pond to Carroll Creek, and the thinking is if the mass in Robinson Pond can be removed or reduced, the concentrations in Carroll Creek will also be reduced.

Mr. Cherry displayed a map showing the highest levels of surface water TCE concentrations between 2012 and 2017 as well as non-detections. He stated the highest concentrations in Carroll Creek are an area referred to as the primary discharge area and are in the single digit range of 1 to 3 parts per billion. He said the concentrations moving away from the primary discharge area are very low at less than 1 part per billion compared to the maximum concentration allowed in drinking water which is 5 parts per billion. He noted there are some seeps and springs that feed into Carroll Creek that have higher concentrations in the 10 to 13 parts per billion range. Mr. Cherry advised the levels of PCE are lower than TCE concentrations.

Mr. Cherry said pore water samples were collected from the sediment at the base of the stream to assess the water flowing in Carroll Creek; there were low levels of TCE detected, with 4.9 parts per billion being the highest concentration detected. Mr. Cherry showed photographs of what a seep and spring looks like and explained groundwater comes up to the surface through the seeps and springs.

Mr. Cherry stated the pilot study is being implemented at Robinsons Pond as a higher flow of groundwater is coming from the outfall of the pond compared to seeps and springs. He explained the pond would be aerated through two approaches.

Mr. Cherry said the first pilot test would be to use aeration fountains and volatilize the volatile organic compounds. He showed a photograph of the fountains in place in the pond. Mr. Cherry explained a fairly extensive monitoring program would be in place to initially collect samples weekly and then bi-weekly in the pond, seeps and springs, and in Carroll Creek. Mr. Cherry said air samples will also be collected at three locations around the pond to see if any TCE is detectable at the edge of the pond. He advised baseline sampling will be conducted for one month, and the test would run for two months with six rounds of data collected. Mr. Cherry said there would be a break, and then the next system would be tested.

Mr. Cherry said the second technology to be tested are air diffusers. He explained this would be a system of aeration devices typically in the shape of a tube placed along the bottom of the pond, similar to what is used in fish tanks, which transfers compressed air into the water to produce air bubbles and water-air mixing. Mr. Cherry said the diffusion technology would also be tested for two months with a similar sampling program as is being done for the aeration fountains technology. Mr. Cherry showed some of the sampling points in Carroll Creek.

7. RAB Member Open Discussion and General Community Comments

Mr. Gortva invited open discussion from the RAB members.

Dr. Pauly suggested the election of community co-chair as outlined in the Operating Procedures be conducted at the next meeting.

Mr. Rob Thompson noted there will be a new EPA Remedial Project Manager replacing him—Mr. Jeff Boylan. The RAB recognized Mr. Thompson's service to the RAB and thanked him.

Ms. Hahn commented that meetings are not being held frequently enough and too much time passes between meetings. She encouraged the Army to hold RAB meetings even when the Army does not have much to present in order to address community concerns and information needs.

Ms. Law asked if presentations or a synopsis could be sent in advance of the meeting. Mr. Gortva said it could be possible, but frequently presentations are being updated through the day before the meeting.

Ms. Hahn asked about the status of the website. Mr. Gortva advised that in the process of a new website being developed and installed, the old website files were lost including previous minutes. He advised they are in the process of compiling the files so a new RAB website can be posted. Ms. Hahn offered to provide input on a new website to ensure it would be easy for a community member to use. Ms. Hahn asked how community members could access meeting minutes, and Mr. Gortva said they could call his office or the Public Affairs Office.

Mr. Gortva invited comments for the community members in the audience, and none were offered.

8. Future Meeting Dates

Mr. Gortva said proposed future meeting dates are December 4, 2019, April 8, 2020, and August 5, 2020. Mr. Gortva said all the dates are tentative and invited anyone who had conflicts to let him know.

Mr. Gortva invited Board members to let him know about topics of interest for future meetings.

The meeting adjourned at approximately 9:07 p.m.

Reviewed by:

Approved/Disapproved

Enclosures:

Area A and Area B Groundwater Monitoring

Area B Groundwater Pilot Study

Meeting Sign-In Sheet

DISTRIBUTION:

Each RAB Member (w/o enclosure)

Each Meeting Attendee (w/o enclosure)

Agenda
Fort Detrick Restoration Advisory Board
Wednesday, August 7, 2019 6:30 p.m.
The Hampton Inn & Suites
1565 Opossumtown Pike, Frederick, Maryland 21702

Time	Subject	Person	Action
6:30-6:35	Welcome/ Greetings	Gary Pauly, RAB Co-Chair	Information
6:35-6:40	Ground Rules/Purpose of Meeting	Joseph Gortva, USAG	Information
6:40-6:50	Remembering and Recognizing Mr. George Rudy	Joseph Gortva, USAG	Information
6:50-7:00	RAB Business Meeting Minutes/Final SOPs/New Member Vote	Joseph Gortva, USAG	Information
7:00-7:30	Status Update: Area B Groundwater Monitoring	Robert Wasserman, ECC/Watermark	Presentation
7:30-8:00	Status Update: Area B Groundwater Pilot Study	John Cherry, Arcadis	Presentation
8:00-8:20	RAB Member Open Discussion	RAB members	Discussion
8:20-8:30	General Community Comments	Open to Public	Information
8:30-8:45	Next Meeting/Adjourn Meeting	Gary Pauly, RAB Co-Chair	Closure

Proposed future RAB meeting dates: 12/04/2019
04/08/2020
08/05/2020



Joint Venture (JV) between:

Watermark Environmental, and
Environmental Chemical Corporation (ECC)

Contract No. W912DR-12-D-0005, Task Order 0006
US Army Corp of Engineers (USACE) – Baltimore District

Presenter:

Robert Wasserman, P.G.
Program Manager

Presentation Agenda

➤ Long-Term Monitoring at Area A

- Site History
- Long-Term Monitoring Requirements
- Current Conditions/Results

➤ Long-Term Monitoring and Maintenance at Area B

- Semi-Annual Landfill Monitoring and Maintenance Requirements and Results
- Lysimeter Monitoring
- Quarterly Monitoring Program - Sentinel Monitoring Wells and Robinson Spring Requirements and Results

Area A Site History

- Focused on Building 568, which was constructed in 1953 by the Army as a microbiological research laboratory facility.
- Used to simulate near freezing and subfreezing conditions.
- A chiller was used for this purpose, and TCE was selected for use as the circulating medium in the chiller due to its heat transfer capabilities, low freezing point, viscosity, and non-flammability.
- The circulating system consisted of three tanks (each approximately 500 gallons) located on a concrete pad outside of Building 568.
- Documented problems with the chiller system include spillage of TCE during filling and draining of the system and leaking mechanical seals on the circulating pumps (dating back to 1964).
- The system was operational between 1953 and 1970. There is no historical information documenting the volume of TCE potentially released.

Area A Semi-Annual Monitoring

- The Long-Term Monitoring Program includes the following activities:
 - Sampling of 6 downgradient perimeter monitoring wells and 2 extraction wells (at Building 568).
 - 40 monitoring wells are gauged for groundwater elevation data (varies based on well accessibility).
 - Analytical Parameters: Volatile organic compounds (VOC).
 - Results are reported to MDE on a semi-annual basis.

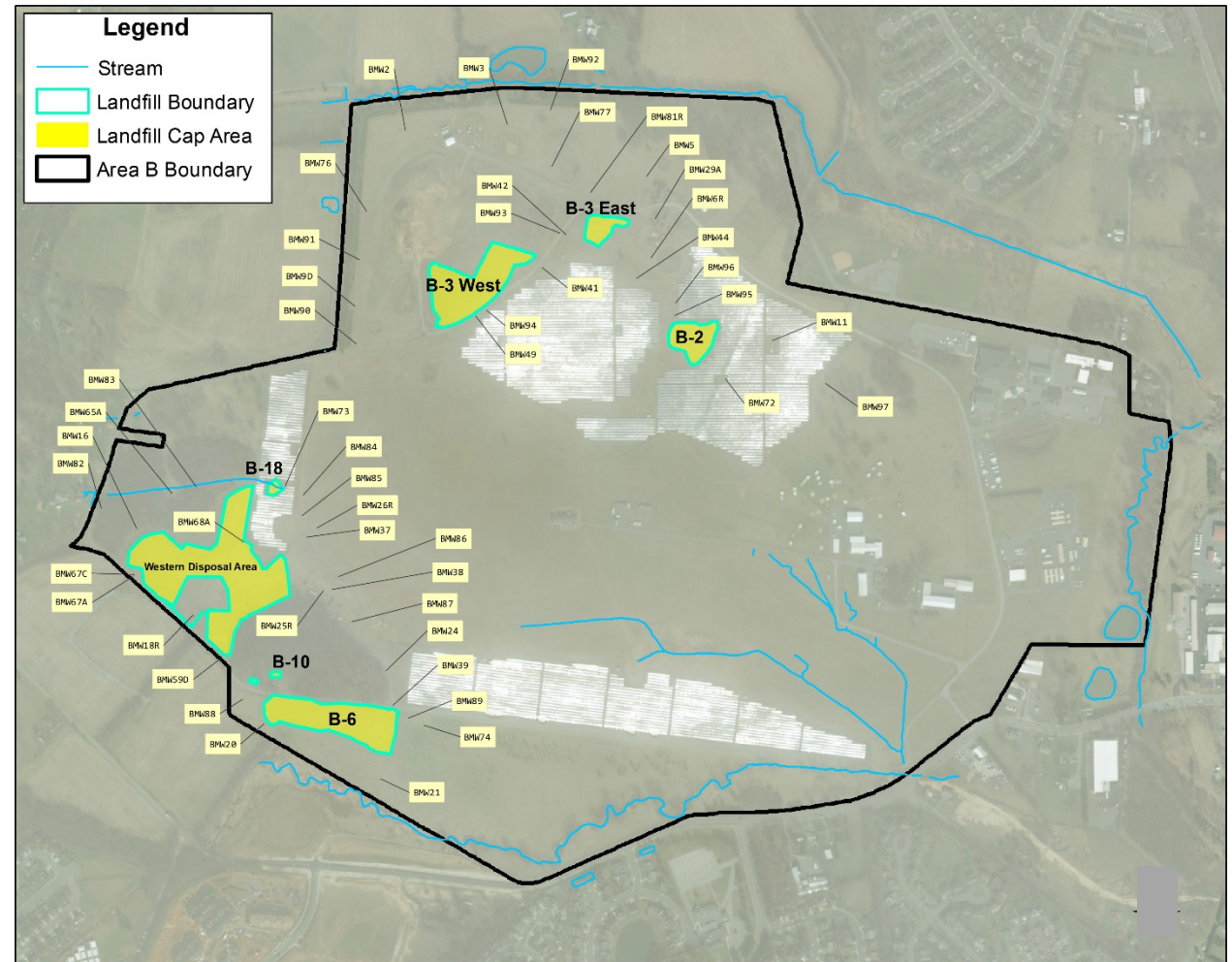


Recent Results - Area A Semi-Annual

- Eight groundwater wells were sampled and analyzed for TCL VOCs during the November – December 2018 sampling event.
- The data quality was found to be acceptable. Low levels of VOC contamination were reported for the groundwater samples, similar to recent sampling events.
- TCE concentrations exceeded the 5 µg/L MCL in extraction well APW-569 at 21 µg/L and in monitoring well AMW568-15A at a concentration of 5.7 µg/L. TCE concentrations in these wells continue to remain relatively stable.
- The November 2018 sampling indicates compliance with the substantive portions of the selected remedial alternative listed below.
 - Hydraulic containment of the source area near Building 568; and
 - Containment of TCE concentrations above the Federal MCL to Fort Detrick property.

