IMFD–PWE 4 DECEMBER 2019

MEMORANDUM FOR RECORD

SUBJECT: Fort Detrick Restoration Advisory Board (RAB) Meeting Summary,
4 DECEMBER 2019

1. Summary Contents

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

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. Jeff Boyland, U.S. Environmental Protection Agency
Mr. Rolan Clark, Community RAB Member
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. Karen Harbaugh, Community RAB Member
Ms. Elizabeth Law, Community RAB Member

Others Present:

Mr. John Buck, US Army Corps of Engineers
Mr. John Cherry, Arcadis
Ms. Laurie Haines, Army Environmental Command
Ms. Rosemarie Potocky, Arcadis
Mr. Brandon Fleming, USGS
Ms. Shelly Morris, On-Site Contractor to Fort Detrick Environmental Restoration Program
Mr. Gary Zolyak, Fort Detrick, SJA
Ms. Tracy Coleman, City of Frederick
Mr. Solomon Brooks, Clean Water Action
Ms. Jennifer Konze, Clean Water Action
Ms. Katrina Harris, Bridge Consulting Corp.

Members Absent:

3. Meeting Opening / Remarks

Mr. Joe Gortva, Army Co-Chair opened the meeting and welcomed everyone.

Mr. Gortva introduced Mr. Jeff Boylan from U.S. EPA who is taking over the project oversight from Rob Thomson. Mr. Boylan stated he looks forward to being part of the Board and provided a brief summary of his background which includes 15 years of experience with EPA. Mr. Gortva acknowledged Mr. John Buck's upcoming retirement and his support to Fort Detrick over many years, particularly in helping to get contracts in place. Mr. Gortva and the RAB thanked Mr. Buck for all his help. Mr. Gortva invited introductions of RAB members and guests.

Mr. Gortva 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. Gary Pauly, Community Co-Chair, welcomed everyone and requested everyone abide by the ground rules for the meeting.

Mr. Gortva and Mr. Pauly discussed the election of the community co-chair. Mr. Gortva invited nominations and Mr. Pauly was nominated. Mr. Gortva asked for any additional nominations, and hearing none, closed the nominations. Mr. Pauly was elected as community co-chair for a two-year term.

4. Meeting Minutes presented by Mr. Joseph Gortva, Fort Detrick

Mr. Gortva noted minutes from the August 2019 meeting had been sent out and asked for any comments.

Ms. Jennifer Hahn provided the following comments:

- Statement by Mr. Wasserman, page 4: "He said the November 2018 data shows there is hydraulic containment with TCE being contained in the groundwater on Fort Detrick property." She requested "Area A" be added to this statement.
- Page 8: Ms. Hahn asked that the minutes contain more details on where the pumped water would be transported to and properly disposed of.
- Page 9: Ms. Hahn asked that KB-1 be shown as a component of the injection in addition to molasses.
- Page 9: Ms. Hahn requested the response to Dr. Pauly's question about potential impacts to Carroll Creek be expanded to explain what the potential impacts might be.

Ms. Hahn asked the following questions regarding the information provided at the August 2019 meeting:

- Page 7, paragraph 2: Ms. Hahn had asked about disclosures and testing requirements for the Waverly property. Ms. Hahn requested additional information on requirements after the homes are built, such as whether there would be vapor intrusion testing, and asked if vapor barriers should be required for the homes.
- Ms. Hahn asked for the location of Stream 2, and Ms. Greene responded that it is on Area B and flows west to east. Mr. Cherry pointed out the location on a map.

5. Area B Groundwater Study presented by Mr. Brandon Fleming, USGS

Mr. Fleming stated he is a hydrologist with the U.S. Geological Survey's (USGS) Baltimore office. He explained USGS is a non-regulatory science agency within the Department of Interior and is working to provide support to Fort Detrick to better understand the conceptual site model at Area B. Mr. Fleming noted USGS' work would result in two reports—one summarizing hydrogeologic conditions at Area B and one describing biogeochemistry characteristics of Area B. He explained the reports will fill in some data gaps and will be looking at the age of groundwater, how fast water moves through system, and whether or not there are exclusively local flow systems or whether groundwater is being transported past Carroll Creek into a more regional system. In response to a question, Mr. Fleming said it is known that groundwater is discharging into Carroll Creek, but there is still a question as to whether there is potential for groundwater to flow underneath Carroll Creek and discharge somewhere further away.

Mr. Fleming reviewed the ongoing monitoring activities being conducted by USGS, noting there are two stream gauges--one in Area B and one in Waterford Park--which are measuring discharge, stream temperature, and conductivity of the water. He advised there is a precipitation station on Area B in an open field and groundwater level monitoring points. He stated USGS is also monitoring for residual dyes in the groundwater to see if dyes from the dye trace studies are still leaching out of system.

Mr. Fleming said one of the questions at the previous meeting was about precipitation levels for the last two years. He displayed a chart showing the 30-year average and monthly precipitation levels from May 2018 through August 2019, noting 2018 was the wettest year on record in the Maryland/DC area. Ms. Hahn asked about contamination movement during this time period. Mr. Fleming responded that quarterly sampling data can be put into context with the precipitation data to provide some information about contaminant movements. Ms. Shelly Morris responded that data was provided at the August 2019 meeting which showed that TCE concentrations, such as in Robinson Pond, declined. Mr. Gortva stated that data presented at the last meeting showed that contamination did not significantly migrate in the source areas, but more than likely the amount of water coming into the system increased, thus diluting and lowering the concentrations. Ms. Morris said the information would be in the presentation by Rob Wasserman from ECC at the August 2019 meeting, particularly the Robinson Pond sampling results from 2017 to 2019.

Mr. Fleming next discussed the stream flow data for Carroll Creek from a gauge on Area B. He noted the spikes in the results are related to two major flood events in the City of Frederick. He noted levels have decreased more recently due to drier conditions. He noted it is desirable to monitor during wet and dry conditions to understand how the system responds to those different conditions. Mr. Fleming displayed a chart showing a sample of groundwater levels in the center of Area B; monitoring started in September 2018, during the wet period. He stated groundwater water levels began dropping in the drier summer months and have dropped about five feet which is normal for summer conditions.

Mr. Fleming reviewed the sampling conducted by USGS and stated 17 groundwater samples and 3 spring samples were collected and analyzed for naturally-occurring chemicals that will "date" the water through the analysis of atmospheric tracers, some natural and some industrial by-products. He explained the atmospheric tracers can be used to understand when rainfall entered the groundwater and got to the stream which was sampled and provide data on how fast water is moving through the system; he advised all the results have not been received yet. Mr. Fleming noted rock cores were collected for further testing to address the question of whether contamination has diffused into the rock matrix. He explained lab analysis on the rock samples would be performed over the next couple months. Mr. Fleming stated samples also were collected to look at microbial activities to understand natural occurring microbes in the groundwater, which ones are present, and how active they are in naturally breaking down contaminants.

Mr. Fleming summarized the retrospective biogeochemistry assessment completed where historical data from 2000 to the present was compiled to examine long-term patterns of contaminants in Area B groundwater and springs. He said the assessment looked at groundwater

near the source area and away from the source area to try and determine the connection between them. He explained the assessment found PCE was dominant in historical sampling events, but has consistently declined over time; TCE was dominant in later years of monitoring. Ms. Hahn asked if the findings regarding PCE and TCE were related to PCE degrading to TCE, and Mr. Fleming said that could be the case. Ms. Hahn asked if the next step is degradation to vinyl chloride, and Mr. Fleming stated there were other steps before degradation to vinyl chloride.

Mr. Fleming reviewed data gaps that were identified to include whether contaminants are stuck in the rock matrix; he showed pictures of some of the cores collected. He stated the cores are being prepared in a solution for six months prior to being analyzed. Ms. Hahn asked if the analysis is only for volatile organic compounds, and Mr. Fleming responded total organics are also included in the analysis.

Mr. Fleming discussed other USGS work to assess the input of contaminants from Area B groundwater into Carroll Creek. He explained this work included temperature surveys of stream bed and banks to estimate input of groundwater into Carroll Creek, targeted, multi-depth porewater and surface water sampling, and analysis for VOCs and other parameters to help understand the possible degradation along the flowpath from the groundwater to Carroll Creek, including sampling pore water along Carroll Creek. Mr. Fleming advised results have not been received yet, but the results will provide a flow rate and concentration over a time period and understanding of how much of the contamination is moving through the system and into the stream. He noted additional sampling will be conducted in the spring to compare fall and spring conditions since the spring is usually wetter.

Ms. Hahn asked if USGS would be sampling willow and poplar trees to see if the levels are any different compared to where there are not trees. Mr. Fleming stated USGS' work does not involve targeting particular trees. In response to a request by Ms. Morris, Mr. Fleming explained USGS' goals for their studies is to characterize the biogeochemistry and provide data that will help in the future with evaluation of remedial strategies.