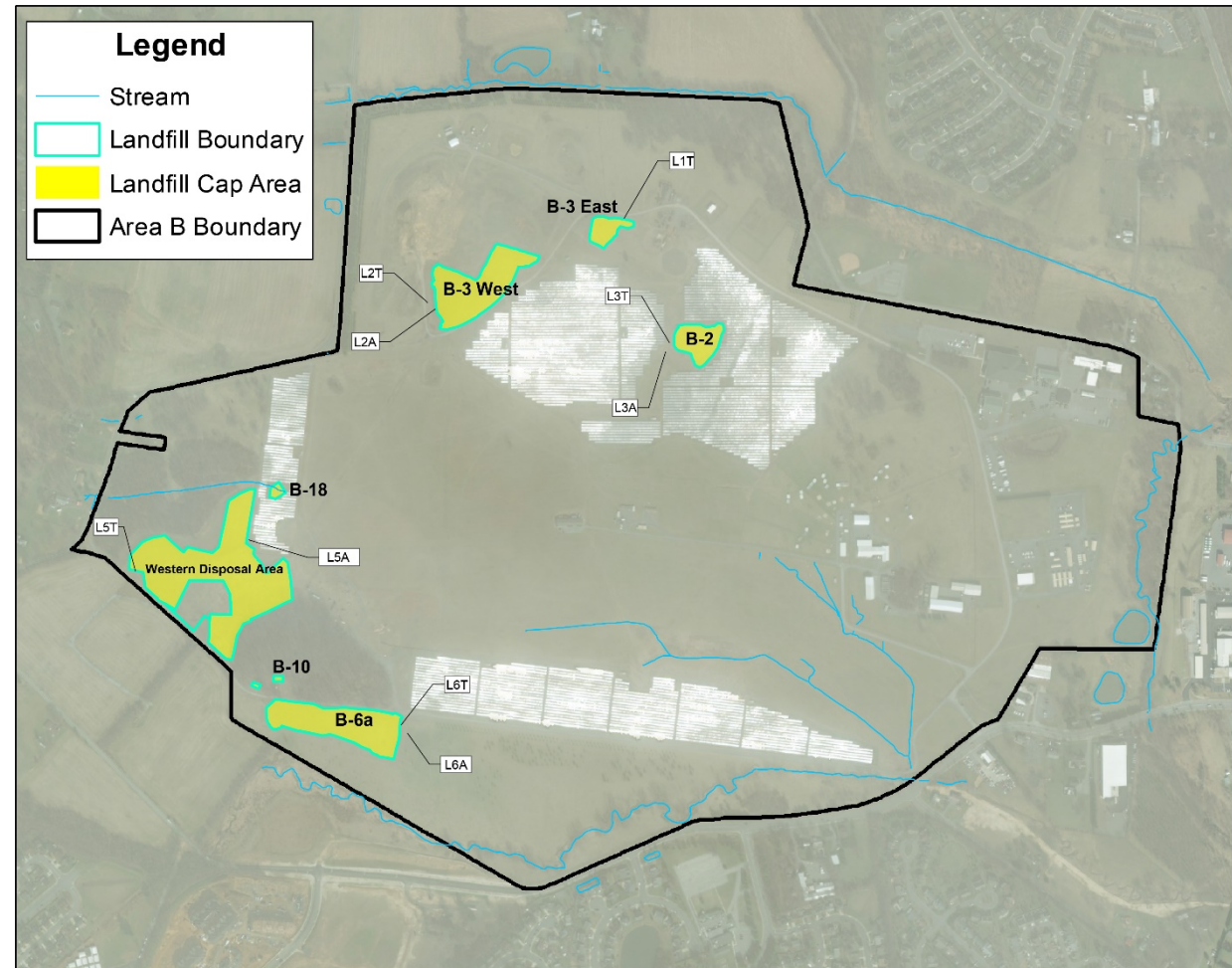
Area B Semi-Annual Landfill Sampling and Monitoring Program

- Includes sampling and gauging of 48 landfill area monitoring wells.
- Analytical Parameters: VOCs, Semi-volatile organic compounds (SVOC)/ polycyclic aromatic hydrocarbons (PAH), total and dissolved metals, and general water quality parameters.
- Additional Analytical Parameters (biennially): polychlorinated biphenyl (PCB), pesticides, herbicides, dioxins/furans and radiochemistry.
- Landfill Inspections: Conducted semi-annually. Includes inspections of the following landfill cap areas:
 - B-2, B-3 East, B-3 West, B-6, B10-1, B10-2, B18, and the Western Disposal Area.
- Landfill Cap Maintenance: Conducted semi-annually. Includes mowing of landfill caps and application of herbicides for weed control (as needed).
- Landfill Cap Rodent Control Activities: Conducted as needed.



Area B Lysimeter Monitoring Program

- Purpose: Lysimeters are used to measure the percolation of water through soils. They were recently installed to evaluate the overall effectiveness of the landfill caps in preventing precipitation and/or surface run-off from infiltrating into the underlying landfill cap and causing leachate to thereby migrate into groundwater.
- Includes 4 pairs of lysimeters that were installed by USACE in 2018. One lysimeter in each pair is installed beneath the landfill to measure potential infiltration of precipitation through the cap. The second lysimeter is installed outside of and away from each landfill as a control.
- Lysimeters are monitored on a weekly basis. Monitoring commenced in late June 2019.
- Select shallow groundwater monitoring wells are also gauged to measure/monitor real time groundwater levels in the general area of these 4 lysimeters.

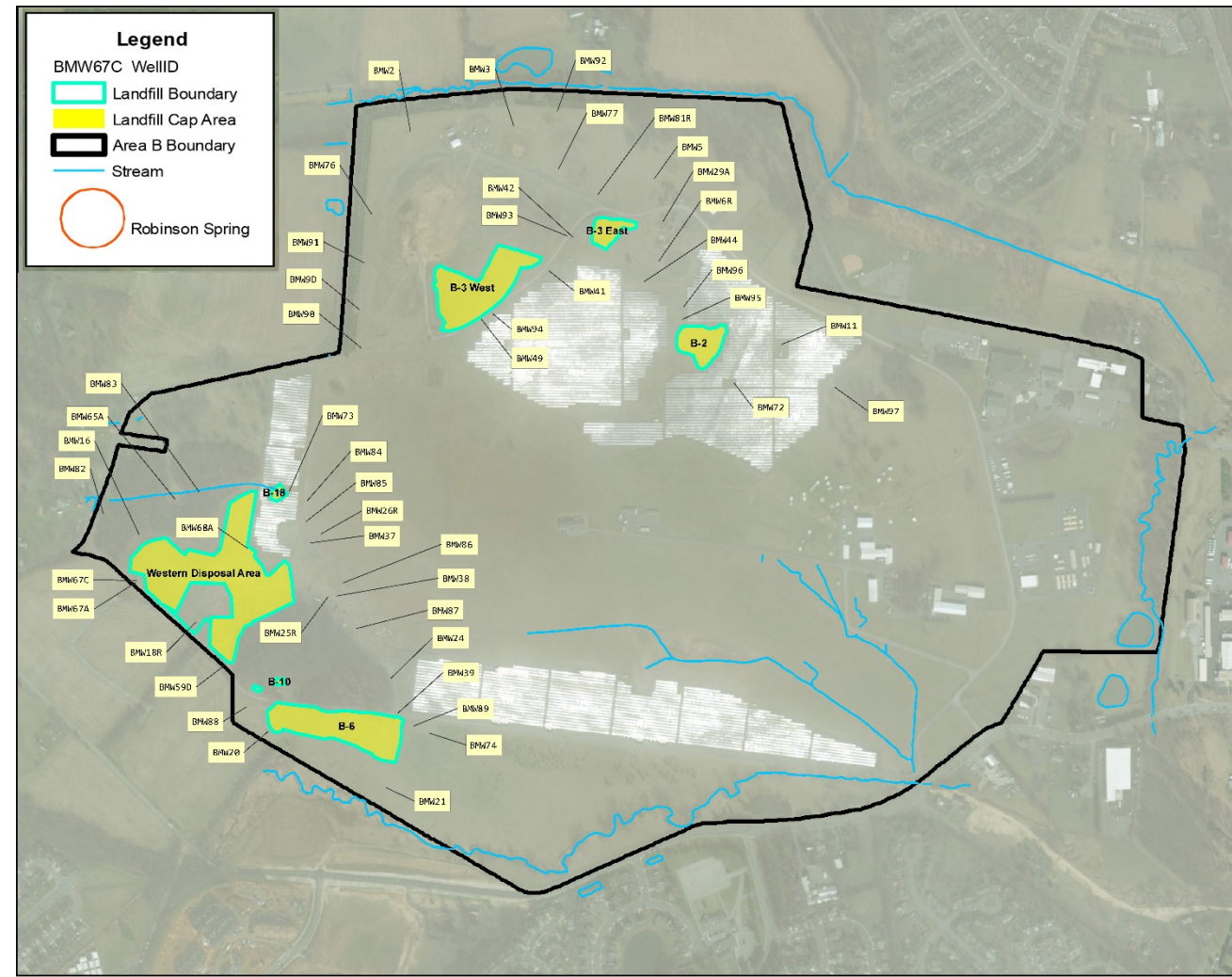


The Quarterly Monitoring Program includes the following activities:

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Area B Semi-Annual Landfill Sampling and Monitoring Program

- Includes sampling and gauging of 48 landfill area monitoring wells.
- Analytical Parameters: VOCs, Semi-volatile organic compounds (SVOC)/ polycyclic aromatic hydrocarbons (PAH), total and dissolved metals, and general water quality parameters.
- Additional Analytical Parameters (biennially): polychlorinated biphenyl (PCB), pesticides, herbicides, dioxins/furans and radiochemistry.
- Landfill Inspections: Conducted semi-annually. Includes inspections of the following landfill cap areas:
 - B-2, B-3 East, B-3 West, B-6, B10-1, B10-2, B18, and the Western Disposal Area.
- Landfill Cap Maintenance: Conducted semi-annually. Includes mowing of landfill caps and application of herbicides for weed control (as needed).
- Landfill Cap Rodent Control Activities: Conducted as needed.



Summary of Recent Results at Robinson Spring

Analyte	Locations			Robinson Spring									
	Sample ID			RISP-03-SPRING									
	Date			6/27/17	8/30/17	10/19/27	12/21/17	5/18/18	7/25/18	9/19/18	12/11/18	3/28/19	6/5/19
	Unit	MCL	RSL Tapwater										
Chloroform	µg/L	70	0.22	1.9	2.0	1.7	1.8	1	0.8	0.8	0.8	0.6	0.6
Tetrachloroethene	µg/L	5	4.1	0.5	0.6	0.6	0.6	0.4J	0.3J	0.3J	0.3J	0.2J	0.2J
Trichloroethene	µg/L	6	0.28	8.6	8.0	8.4	8.4	3.5	3.5	2.9	2.6	2.3	2.2

Notes:

Results exceeding the Maximum Contaminant Level (MCL) are shown in **bold**.

Results exceeding the Regional Screening Level (RSL) are shaded gray.