Mr. Fleming stated not much information is available on natural attenuation parameters and natural occurring biodegradation so USGS is sampling wells to better understanding the likelihood of that occurring. He noted USGS' work in this area is tied to some of the pilot work Arcadis is doing with enhanced reductive dechlorination, so analysis is being done before, during and after the pilot study. He noted this work has just begun so results are not yet available.

Mr. Fleming said sampling and analysis will continue, along with the rock matrix analysis and microbial assessments. He said the two reports will then be developed and any further work will be decided upon based on the information in the reports.

Ms. Hahn asked if any concentrations found in the rock matrix would be reported in parts per billion, and Mr. Fleming stated he would check.

Ms. Betty Law asked if the RAB could be emailed a copy of Mr. Fleming's slides, and Mr. Gortva asked Ms. Morris to send to the RAB. [Ms. Morris emailed the two presentations on December 5.]

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

Mr. Cherry advised he would be providing an update on the groundwater pilot study being conducted at Area B as discussed at the last meeting.

He explained the pilot study is looking at three potential remedial actions discussed with EPA and MDE 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 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 for a full-scale implementation. He added some of the contaminant mass would be removed during the pilot study.

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 downgradient as it gets closer to Robinson Pond.

Ms. Law asked about groundwater conditions at Kemp Lane. Mr. Cherry advised wells were tested on Kemp Lane, and five wells on Kemp Lane were connected to public water. Mr. Gortva noted there had been one low level detection of TCE a number of years back under drought conditions; he noted all sampling showed no detections or detections below EPA drinking water standards. Mr. Cherry advised the properties were provided bottled water until public water connections were available.

Ms. Hahn mentioned the potential vapor intrusion issue if homes were built on the Waverly property. Mr. Gortva said there is a prohibition issued by MDE from that property utilizing the groundwater so there would not be a showering issue. Ms. Hahn expressed concern that there is nothing in the City's Land Management Code which requires the potential homeowners to be notified or requires the building to determine if vapor intrusion needs to be addressed. Mr. Gortva stated the Waverly property owner is aware of the potential vapor intrusion issue based on discussions Fort Detrick has had with the owner.

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 noted the model

shows the many diverse issues being investigated. He explained the goal is to improve conditions at the source area which will improve conditions throughout the study area.

Ms. Law asked if USGS' studies determine contaminants are in the rock matrix, is it known what the timing would be for any impact and what the impact might be in light of the nature of the karst environment and climate change causing wetter conditions. Mr. Cherry responded the geology is limestone and is karst which changes over times and it is a factor; however, it is not changing on a daily basis. He noted it does cause some considerations and challenges in investigation and planning for remediation. Mr. Gortva added that whatever treatment technology is chosen is not going to be a magic bullet but will take a substantial amount of time to remediate the groundwater. Mr. Gortva said remediating any residual amount of material in the rock matrix will take a very long time and involve continuous monitoring.

Mr. Gortva noted the concept of acidic water dissolving limestone takes hundreds or thousands or years, and the site contamination does not have an impact on rocks in terms of dissolving or changing the rock. He explained that sinkholes do not occur because rocks have changed, but as dirt is washed away above a water-filled void, the void travels upwards and when it gets close to the surface, dirt falls in and that is the sinkhole seen on the surface.

Mr. Rolan Clark asked about the potential new road to be constructed by the City over Area B and the impact of vibrations in light of the karst environment, as well as the potential for sinkholes. Mr. Clark also asked about the status of the road. Mr. Cherry responded that the karst geology is not unique to Fort Detrick but is found throughout the area. He said many of the area roads are constructed over a karst geology and sinkholes are not occurring. Mr. Gary Zolyak advised that neither the County nor City has asked Fort Detrick for a right of way yet. Mr. Zolyak stated such a decision would be made by the Army's higher headquarters, and the City or County would also need to obtain EPA's input on whether or not to allow the building of the road. Ms. Tracy Coleman noted she had presented on the topic about a year ago. She advised some testing along the roadway had been done, and an internal draft of an Environmental Assessment has been prepared by the City's consultants. She said there had been other priorities, and the City has not yet reviewed the Environmental Assessment. She said the Environmental Assessment will eventually be shared with Fort Detrick and EPA, prior to any formal request for a right of way. Ms. Law asked when the public would be able to read and comment on the Environmental Assessment, and Ms. Coleman responded the draft would be made available to the public through posting on the City's website.

Mr. Gortva added that the Environmental Assessment will have limited data, and Fort Detrick will also need to see the design of the road. He noted there are many steps in the process prior to a road being built, and at any step of the process, the decision can be made to not proceed further.

Ms. Hahn asked about language in the Site Management Plan which restricts vehicle traffic through Area B, and Ms. Morris stated the language does not restrict vehicle traffic through Area B but only on the caps themselves.

Ms. Hahn asked if Fox and Associates are experts in working at Superfund sites. Ms. Coleman said Fox and Associates are a civil design firm and have a subcontractor who is an expert in environmental issues and prepared the Environmental Assessment. Ms. Hahn asked to be provided with the name of the subcontractor.

Mr. Cherry stated for the groundwater component the two remediation technologies to be tested are pump and treat and enhanced reductive dechlorination. He noted the groundwater technologies will be tested sequentially with the pump and treat test done first; this will allow the results to be independently assessed. He explained the pump and treat portion will be done first as it will remove readily-accessible dissolved mass from the fractures. Mr. Gortva added that once the pump and treat system is turned off, the groundwater will return to a steady state and thus allow the performance of enhanced reductive dechlorination technology to be independently evaluated. Mr. Cherry 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. He stated the drilling for the groundwater pilot study was completed in September 2019, and all wells were installed as planned with no issues. Mr. Cherry said the implementation of all the options will take about 2.5 years. He stated the groundwater data for the pilot study area is being evaluated to design the pump and treat system which will be built early next year and then run for about eight months.

Mr. Cherry stated the objective of the pilot study is to try to reduce volatile organic compound concentrations. He noted other contaminants will be considered when evaluating eventual remedial actions. Mr. Gortva noted the other contaminants are accounted for during the pump and treat test so unacceptable levels are not discharged into Carroll Creek. Mr. Gortva noted the water is collected first and tested before it is released to ensure it meets Maryland Department of the Environment discharge standards. Mr. Gortva said if it is found the water contains a compound that cannot be handled by the pump and treat technology, the water would be transported to a facility which could treat and properly dispose of the water.

Ms. Hahn asked about the treatment train. Mr. Cherry responded the system components are in the process of being designed but will generally consist of an air stripper, bag filters, activated carbon, and an advanced oxidation process.

Ms. Hahn asked about monitoring protocols and the construction stability of the system. Mr. Cherry noted that the system is being designed based on groundwater sampling and analysis conducted to date, including the most recent sampling efforts, so the design reflects the concentrations of compounds in the groundwater. He stated periodic monitoring will detect any changes in the compounds or concentrations over time. He advised the treatment system will be inside a heated building. Mr. Gortva added that system will be robust enough to withstand winter and summer conditions. He stated the system will be in a steel structure building on a concrete pad with appropriate piping installed so freezing does not occur. Mr. Cherry pointed out the location of the building and where the piping will be installed along the fenceline on Fort Detrick property. Mr. Gortva noted the location was selected so the system will not be on top of the landfill caps.

Mr. Barry Glotfelty asked about the system monitoring and alarm systems. Mr. Cherry explained the system will have the capability of being monitored remotely and being shut down remotely, as well as automatic shutdown. Ms. Hahn asked if the local health department would be alerted when there is an alarm. Mr. Cherry responded that it would depend on the nature of the alarm; for example, the system may alarm because maintenance is needed. Mr. Cherry said if there was a need for the local health department to be notified of certain issues, Arcadis would be glad to coordinate the necessary communications.

Ms. Law asked if there are any concerns about compounds moving into the air. Mr. Cherry said the system includes an air stripper to remove volatile organic compounds from the groundwater; any emissions from the system would need to meet Maryland Department of the Environment air emission requirements. Mr. Cherry said preliminary calculations show the emissions would be significantly under MDE requirements, but the calculations would be further developed as the design process continues.

Ms. Hahn asked if there was to be a sinkhole what would happen and would contamination be moved. Mr. Cherry responded that testing the pump and treat technology is being done at EPA's request, and the potential for a sinkhole was a concern discussed early in the pilot study planning process. Mr. Cherry explained that to minimize the potential for a sinkhole, flow rates will be kept low and turbidity will be monitored so as not to be disruptive to the sub-surface. Mr. Gortva added that monitoring turbidity is commonly done at water treatment plants, and an alarm can shut down the system if turbidity starts to increase.

Mr. Cherry said if there was to be a sinkhole, the impact to contamination would be localized. He advised there is a sinkhole mitigation plan when doing drilling to prevent it from happening which includes the site safety officer inspections and looking for subsidence. Mr. Cherry stated there were incidences of sinkholes 10 or 12 years ago that were relatively small. Mr. Gortva added that these sinkholes were caused by the type of drilling technique being used at the time. He stated rotosonic drilling was not used in the past, but more recent use has worked very well.