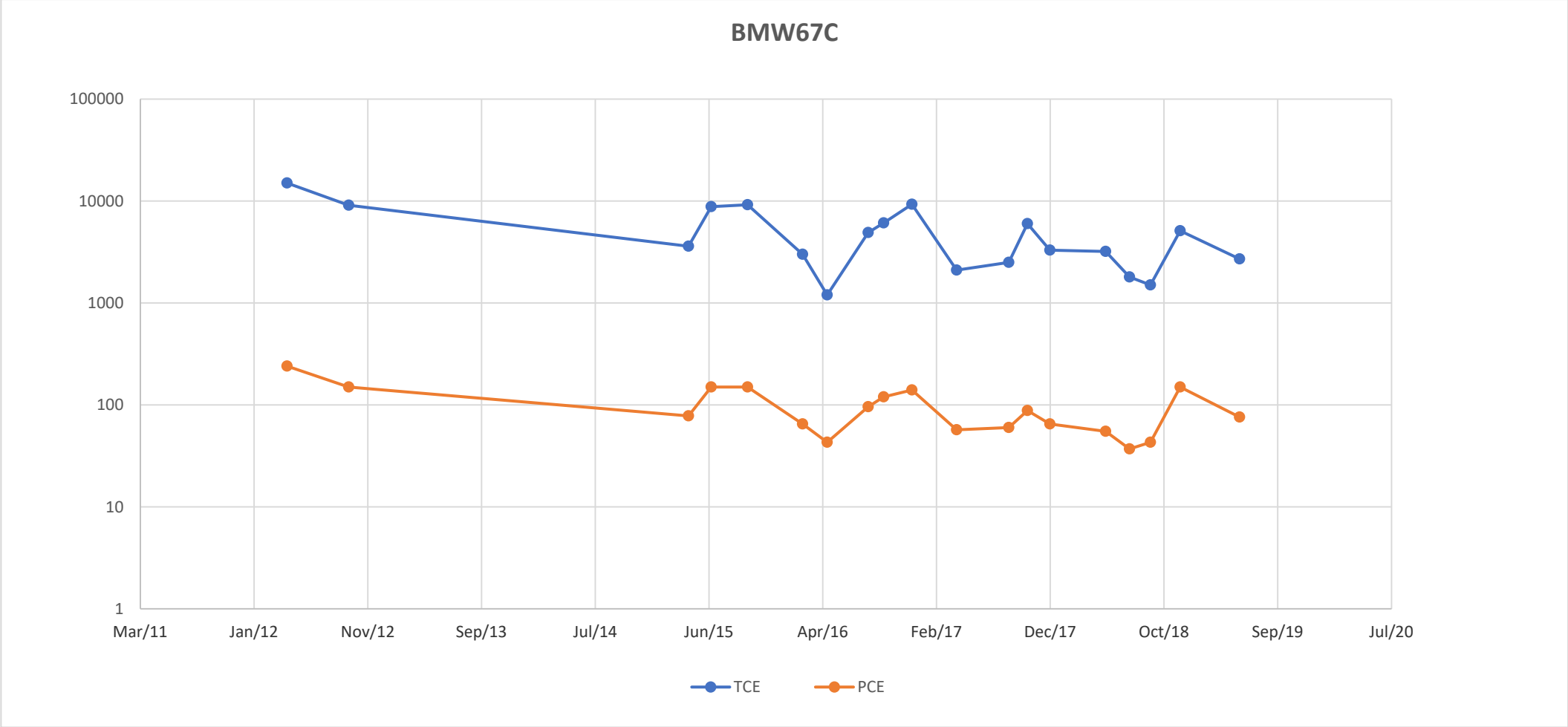
-- Indicates that an analyte was analyzed for but was not detected at or above the method reporting limit.

(1) - Chloroform has a maximum contaminant level goal (MCLG) of 70 µg/L.

J = Estimated Value

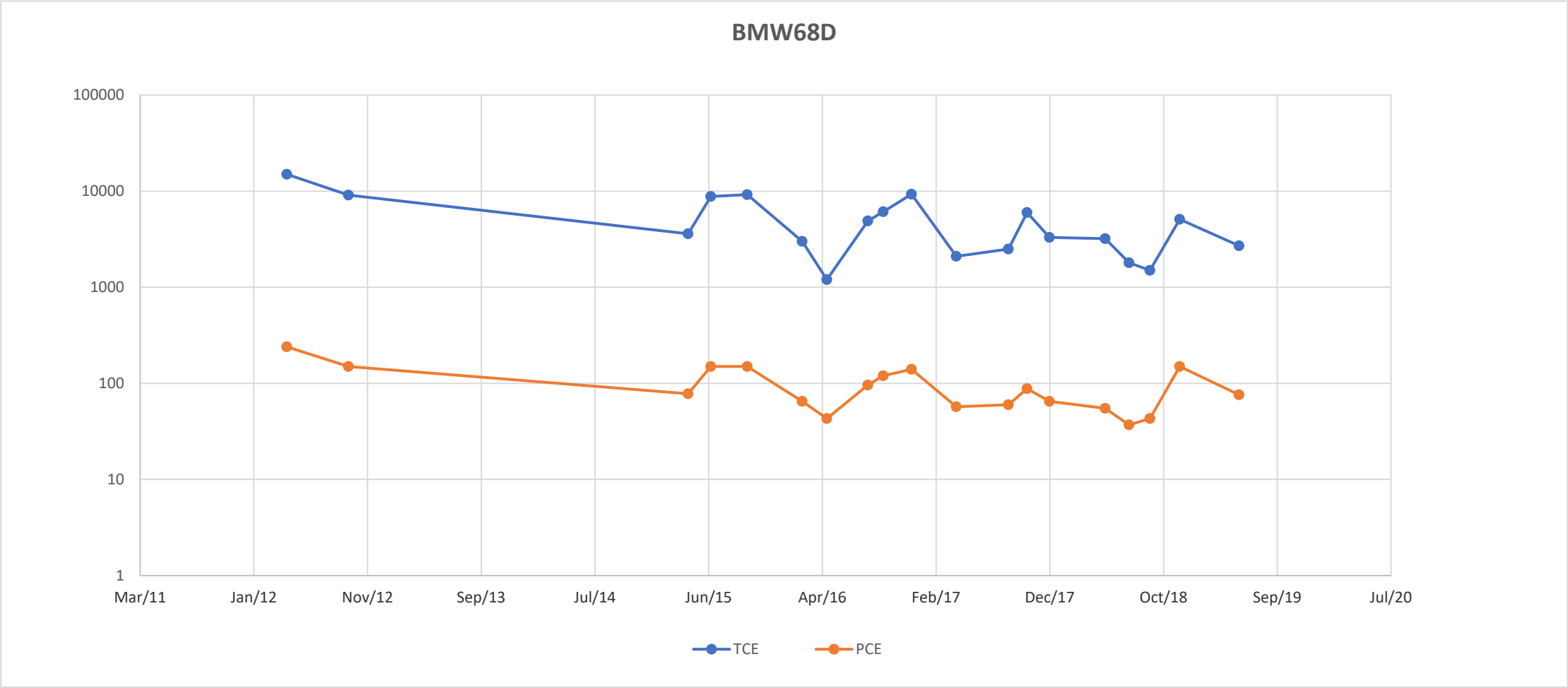
RSL = Regional Screening Levels for Tapwater, THQ = 0.1, EPA November 2018

Trend Graph for BMW67C



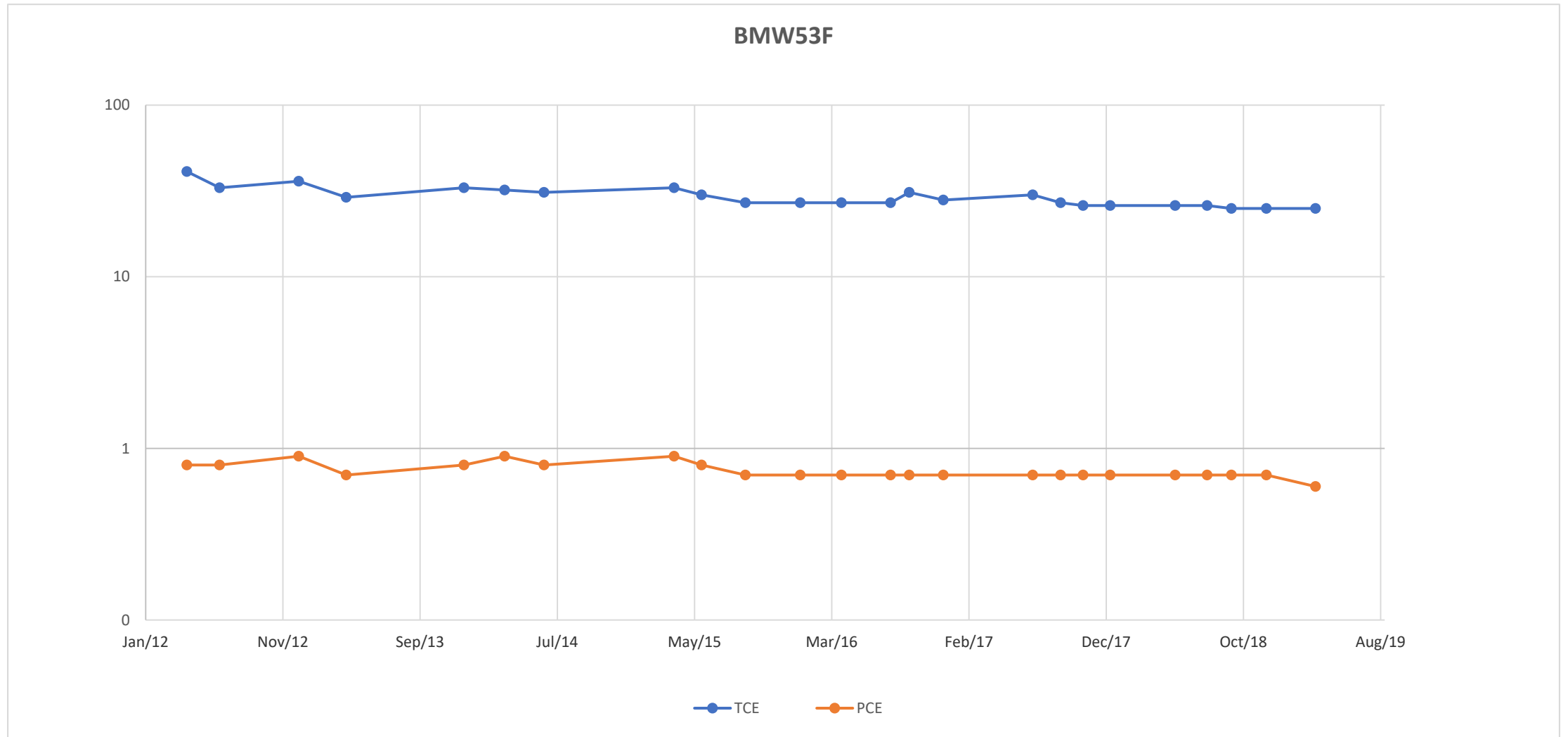
Notes:
May 2019 data is draft.

Trend Graph for BMW68D



Notes:
June 2019 data is draft.

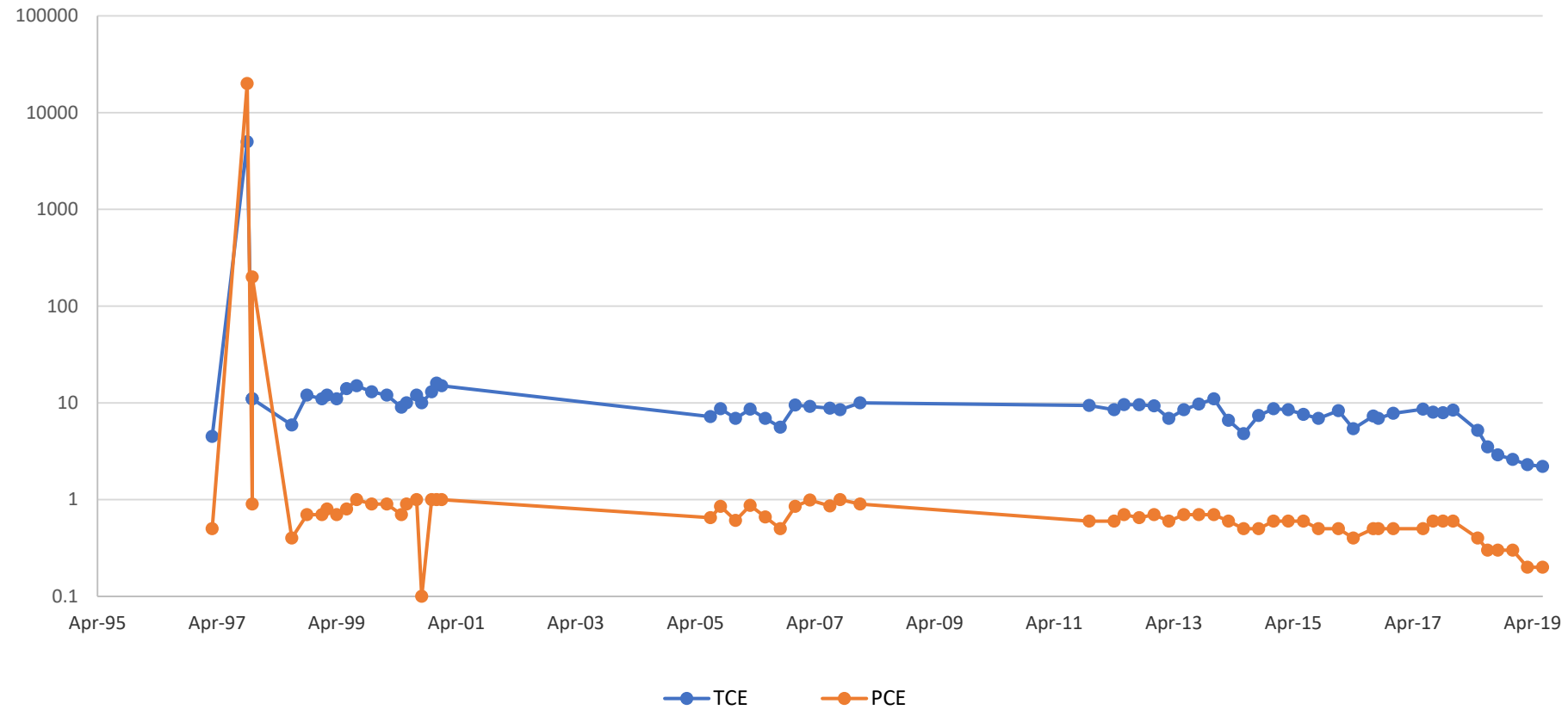
Trend Graph for BMW53F



Notes:
June 2019 data is draft.

Trend Graph for RISP03

RISP03



Notes:
June 2019 is draft.

Questions?

ENVIRONMENTAL RESTORATION SERVICES FORT DETRICK, FREDERICK MD

Progress of the Pilot Study for Three Potential Remedial
Technologies

August 7, 2019

John Cherry
Arcadis

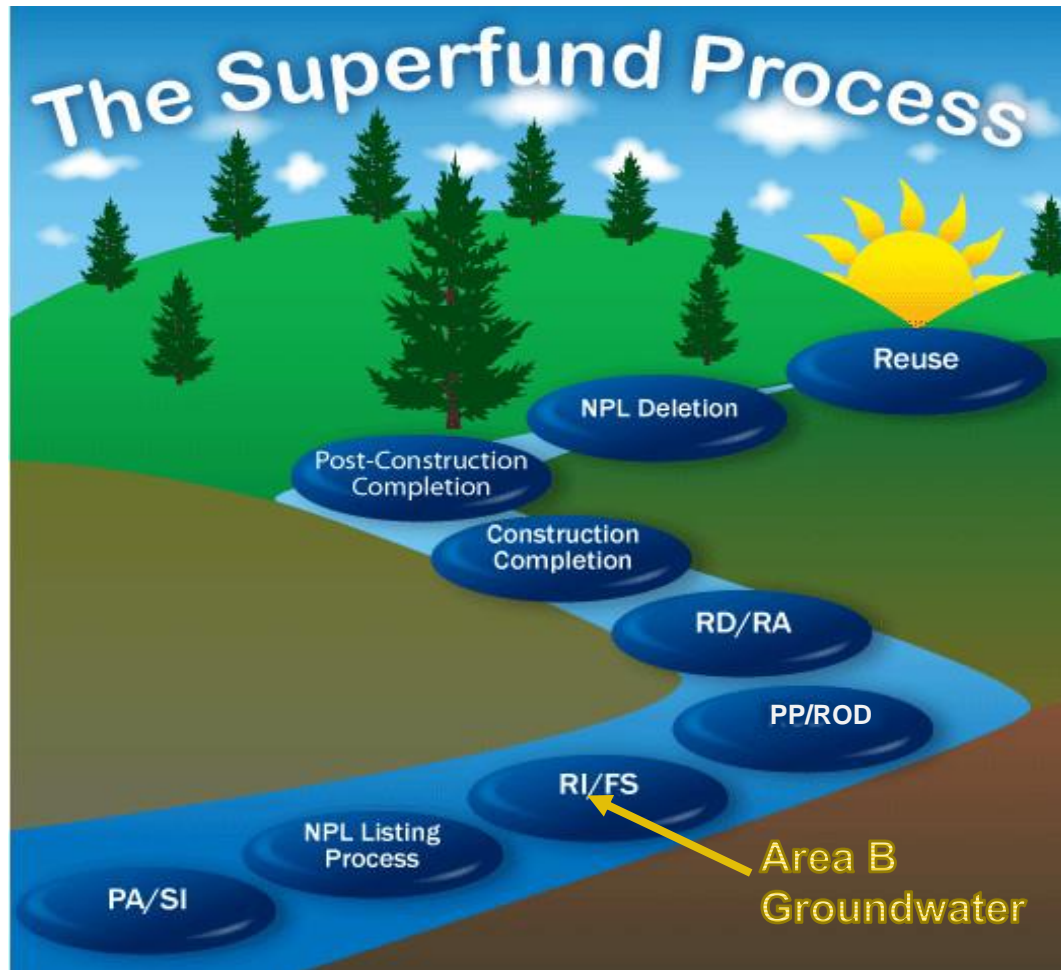
Overview of Topics

- ❑ Pilot Study Overview
- ❑ Pump & Treat (P&T) Drilling Update
- ❑ Enhanced Reductive Dechlorination (ERD) Drilling Update
- ❑ Pond Aeration for Surface Water Update

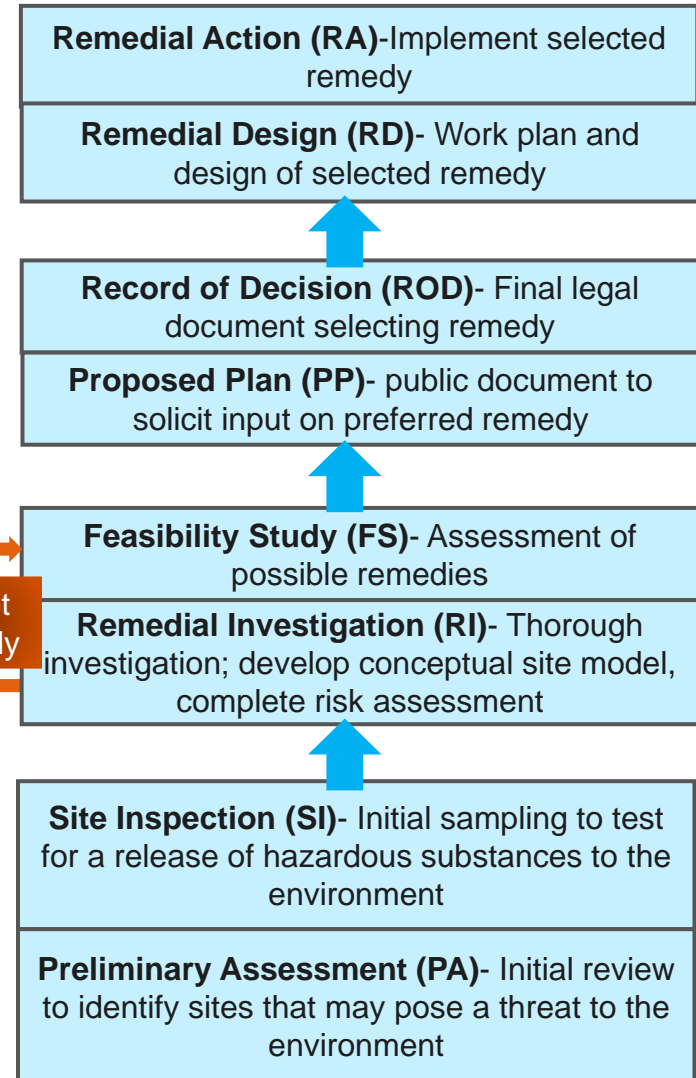


Area B Groundwater Pilot Study Overview

Where Does this Pilot Study fit into the Process?