Ms. Hahn asked if pump and treat proved to be a viable remediation technology, would the same equipment be used. Mr. Cherry said some infrastructure could be reused, but some components are only rented for the eight-month study period.

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 (primarily food-grade molasses) and monitoring the ground water. Mr. Cherry stated KB-1 would also be part of the serum injected. 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. Mr. Cherry said the 12 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.

Mr. Gortva referenced Ms. Hahn's earlier question about potential impacts on Carroll Creek. He explained the injections are basically sugar water which would not cause a negative impact on Carroll Creek. He stated even the additional bacteria would not cause any problems in Carroll Creek as there will not be a change in smell or color of the water. He said the surface water in the Creek will be monitored. He noted USGS will be sampling before, during and after this technology is studied so there will be good information on how the bacterial community is responding.

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 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 used aeration fountains to 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 was in place during the test to initially collect samples weekly and then bi-weekly in the pond, seeps and springs, and in Carroll Creek, along

with air sampling at three locations around the pond to see if any TCE is detectable at the edge of the pond. He advised the fountains operated from July 18th to September 17 and was then turned off. He explained the data shows a slight reduction in the low concentrations that were detected prior to the fountains operating.

Mr. Cherry said the second technology to be tested are air diffusers. He explained this is 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 testing began November 22 and will continue for two months with a similar sampling program as was done for the aeration fountains technology. Mr. Cherry advised results will be shared as they are received. Mr. Gortva noted the results are just informational and no conclusions are being drawn at this time.

Ms. Law asked about the language in the pilot study work plan indicating it is not a public document. Mr. Cherry stated the language is just standard Arcadis language and can be deleted in the future. Ms. Law asked if documents are provided to the public after the regulators have reviewed or concurrently. Mr. Gortva responded that typically reports have been issued to the regulators first, so their comments are incorporated, and all significant technical changes have been made prior to distributing to RAB community members.

Ms. Hahn commented that the site background section of the work plan did not clearly state the groundwater plume is not limited to the capped areas and also extends to the west and to Carroll Creek. Mr. Gortva stated the pilot study report will clarify that the study focused on a microcosm of the plume.

Ms. Hahn asked for clarification as to whether the Superfund Site designation extended to off-post property if the contamination has moved off Fort Detrick. Mr. Gary Zolyak responded that the National Priority List listing is only for Area B groundwater. He stated the Army has responsibility for any unacceptable contamination that has moved beyond its boundaries. Mr. Gortva explained the Army has to follow the contamination that poses a potential risk under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and address any unacceptable risk which is determined by a risk assessment. He further explained that once the levels reached an acceptable level under regulatory standards, the Army did not have any further responsibility and taxpayer dollars could not be used. Mr. Jeff Boyland stated groundwater contamination is not driven by land use as the risk assessment includes evaluation of a potential future resident as one of the land use scenarios. Mr. Boyland said EPA does not consider land use controls as an acceptable remedy for groundwater contamination.

Mr. Zolyak said if the Waverly property developer decided to build homes, the Army could be responsible for the cost of installing a vapor barrier. He noted there is still ongoing litigation, and the property owner has not broached this topic with the Army. Mr. Gortva said he has had conversations with the property owner and believes the owner is aware of the potential risks and will discuss with the Army when plans are further developed.

Ms. Green added that there is a restriction on the use of the groundwater on the Waverly property, and any proposed private well installation would need approval by the Board of Health. Mr. Pauly asked what additional role the Board of Health would have with regard to a new development, and Mr. Glotfelty responded that the Board of Health would assure the well and septic systems are adequate and vapor barrier installation could be a requirement.

Mr. Zolyak advised the owner of the Waverly property filed a lawsuit on the question of whether groundwater contamination from Area B-11 migrating onto his property and the Army's need to conduct monitoring on the Waverly property constituted a taking of a portion of the property by the U.S. government. Mr. Zolyak stated the case was heard in the U.S. Court of Federal Claims, and the judge ruled the in favor of the plaintiff, so the government does own the area where there are monitoring wells and the temporary roadway.

Ms. Laurie Haines stated that once the CERCLA process is further along, and the nature and extent of the contamination is fully defined, there would be agreements between the Army and City on the use of the Waverly property and any controls that would be required would be discussed at that time. She stated it would not be restricted use, development could still occur, but any safety measures such as vapor barriers would be discussed at that time. Ms. Haines said taking interim action prior to a Record of Decision might be an option as a legal step.

Ms. Hahn expressed concern that there is not adequate communication between the Army and the County and City on these issues, and development will be approved or a sale of the property will occur without all the facts being known.

Ms. Green stated another legal document that might be an option is an environmental covenant which is attached to a property's deed. Mr. Zolyak referenced Maryland law which requires a property owner to make any defects known prior to a property sale.

Mr. Gortva advised that the Remedial Investigation Report will be issued soon, and because of the size of the document, RAB members will be provided with a disk not hard copies.

7. RAB Member Open Discussion and General Community Comments

Mr. Gortva invited open discussion from the RAB members. Ms. Hahn requested the topic of the Superfund Site delineation be included on the next agenda.

Mr. Gortva invited comments from the community members in the audience.

Ms. Jennifer Kunze asked about the updating of the website and adding more content beyond documents. Ms. Morris responded that the website has been updated within the funding allotted to the Public Affairs Office. Ms. Morris said the full administrative record is in the library. Ms. Green added that the community can also request documents from Maryland Department of the Environment.

8. Future Meeting Dates

Mr. Gortva said proposed future meeting dates are April 8, 2020, August 5, 2020 and December 2, 2020. Mr. Gortva said all the dates are tentative and invited anyone who had conflicts to let him know.

The meeting adjourned at 9:32 p.m.

Reviewed by:

Approved/Disapproved

Enclosures:
Area B Groundwater Study by USGS
Area B Groundwater Pilot Study
Meeting Sign-In Sheet

DISTRIBUTION:
Each RAB Member (w/o enclosure)
Each Meeting Attendee (w/o enclosure)

Fort Detrick Restoration Advisory Board Meeting

August 7, 2019

Members:

Name	Initial		Name	Initial
Mr. Joseph Gortva (Co-Chair)	JG		Mrs. Laurie Haines	
Dr. Gary Pauly (Co-Chair)	GP		Mr. Cliff Harbaugh	CH
Mr. Robert Thomson	RCT		Ms. Karen Harbaugh	
Ms. Elisabeth Green	EG		Mr. Barry Glotfelty	BG
Ms. Alicia Evangelista				
Mr. Roland Clark				
Ms. Jennifer Hahn	JH			

Contractor Representative

Name	Initial	Company
John Buck		USACE Baltimore District
John Cherry		ARCADIS
Shelly Morris		ERG
Robert Wasserman		Watermark/ECC JV
		USGS
Gary Zolyck		Fort Detrick Garrison
Rosemarie Potocki	REP	Arcadis

Additional Attendees (Please Print Legibly)

Name	Address/Representing Organization	Phone Number	Email	Check here to receive emails announcing future RAB meetings
Robert LADNER	self	3015248319	phagebob64@gmail.com	✓
John Buck	USACE	410-962-6935	john.p.buck@usace.army.mil	
Jennifer Kunze	Clean Water Action	240 397 4126	jkunze@cleanwater.org	yes
Sofia Verheyen	Clean Water Action	3154669219	sverhey1@jhu.edu	
Elizabeth Lee				
Robert Lee				

Agenda
Fort Detrick Restoration Advisory Board
Wednesday, December 4, 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	RAB Business Meeting Minutes	Joseph Gortva, USAG	Information
6:50-7:20	Status Update: Area B Groundwater Study	Brandon Flemming, USGS	Presentation
7:20-7:50	Status Update: Area B Groundwater Pilot Study	John Cherry, Arcadis	Presentation
7:50-8:15	RAB Member Open Discussion	RAB members	Discussion
8:15-8:30	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: 04/08/2020
08/05/2020
12/02/2020

USGS
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Fort Detrick Area B Groundwater Investigation

Restoration Advisory Board
December 4, 2019

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USGS MD-DE-DC Water Science Center

U.S. Department of the Interior
U.S. Geological Survey

US Geological Survey Involvement

- The USGS is a non-regulatory science agency in the Department of the Interior.
- The USGS working to provide two reports:
  - **Report 1**
    - **Summarize results of groundwater and streamflow monitoring.**
    - **Analyze groundwater chemistry to infer where and how fast groundwater flows.**
    - **Calculate a “Water Budget”**
  - **Report 2**
    - **Summarize results of retrospective analysis of contaminant patterns in groundwater and springs**
    - **Summarize results of contaminant storage in rock matrix and input to Carroll Creek**
    - **Summarize the assessment of biodegradation in Area B groundwater based on current conditions and the potential for enhancement of these conditions.**

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Monitoring Activities (ongoing)

- Streamflow at two stream gauges.
- Precipitation at a single gauge
- Groundwater level at 8 monitoring points
- Monitored for residual dyes in groundwater from last dye injection.

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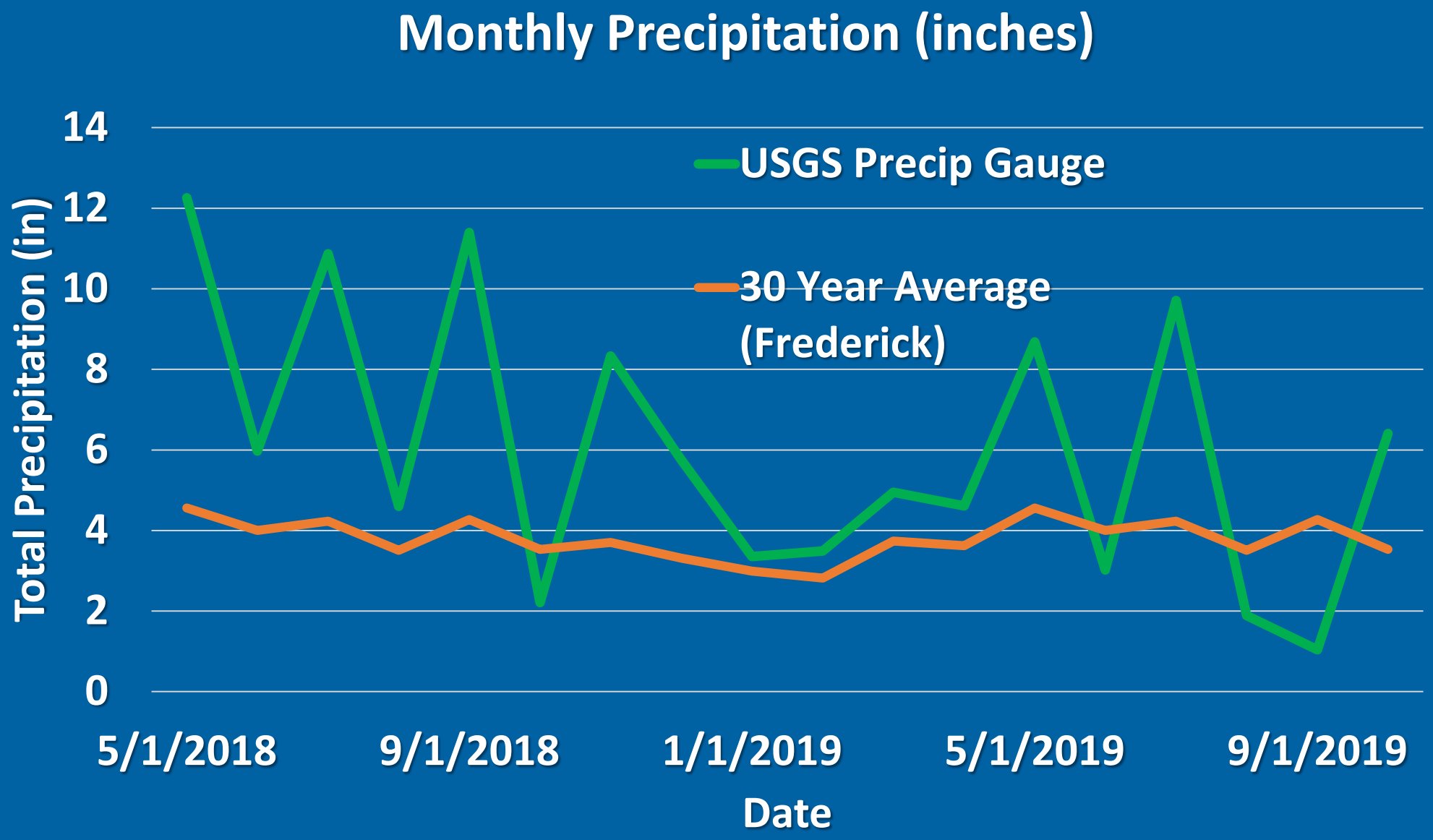
2018 was the wettest year on record at BWI, Dulles, and Reagan National Airports.

August and September 2019 were very dry.



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May 2018-November 2019 spanned a range of hydrologic conditions.

This is evident in the Carroll Creek streamflow data.

Streamflow data was collected at 2 USGS gauges.

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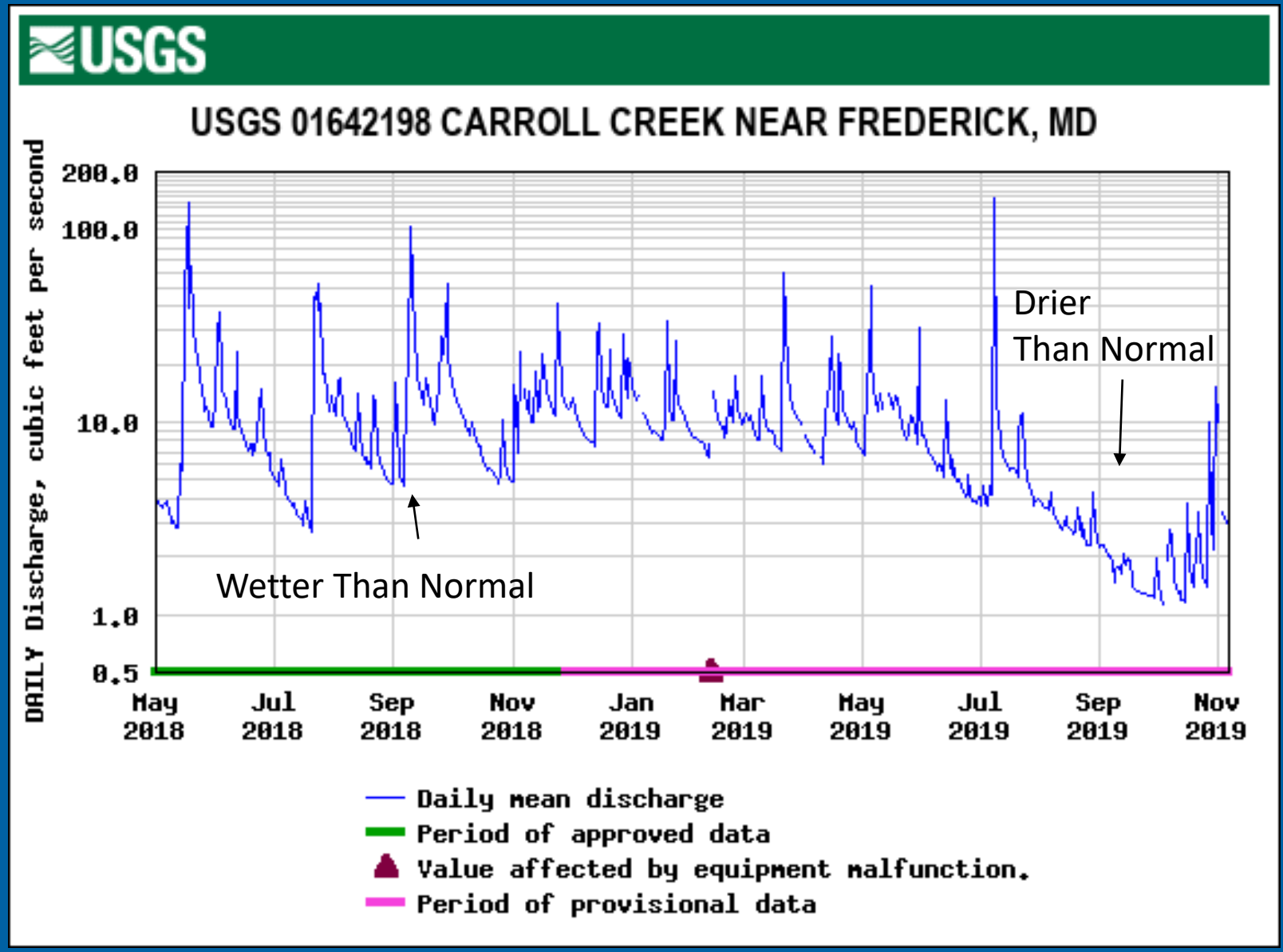

Groundwater levels also respond to climatic variability.

These levels were collected at 8 monitoring points at different depths.