Pilot Study

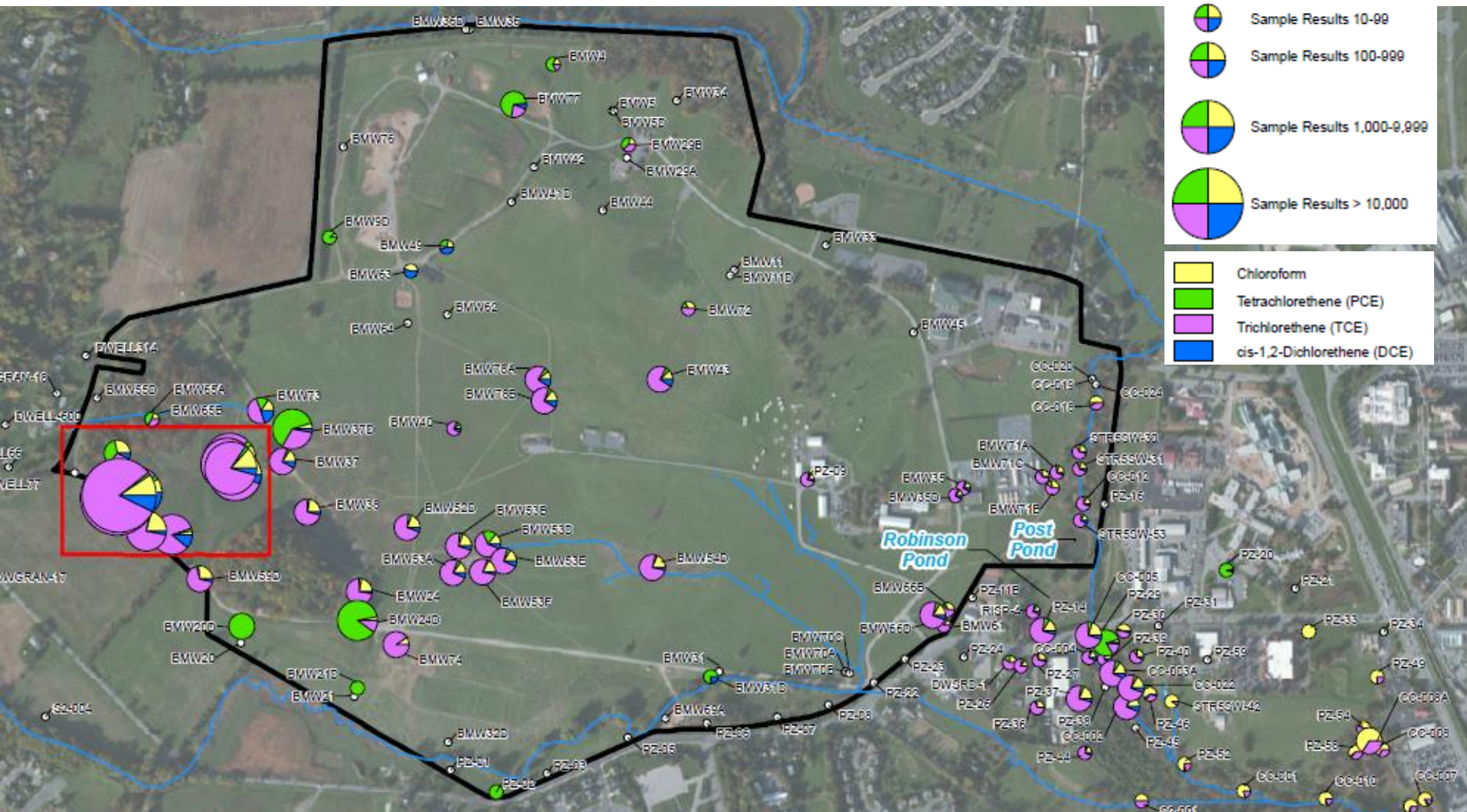


Pilot Study was based on data gathered during the RI activities. Results will be used in the FS to assess potential full-scale remedial technologies.

Purpose of the Pilot Study

- Goal: Evaluate potential pilot study options that could be planned and tested to facilitate future selection of appropriate full-scale remedial actions
- Primary objective: Collect data needed to evaluate the effectiveness and feasibility of each proposed remedial technology for potential full-scale implementation at the site.
 - Data will be used to support decision making about the remedial strategy for the Site.
 - Potential remedial alternatives will be identified in a Feasibility Study for detailed evaluation of possible remedial approaches to address any potential risks to human health and the environment identified in the forthcoming RI report.

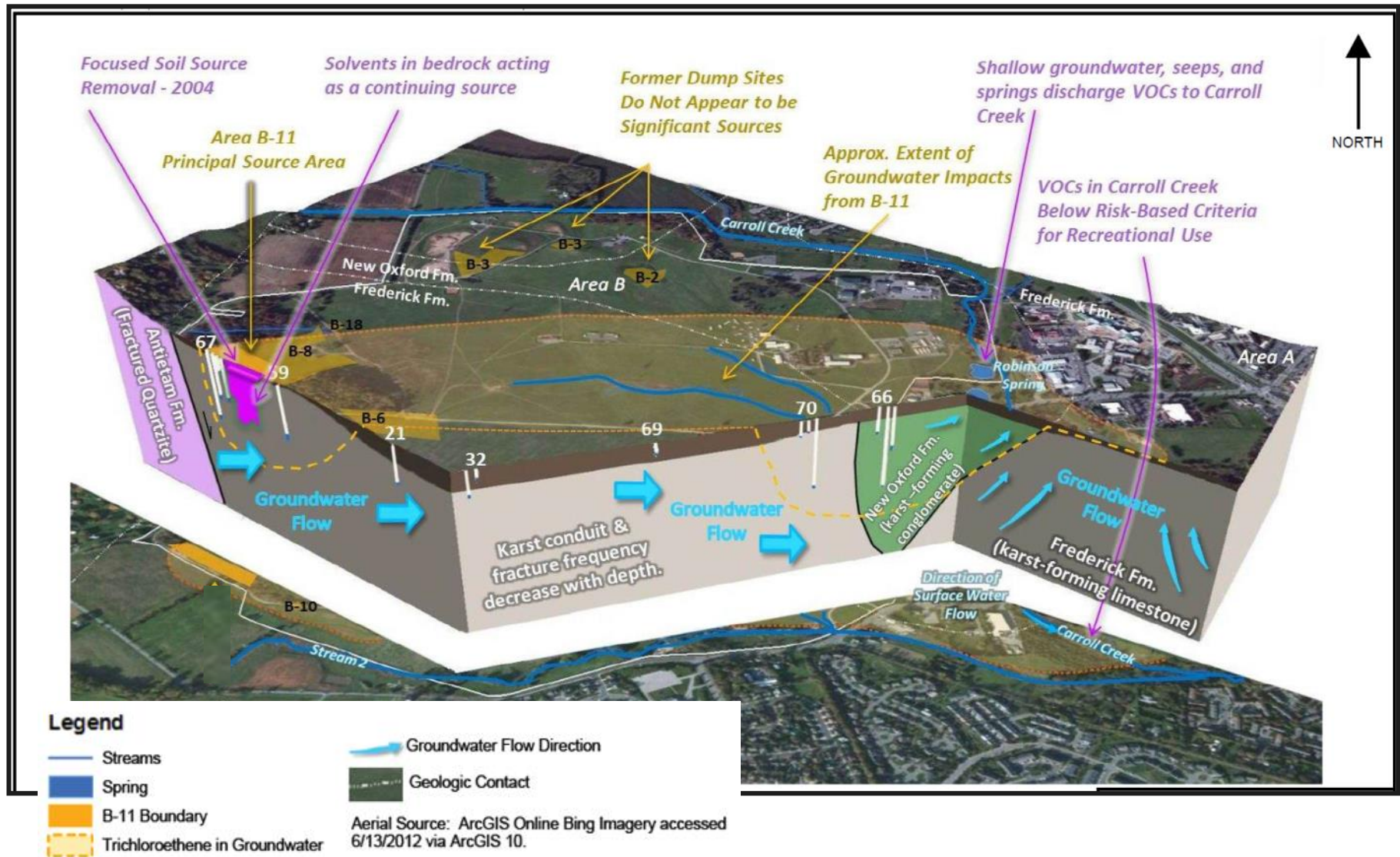
Distribution of VOCs



The Maximum Contamination Level (MCL) is the maximum level allowed of a contaminant in water which is delivered to any user of a public water system and is set by USEPA.

The MCL for both TCE and PCE is 5 µg/L.

Conceptual Site Model



Three Pilot Study Technologies in Two Areas

Groundwater Pilot Study Area (source area)

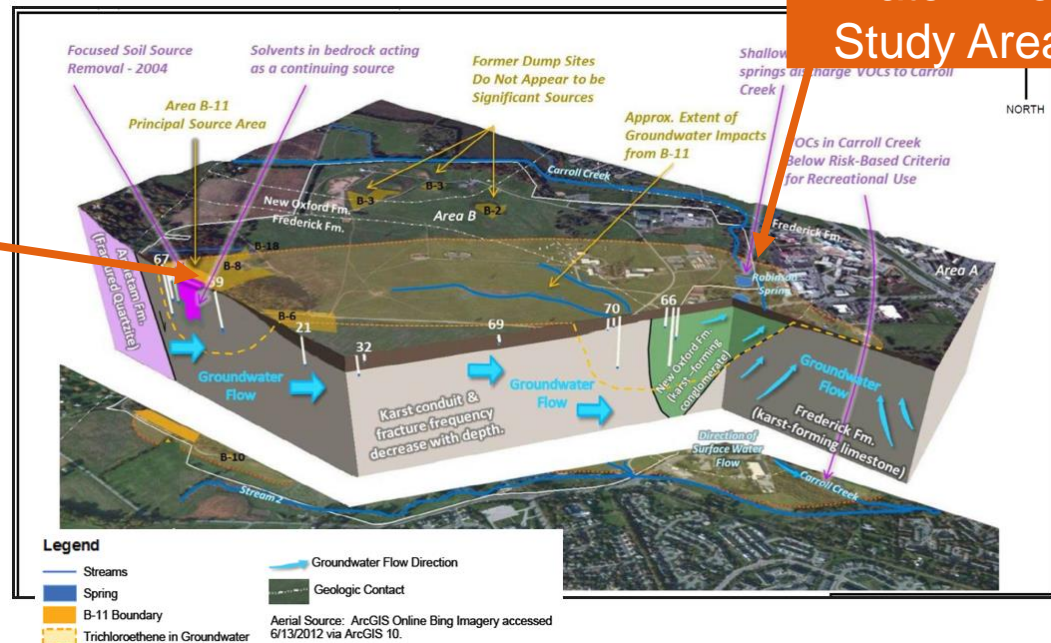
1. Pump and Treat
2. Enhanced Reductive Dechlorination (ERD)

Surface Water Pilot Study Area (downgradient)

3. Pond Aeration

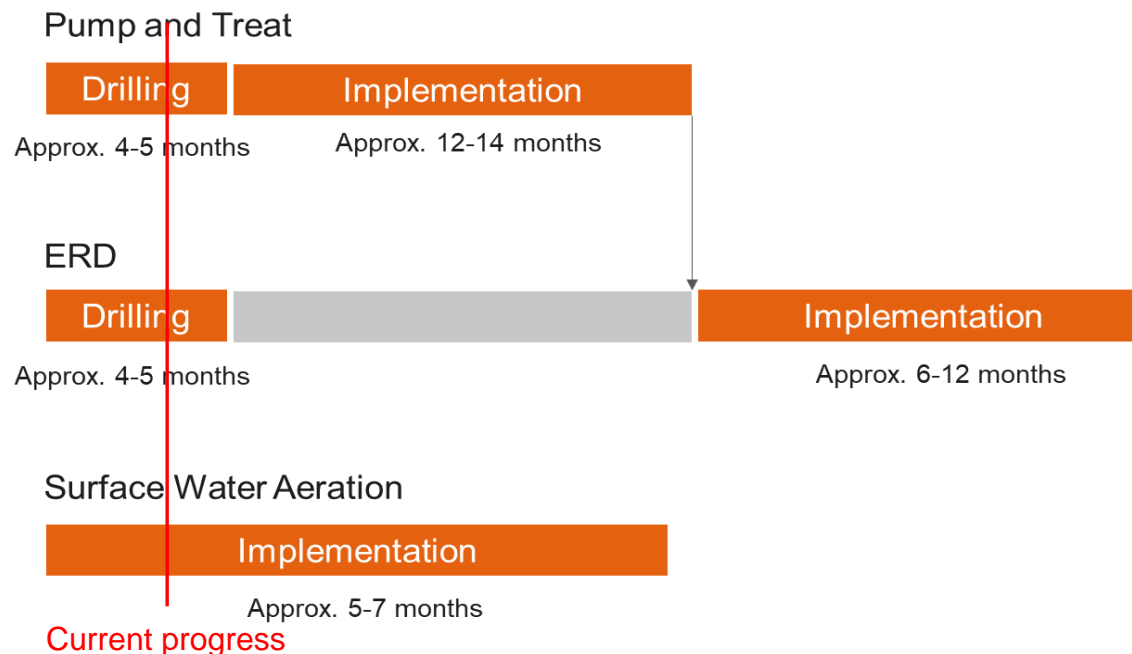
Groundwater
Pilot Study
Area

Surface
Water Pilot
Study Area



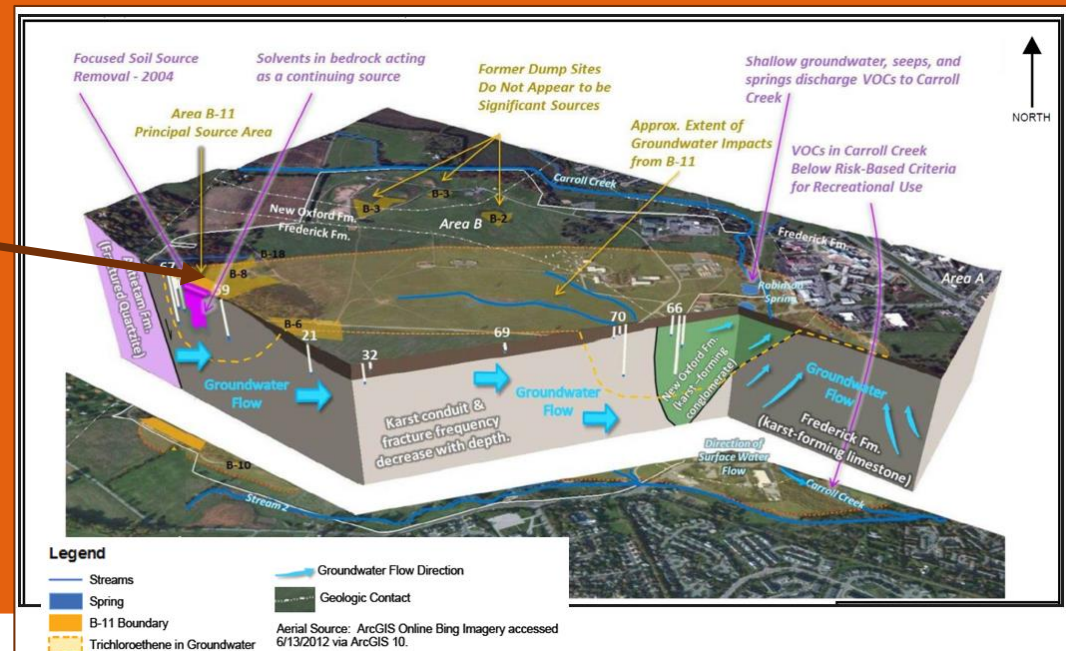
General Pilot Study Schedule

- Drilling work began on June 18, 2019
- Surface water aeration implementation began on June 10, 2019
- Implementation of all options will take approximately 2.5 years



1st Technology: *Pump and Treat*

Groundwater Pilot Study Area



1st Technology: Pump and Treat

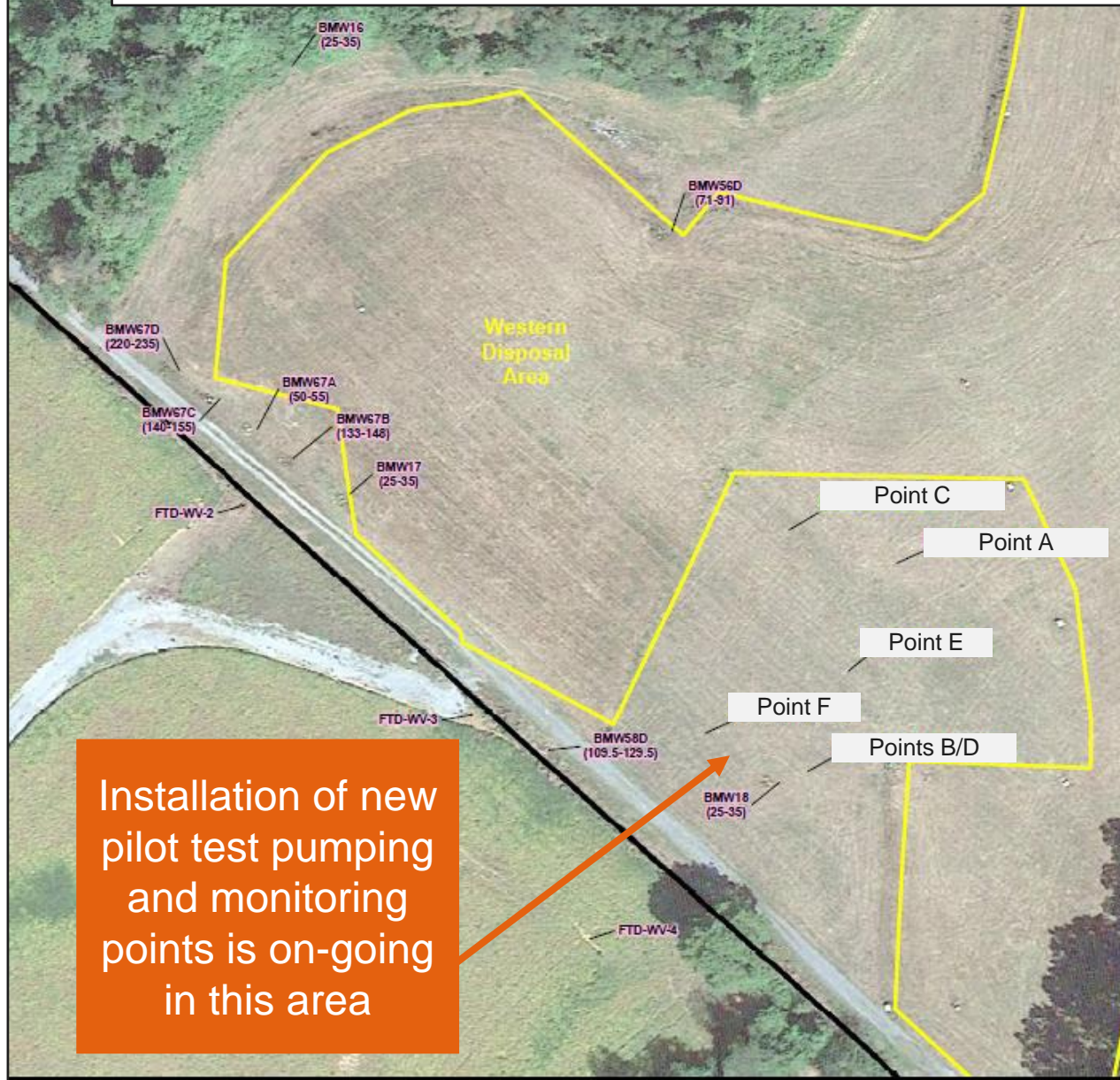
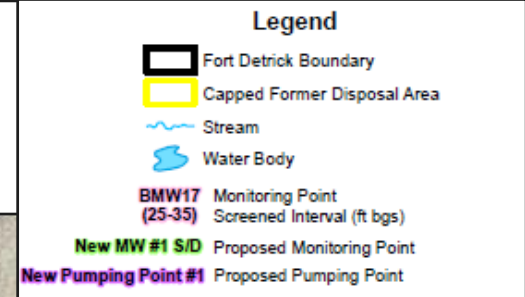
Approach

- Groundwater will be pumped from two newly installed points; water will be treated to remove potential contaminants; clean water will be discharged to nearby stream

Objective:

- Evaluate the feasibility of pumping and treating groundwater to reduce VOC concentrations in karst bedrock groundwater near the capped area; assess whether this approach could be expanded for full-scale implementation.

Pump and Treat Pilot Test Area



- New source area points planned for “cap cut-out area” of the Western Disposal Area landfill cap.
- Includes 2 pumping points and 3 pairs of nested monitoring points
- Geophysics and packer testing in each borehole
- Nested points will have a shallow zone (50-100 ft bgs) and deep zone (100-200 ft bgs)

Installation of new pilot test pumping and monitoring points is on-going in this area

Pump and Treat Drilling Progress

8/7/2019

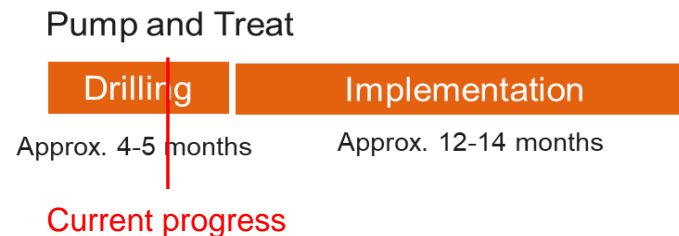
- Drilling Started - June 19, 2019
- ✓ All 5 new borings drilled to depths of approx. 200 feet.
- ✓ Geophysical logging and packer testing conducted to determine construction specification for pumping & monitoring points.
- ✓ Pumping/monitoring point construction underway.



1st Technology: Pump and Treat

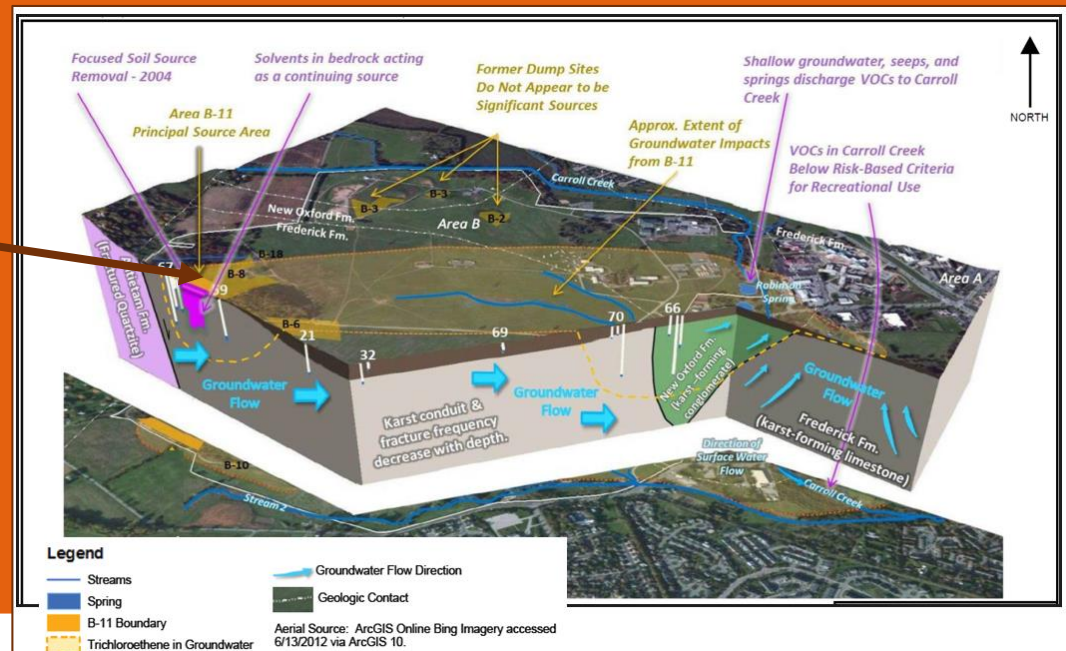
Next Steps

- Wrap up installation of pumping and monitoring points.
- Baseline groundwater sampling– *September 2019*
- Treatment system will be built based on pumping rates and analytical results – construction *planned for early 2020*
 - A new building will be installed to house groundwater treatment system
 - Treated clean water will be discharged to nearby Area B stream with regular confirmatory testing
- Pumping test, water treatment, and sampling will occur for 8 months – *planned through the end of 2020*