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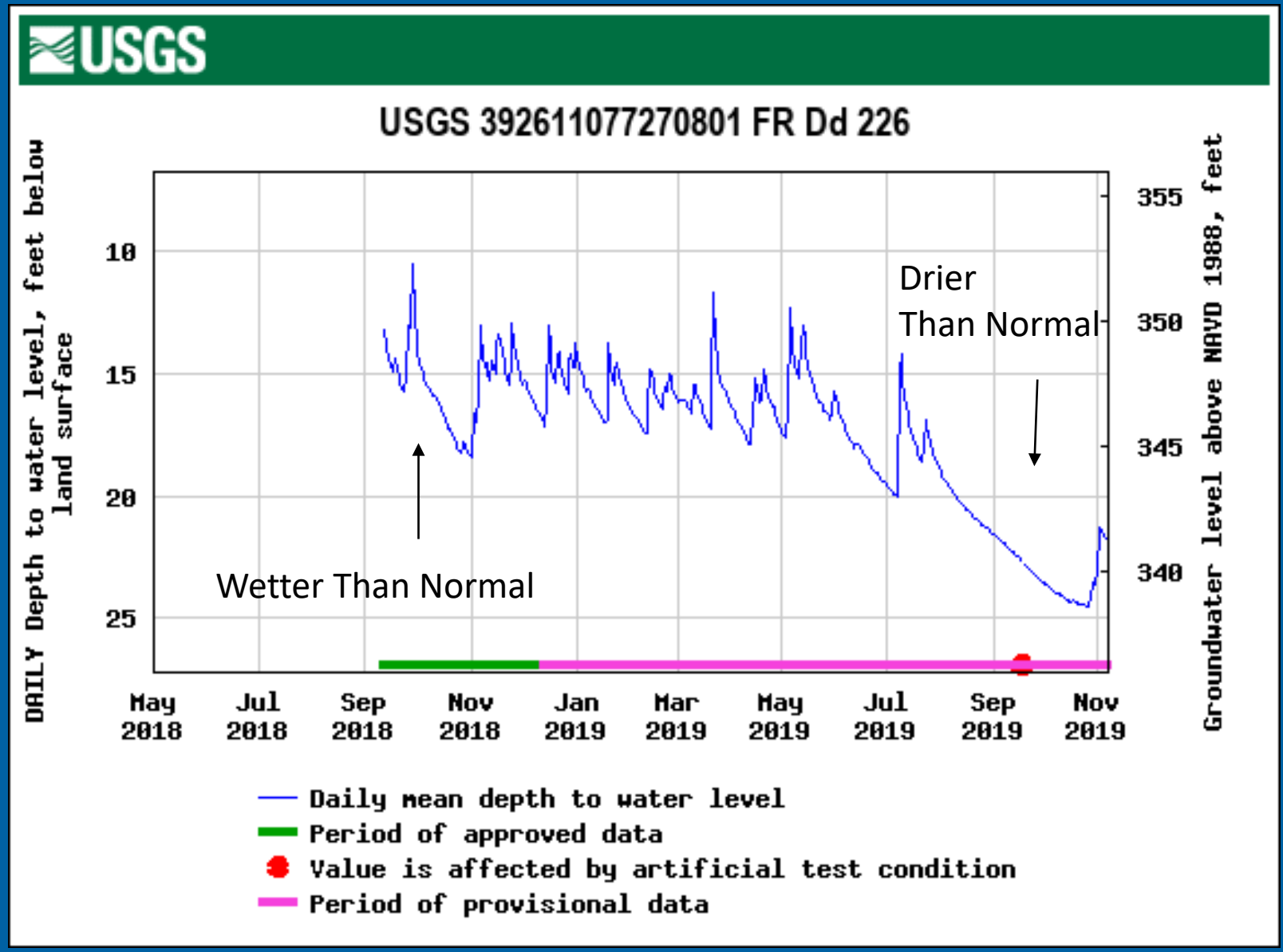

Sampling Activities

- Collected 17 groundwater samples and 3 spring samples for naturally-occurring chemicals that will “date” the water.

- Collected rock cores for further testing.

- Collected samples to assess volatile organic compound concentrations and microbial activity. These were collected from groundwater, springs, and in Carroll Creek.

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Retrospective biogeochemistry assessment - summary

- Compiled historical data 2000-present to examine long-term patterns of contaminants in Area B groundwater and springs
  - Groundwater near source areas: PCE was dominant in historical sampling events, but has consistently declined over time. TCE was dominant in later years of monitoring, steady/increasing over a large area.
  - Groundwater distant from source areas: TCE was present throughout the eastern extent of Area B at lower concentrations
  - Patterns in springs provide evidence for connection to groundwater

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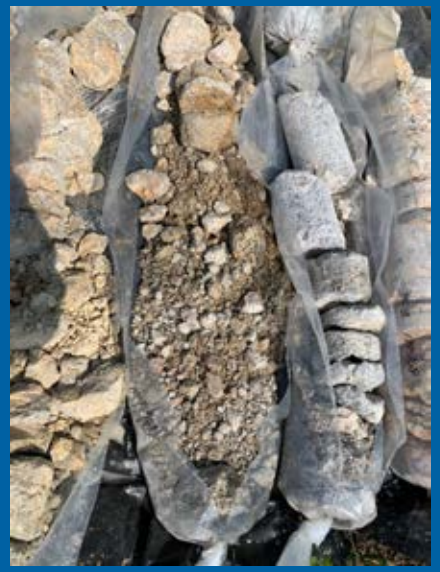
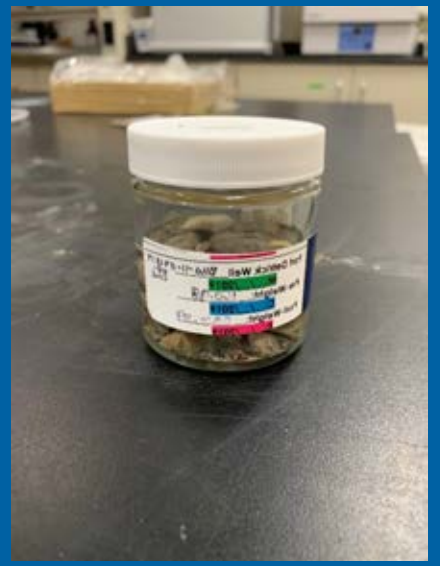
Refining CSM – Potential Data Gaps and Associated Tasks (1)

- Contaminants moving from groundwater to springs is known, but the storage of contaminants in the rock matrix itself is not well understood
  - We can estimate this using rock chips from the newly drilled wells for pilot tests and historical cores (in long-term storage)
  - Collection, crushing Summer 2019, *Analysis Winter 2020*





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Refining CSM – Potential Data Gaps and Associated Tasks (2)

- Assess input of contaminants from Area B groundwater into Carroll Creek
  - Temperature surveys of stream bed and banks to estimate input of groundwater into Carroll Creek (Summer 2019, *Spring 2020*)
  - Targeted, multi-depth porewater and surface water sampling (Summer 2019, *Spring 2020*)
  - Analysis for VOCs and other parameters to help understand the possible degradation along the flowpath from the groundwater to Carroll Creek

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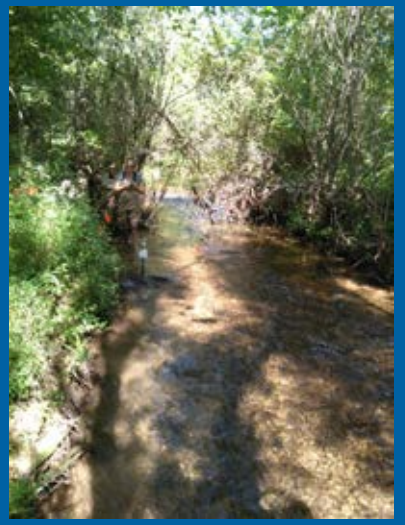

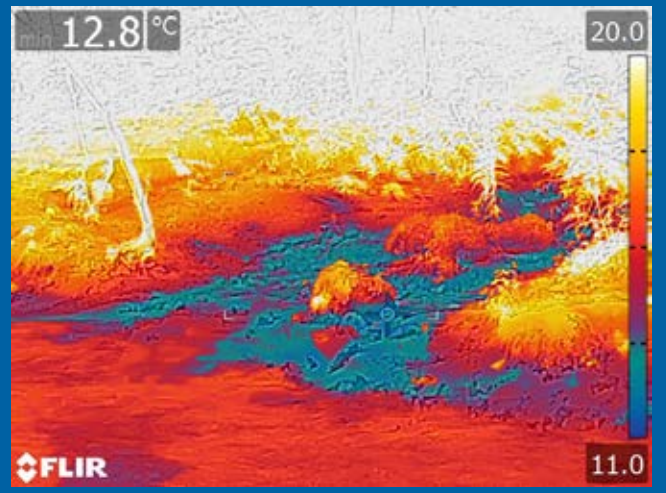

Biodegradation–Potential Data Gaps and Associated Tasks (3-4)

- Limited historical data (2005) suggests some potential for biodegradation of contaminants in groundwater
  - Sampling of select, existing wells for parameters throughout Area B that provide information on the likelihood that biodegradation is occurring under current conditions (Fall 2019, *Spring 2020*)
  - Evaluation of potential to enhance biodegradation outside the bioremediation pilot test area using in-situ microcosm (*Spring 2020*)
  - Additional microbial community sampling of groundwater before, during and after the bioremediation pilot test (*dependent on pilot test schedule*)

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Fall natural attenuation sampling effort

Passive microbial samplers

In situ microcosm schematic

Next Steps…

- Analysis of field data collected (winter 2020)
  - Groundwater Age tracers
  - Rock Matrix VOCs
  - Microbial Assessment
- Completion of remaining field events (spring 2020+)
- Report describing biogeochemistry investigation results (2020-2021)
- Report describing Hydrologic investigation results (2021-2022)

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ENVIRONMENTAL RESTORATION SERVICES FORT DETRICK, FREDERICK MD

Progress of the Pilot Study for Three Potential Remedial Technologies

December 4, 2019

John Cherry
Arcadis

Overview of Topics

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

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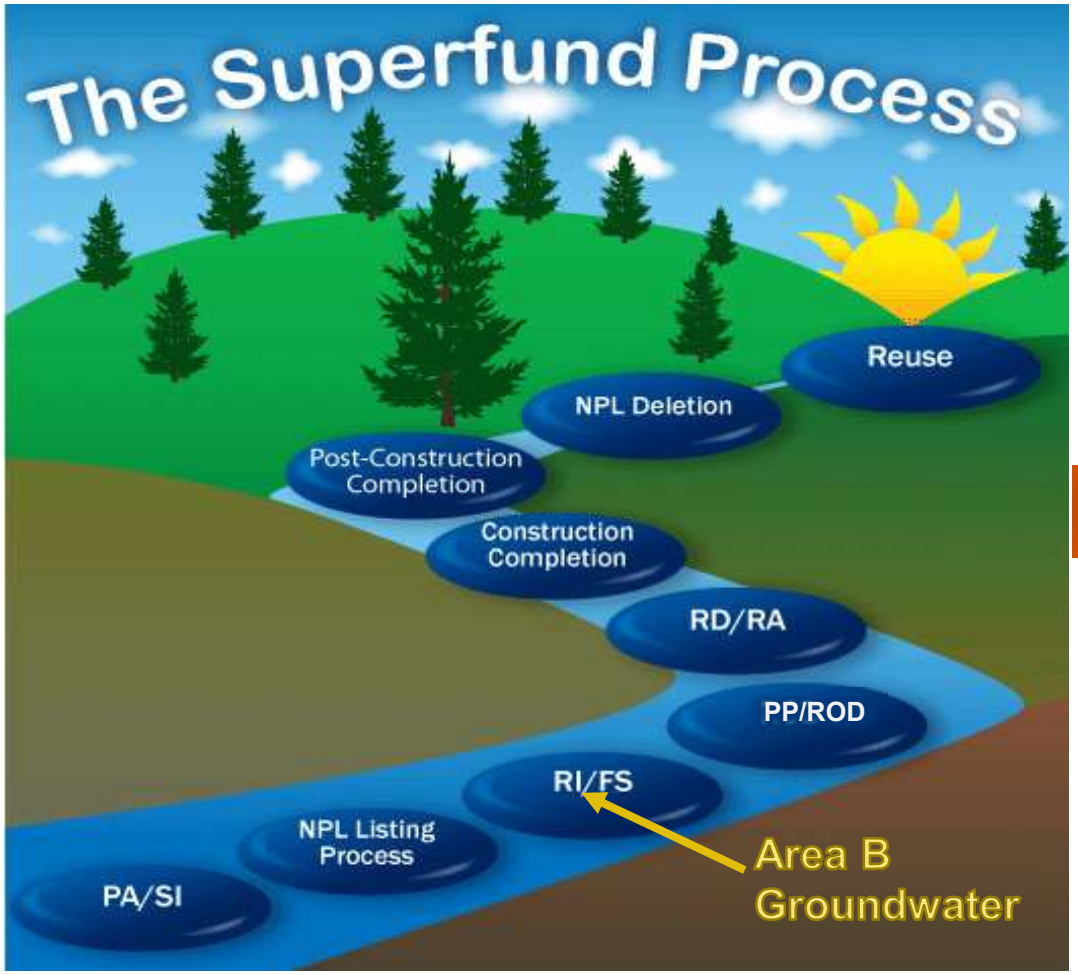
Area B Groundwater Pilot Study Overview

Where Does this Pilot Study fit into the Process?



Pilot Study

Remedial Action (RA)-Implement selected remedy

Remedial Design (RD)- Work plan and design of selected remedy

Record of Decision (ROD)- Final legal document selecting remedy

Proposed Plan (PP)- public document to solicit input on preferred remedy

Feasibility Study (FS)- Assessment of possible remedies

Remedial Investigation (RI)- Thorough investigation; develop conceptual site model, complete risk assessment

Site Inspection (SI)- Initial sampling to test for a release of hazardous substances to the environment

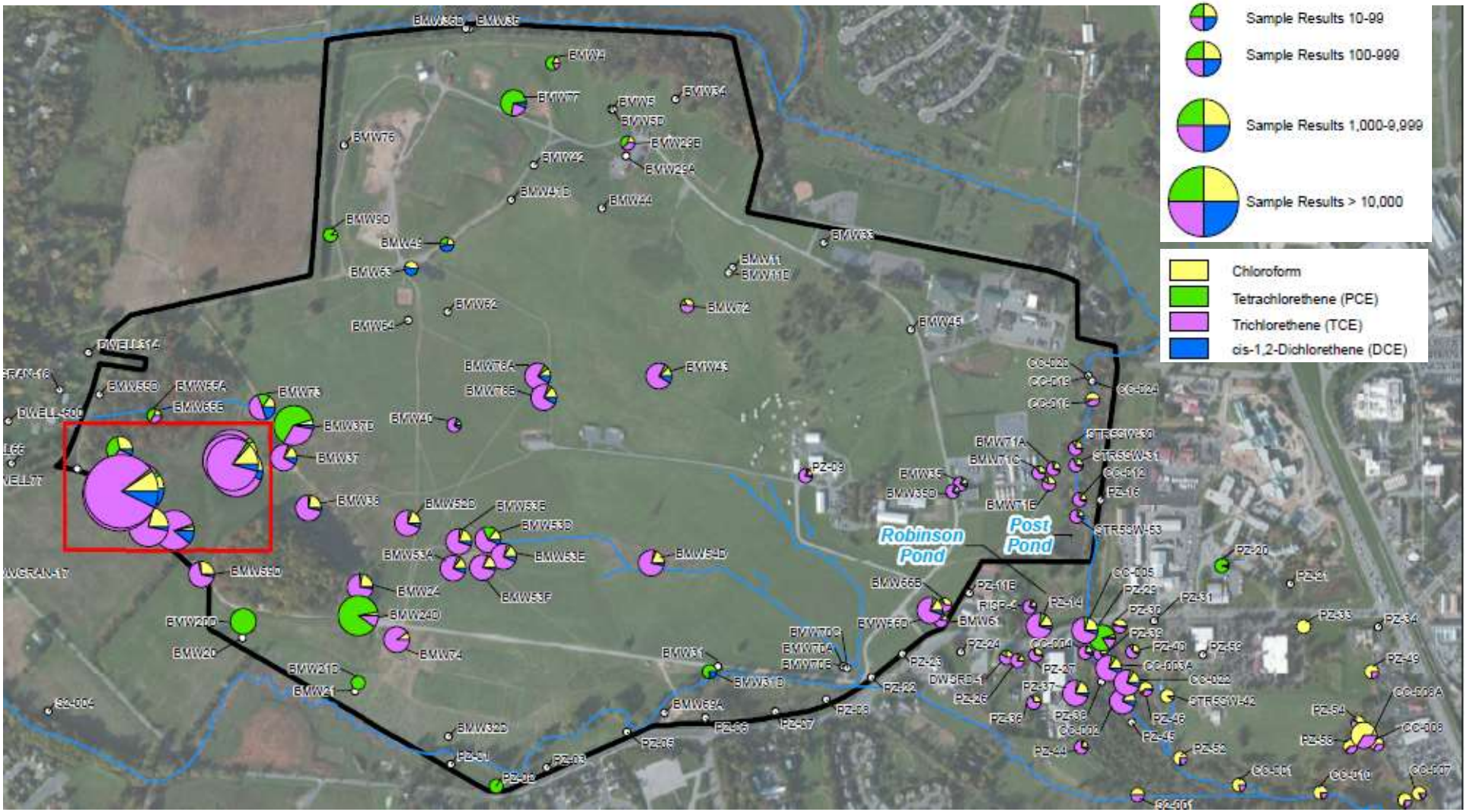
Preliminary Assessment (PA)- Initial review to identify sites that may pose a threat to the environment

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.