2nd Technology: *Enhanced Reductive Dechlorination*

Groundwater Pilot Study Area



2nd Technology: Enhanced Reduction Dechlorination (ERD)

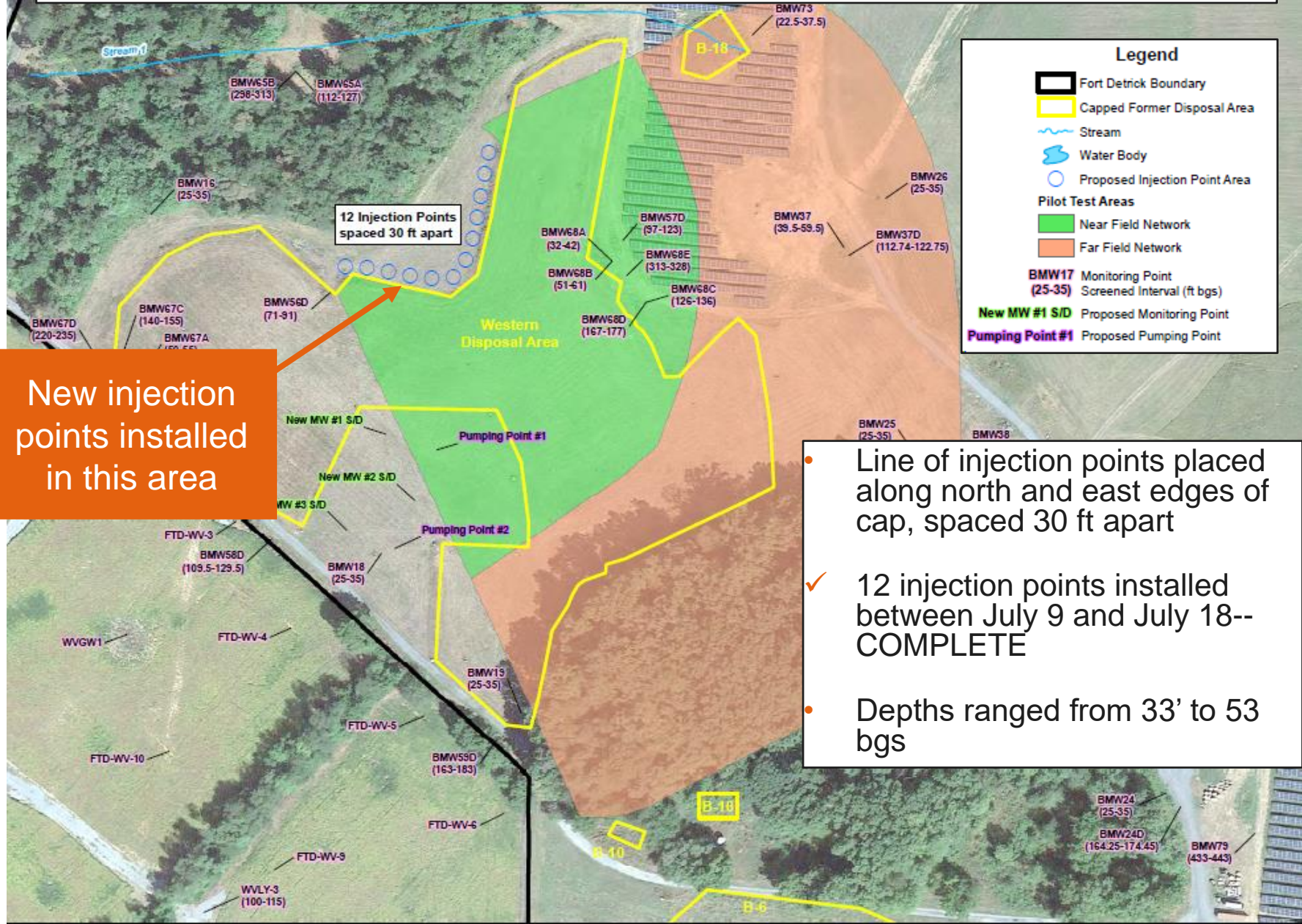
Approach

- Injection of carbon solution (e.g., molasses) via 12 shallow injection points (~30-50 feet deep) to stimulate microbial degradation of VOCs in groundwater.

Objective:

- Evaluate the effectiveness of the ERD technology to reduce VOC concentrations and assess whether this proven approach could be implemented as a full-scale remedy in the karst environment at Area B

Enhanced Reductive Dechlorination Pilot Test Area

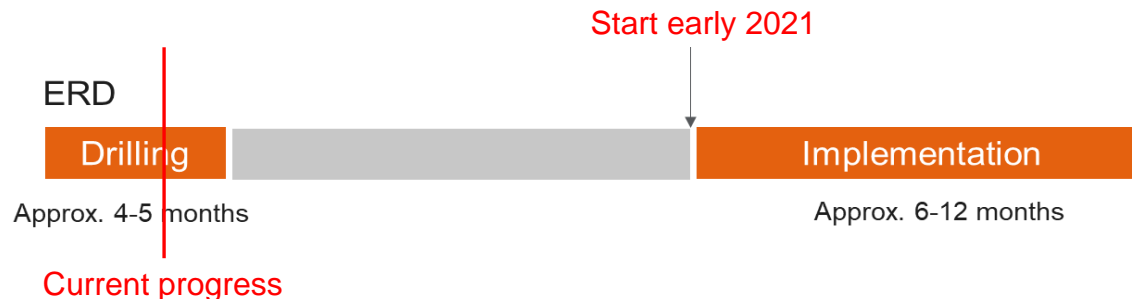


2nd Technology: Enhanced Reduction Dechlorination (ERD)—Next Steps

- Baseline groundwater sampling - *September 2019*
- Pilot Test Implementation— *planned for 2021 (after P&T test)*
 - Organic carbon solution will be injected (dilute molasses)
 - 2% solution of food grade molasses injected to support sustained microbial activity
 - Up to 3 molasses injection events planned under the Pilot Study.
 - Injected volume is expected to be approximately 2,000 gallons of solution per injection point (1 gallon per minute injection rate)
 - During injection, monitoring of water levels and field parameters will be performed in the monitoring network to assess radius of influence.

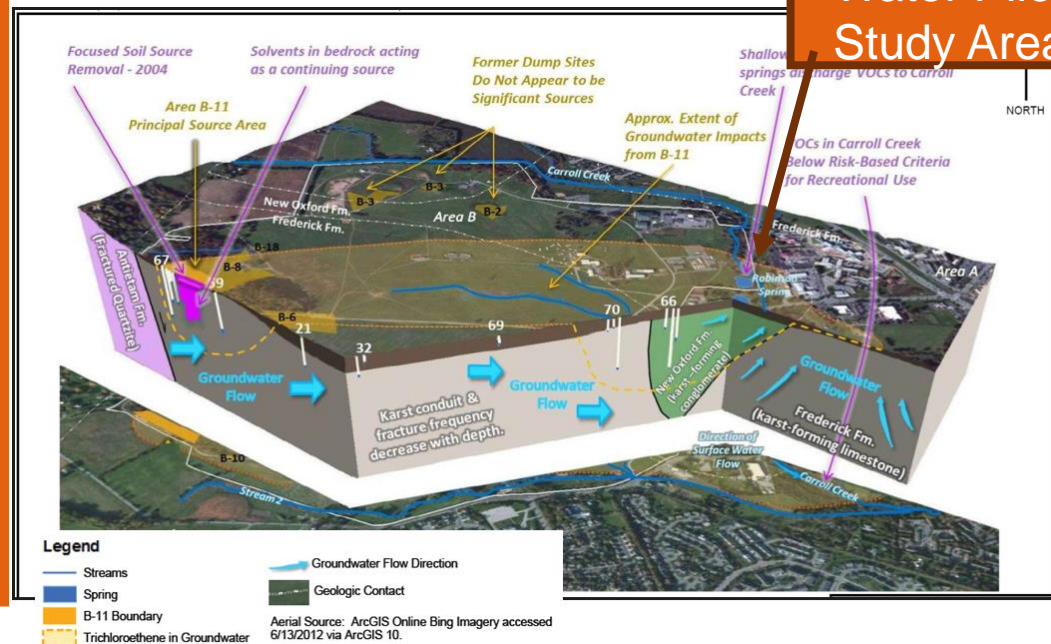
2nd Technology: Enhanced Reduction Dechlorination (ERD) – Next Steps

- Bioaugmentation
 - Sampling to identify naturally occurring microbial organisms known to degrade VOCs.
 - If necessary, supplemental dechlorinating organisms will be added to the in-situ treatment area to facilitate the remediation of the VOCs
- ERD Pilot Test Monitoring
 - Weekly monitoring in the injection area to assess carbon substrate distribution.
 - Monthly sampling at select points for VOCs, geochemical parameters, and water quality parameters.



3rd Technology: *Pond Aeration*

Surface Water Pilot Study Area



3rd Technology: Pond Aeration Pilot Test

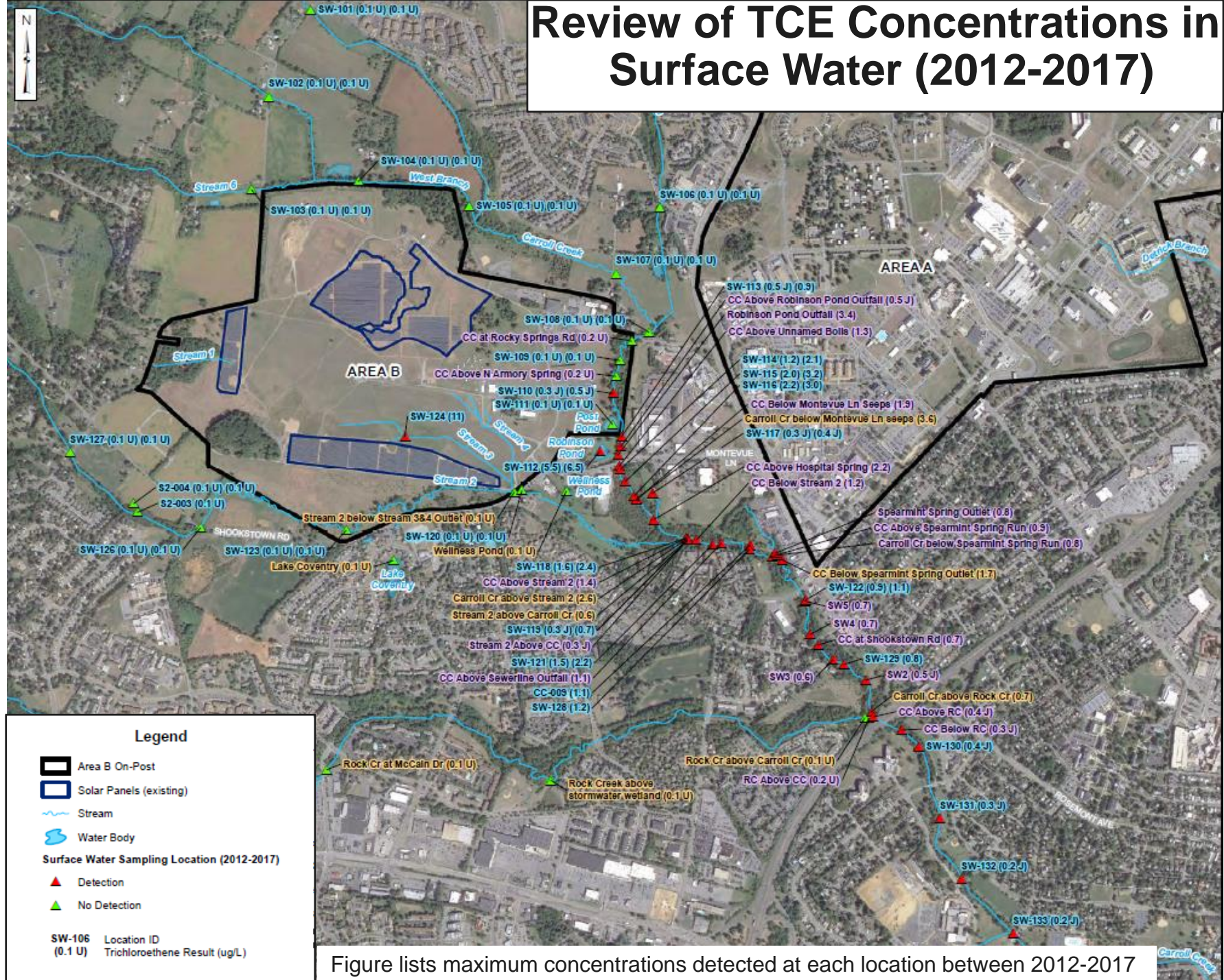
Approach:

- Install and operate aeration technologies in off-post pond (typical pond fountains and pond diffusers).