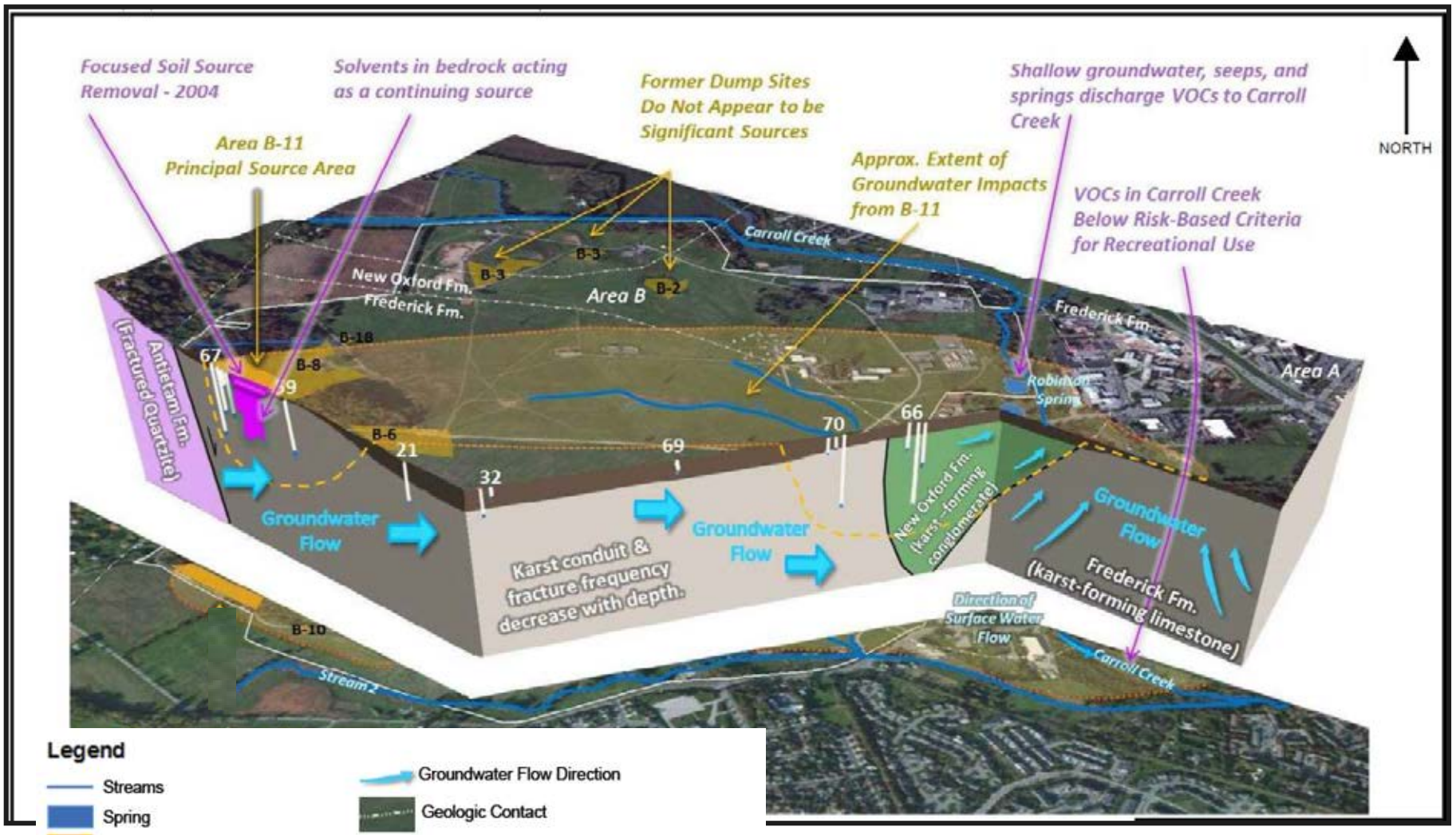
Distribution of VOCs



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)

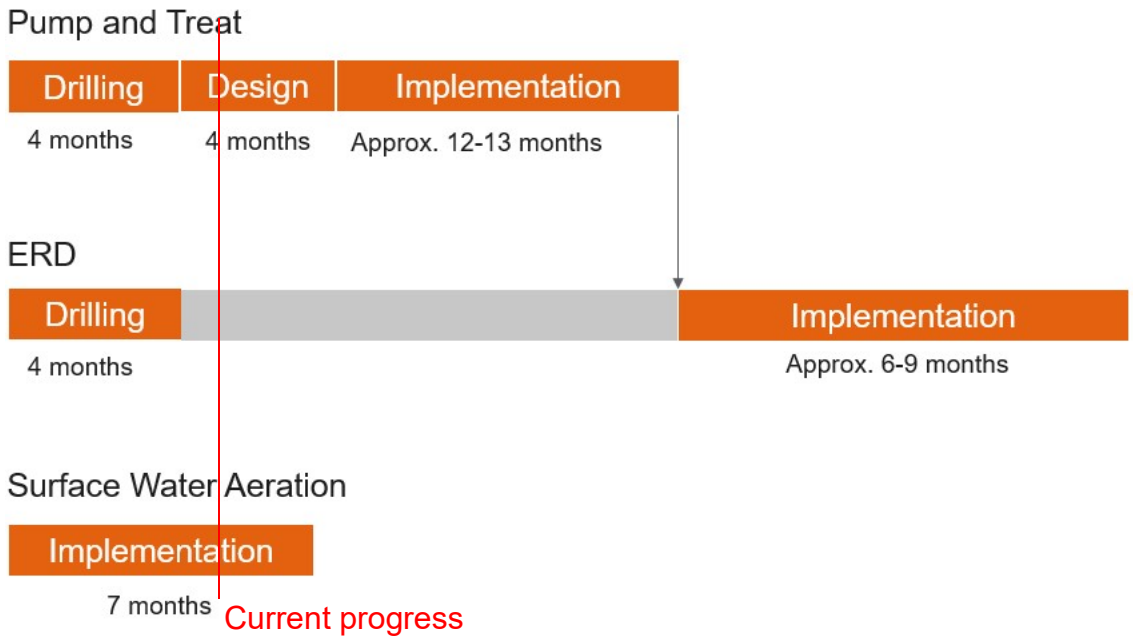
3. Pond Aeration

Surface Water Pilot Study Area

Groundwater Pilot Study Area

General Pilot Study Schedule

- Drilling work completed September 10, 2019
- Baseline Sampling conducted September 16-October 10
- Build out of P&T system expected for early 2020
- Surface water aeration implementation began on June 10, 2019. Will be completed in January 2020.
- Implementation of all options will take approximately 2.5 years



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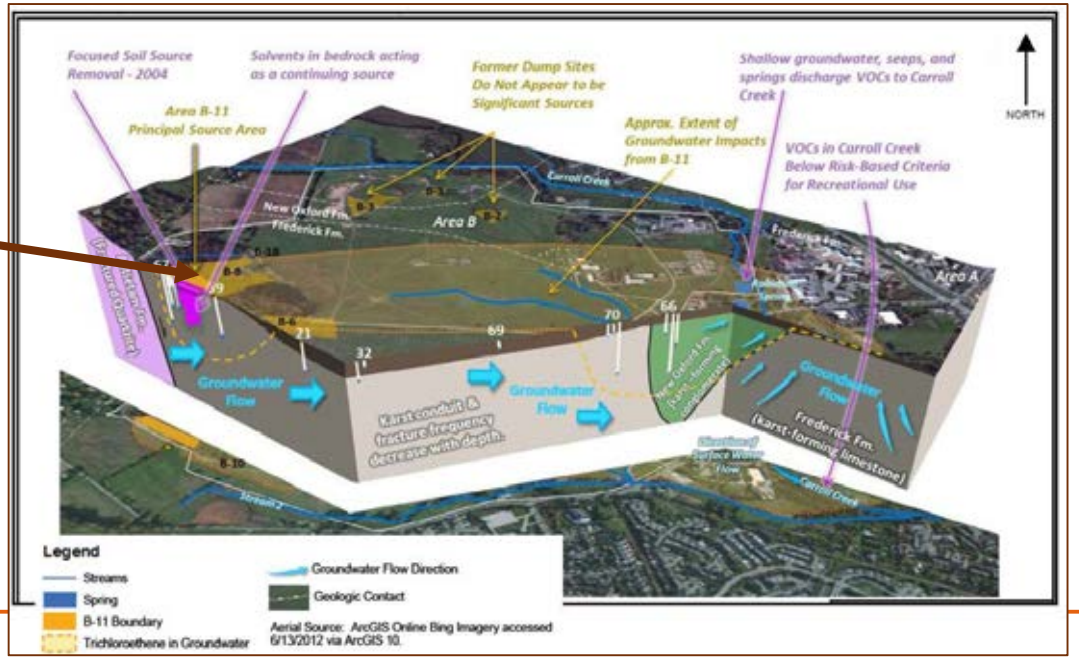
1st Technology: *Pump and Treat*