Objective

- Evaluate the treatment efficiency of aeration systems to reduce VOC concentrations in the pond water and ultimately in Carroll Creek. VOC-impacted groundwater that discharges to the pond then flows into Carroll Creek, thereby contributing to detectable VOC concentrations in downgradient portions of the creek. The pilot test objective is to evaluating whether these aeration technologies can reduce VOC concentrations in the pond and subsequently reduce the VOC loading into Carroll Creek.

Review of TCE Concentrations in Surface Water (2012-2017)



Review of TCE Concentrations in Surface Water (2012-2017)

- 2017 Field Work – Observations

Surface Water (Carroll Creek)

- 22 surface water samples collected in 2017.
- Highest TCE detections were in the primary discharge area at 2.2 and 3.4 µg/L. Concentrations decrease further downstream.
- Low estimated PCE detections at 4 locations (up to 0.2 J µg/L).

Pore Water (water in Carroll Creek sediments)

- 20 water samples collected in 2017.
- TCE was detected in pore water at up to 4.9 µg/L in the primary discharge area (near Montevue Lane).
- Low estimated PCE detections at 4 locations (up to 0.4 J µg/L).

Comparison criteria for Surface Water

- Surface water screening criteria (USEPA Region III Biological Technical Assistance Group) for TCE is 21 µg/L to be protective of sensitive species.
- No samples exceeded the SW screening criteria; therefore, further action is not risk driven.

Review of TCE Concentrations in Surface Water (2012-2017)

- 2017 Field Work – Observations

Seeps and Springs

- 14 seep and spring samples collected in 2017.
- Concentrations and locations with detections in 2017 were very similar to 2012 results.
- Highest TCE detection in seeps was at CC-21 in the primary discharge area at $13\text{ }\mu\text{g/L}$.
- Low PCE detections in the primary discharge area (up to $0.6\text{ }\mu\text{g/L}$ compared to drinking water standard of $5\text{ }\mu\text{g/L}$).



Seep with
highest
concentrations



Pond Aeration Pilot Test – Fountains

First System Test

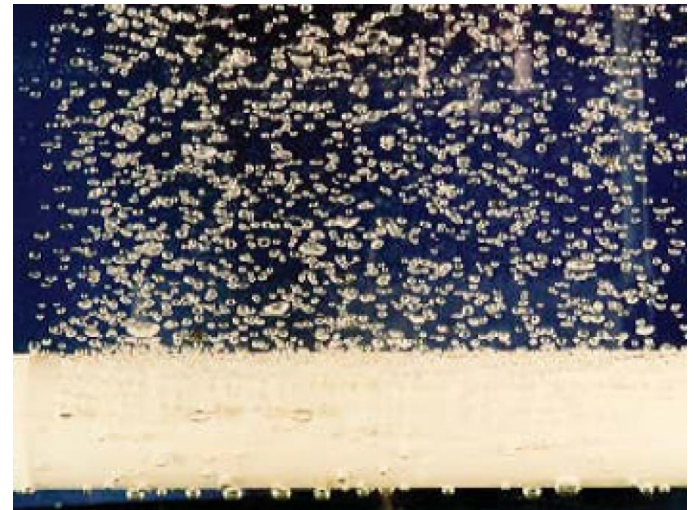
- Electric fountains expel water into the air phase in a cascading, trumpet-shaped spray
- Five fountains have been installed to maximize treatment effectiveness
- Surface water sampling in the pond and in Carroll Creek will help assess whether the aeration is reducing VOC loading into the creek.



Pond Aeration Pilot Test – Diffusers

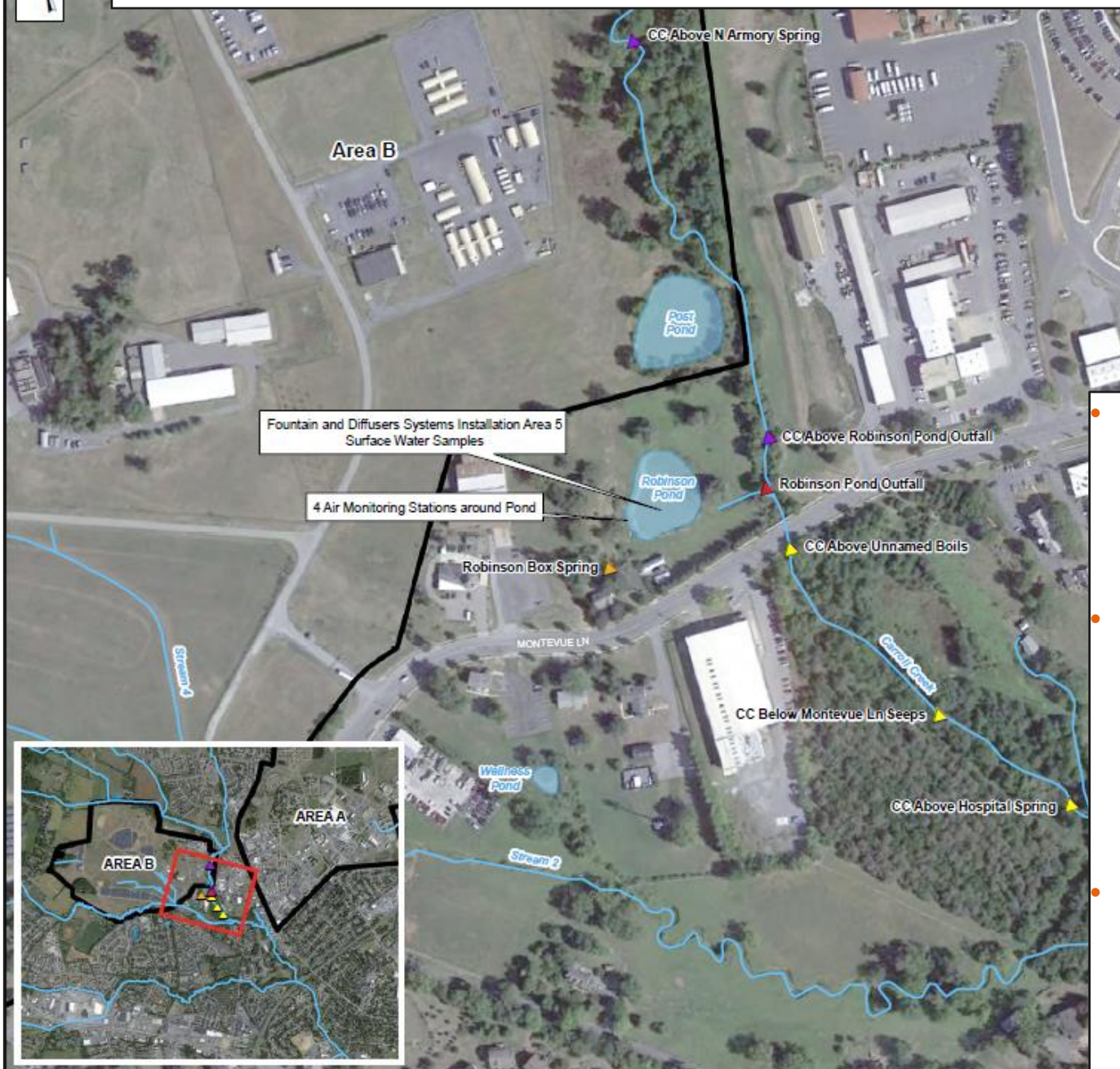
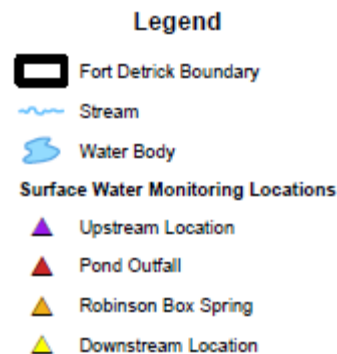
Second System Test

- Porous air diffuser tubing/piping will be installed in rows across the bottom of the pond.
- Compressed air will be forced through perforated or porous diffusers to produce air bubbles that rise through the water and produce turbulence resulting in effective water-air mixing.
- Similar surface water sampling will be performed to evaluate effectiveness in reducing VOC impact to Carrol Creek.



Example of Fine Porous Well Screen
Air Diffuser Proposed for Pilot Test

Pond Aeration Pilot Test Area



- 5 fountain aerators and 3 transects of fine bubble diffusers will be tested in the pond
- Surface water sampling will be conducted in the pond, at the outfall, at the Box Spring, and in Carroll Creek
- Air monitoring will be conducted around the perimeter of the pond

Pond Aeration Pilot Test - Implementation

- Each system will be run for 2 months, with an expected 6-month study duration
 - ✓ Phase 1: Baseline sampling will be conducted for a month prior to fountain system operation--COMPLETE
 - Phase 2: Fountain test will be conducted for 2 months (with accompanying sampling)--ONGOING
 - Phase 3: Second baseline sampling will be conducted for a month prior to diffuser system operation
 - Phase 4: Diffuser test will be conducted for 2 months (with accompanying sampling)

Pond Aeration Pilot Test – Implementation

Phase 1 - Completed

- Buildout of fountain system was conducted from June 10th to June 12th
- Two rounds of baseline surface water and air sampling were conducted
 - Round #1 June 15th
 - Round #2 July 12th
 - Sampling results are pending and will be discussed during a future RAB.



Pond Aeration Pilot Test – Implementation

Phase 2 - Ongoing

- Fountain test ongoing for 2 months (with regular surface water and air sampling)
- Two-month fountain aeration test officially began on July 18th
 - First of four surface water/air sampling events conducted August 1st



Next Steps – Surface Water Aeration

- Phase 2: Fountain test will be conducted for 2 months (with accompanying sampling)—ONGOING *through mid-September*
- Phase 3: Second baseline sampling will be conducted for a month prior to diffuser system operation. All aerators will be stopped for one-month to allow pond to return to baseline conditions.— *mid-September through mid-October*
- Phase 4: Diffuser test will be conducted for 2 months (with accompanying sampling). – *build out mid-October and run through mid-December.*
- *Updates will be provided during future RABs.*



Questions?