Groundwater Pilot Study Area



1st Technology: Pump and Treat

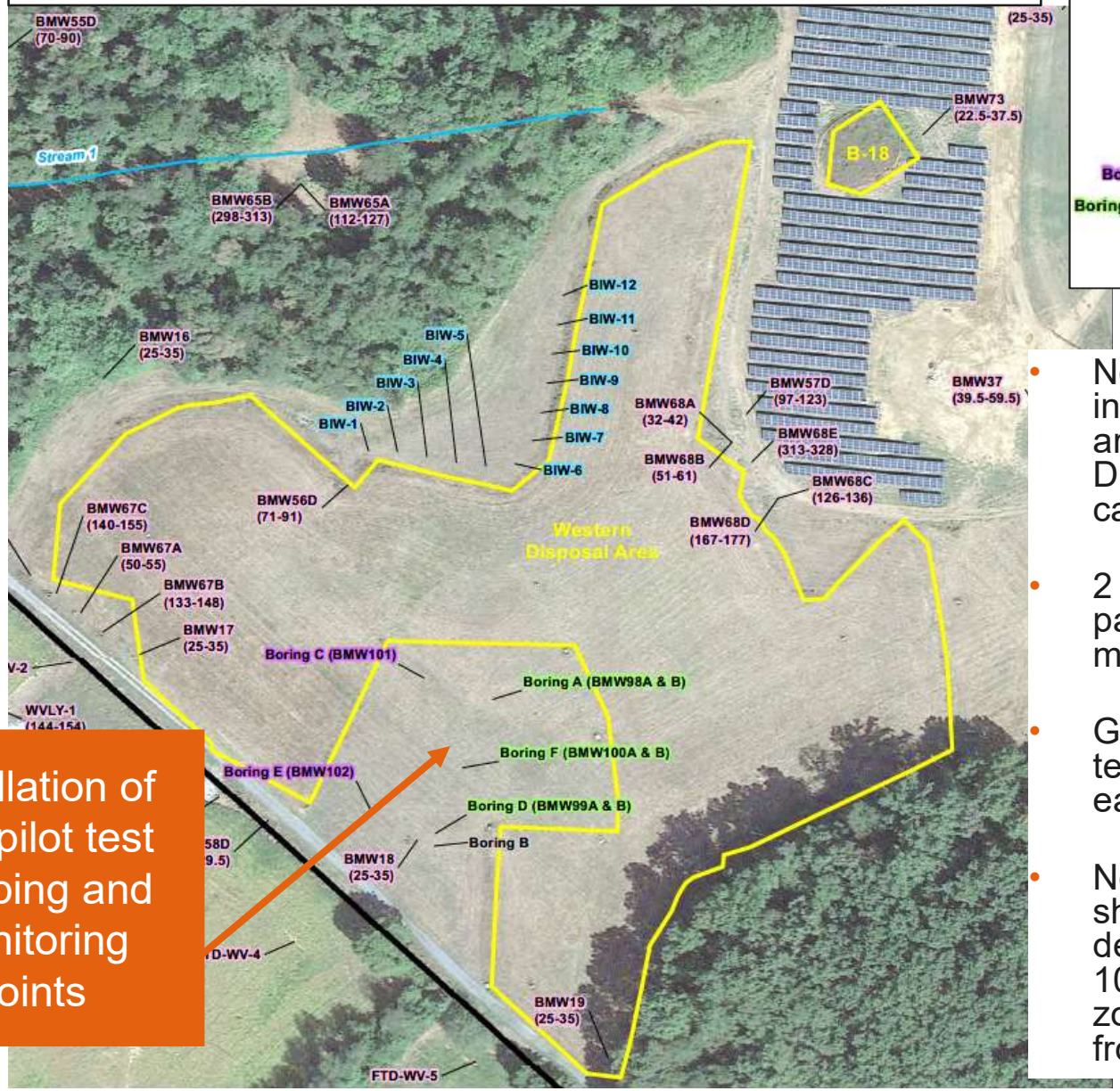
Approach

- 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



Legend

- Fort Detrick Boundary
- Capped Former Disposal Area
- Stream
- Water Body
- **BMW17 (25-35)** Monitoring Point Screened Interval (ft bgs)
- **BIW-1** Injection Point
- **Boring C (BMW101)** Pumping Point
- **Boring A (BMW98A &B)** Monitoring Point
- **Boring B** Abandoned Boring

Installation of new pilot test pumping and monitoring points

- New source area points installed in “cap cut-out area” of the Western Disposal Area landfill cap.
- 2 pumping points and 3 pairs of nested monitoring points
- Geophysics and packer testing completed at each borehole
- Nested points will have a shallow zone (total depths range from 76-105 ft bgs) and deep zone (total depths range from 135 to 188 ft bgs)

Pump and Treat Point Installation

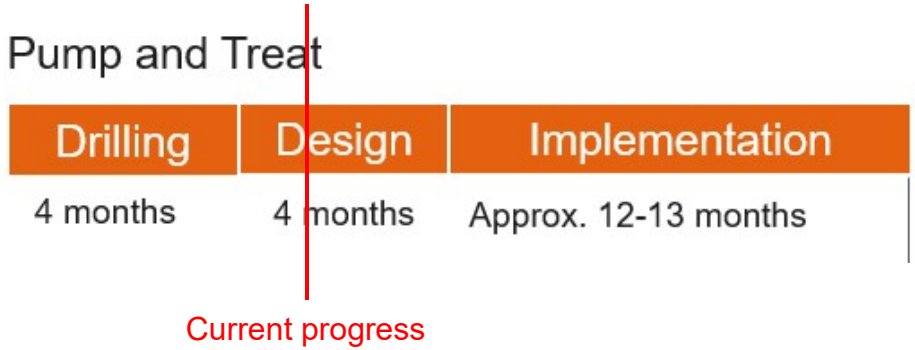
- Drilling conducted - June 19 – September 10, 2019
- 2 pumping points and 3 sets of nested monitoring points were installed
- All 5 new borings drilled to depths of approx. 200 feet.
- Geophysical logging and packer testing conducted to determine construction specification for pumping & monitoring points.
- Step test conducted November 20-22, 2019

Pump and Treat Baseline Sampling

- Baseline sampling conducted September 16-October 10, 2019 to determine the final design of the P&T system
- Sample locations:
  - Both new pumping points and the six new monitoring points;
  - 11 existing monitoring points
  - Robinson Box Spring
- Analytes:
  - VOCs
  - Semi-volatile organic compounds (SVOCs)
  - Pesticides
  - Herbicides
  - Dioxins/furans
  - Gross alpha/beta radiation
  - PFAS (17 congeners)
  - Inorganics (total and dissolved)
- TCE detected up to 2,500 parts per billion, consistent with past data

1st Technology: Pump and Treat Next Steps

- 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*



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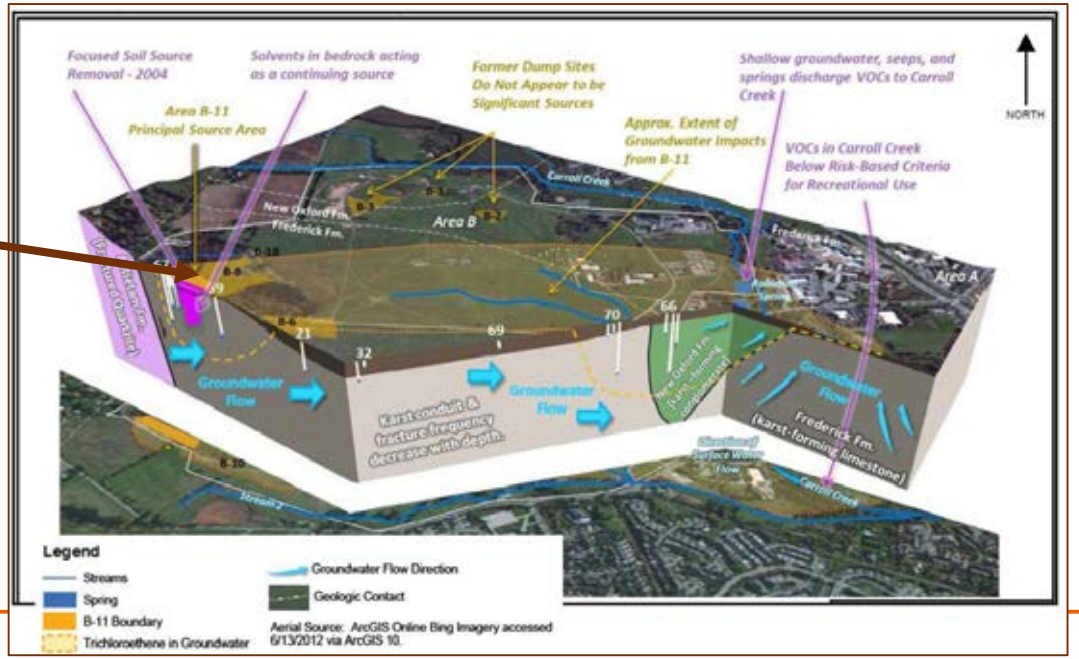
2nd Technology:
Enhanced Reductive Dechlorination

Groundwater Pilot Study Area



2nd Technology: Enhanced Reduction Dechlorination (ERD)

Approach

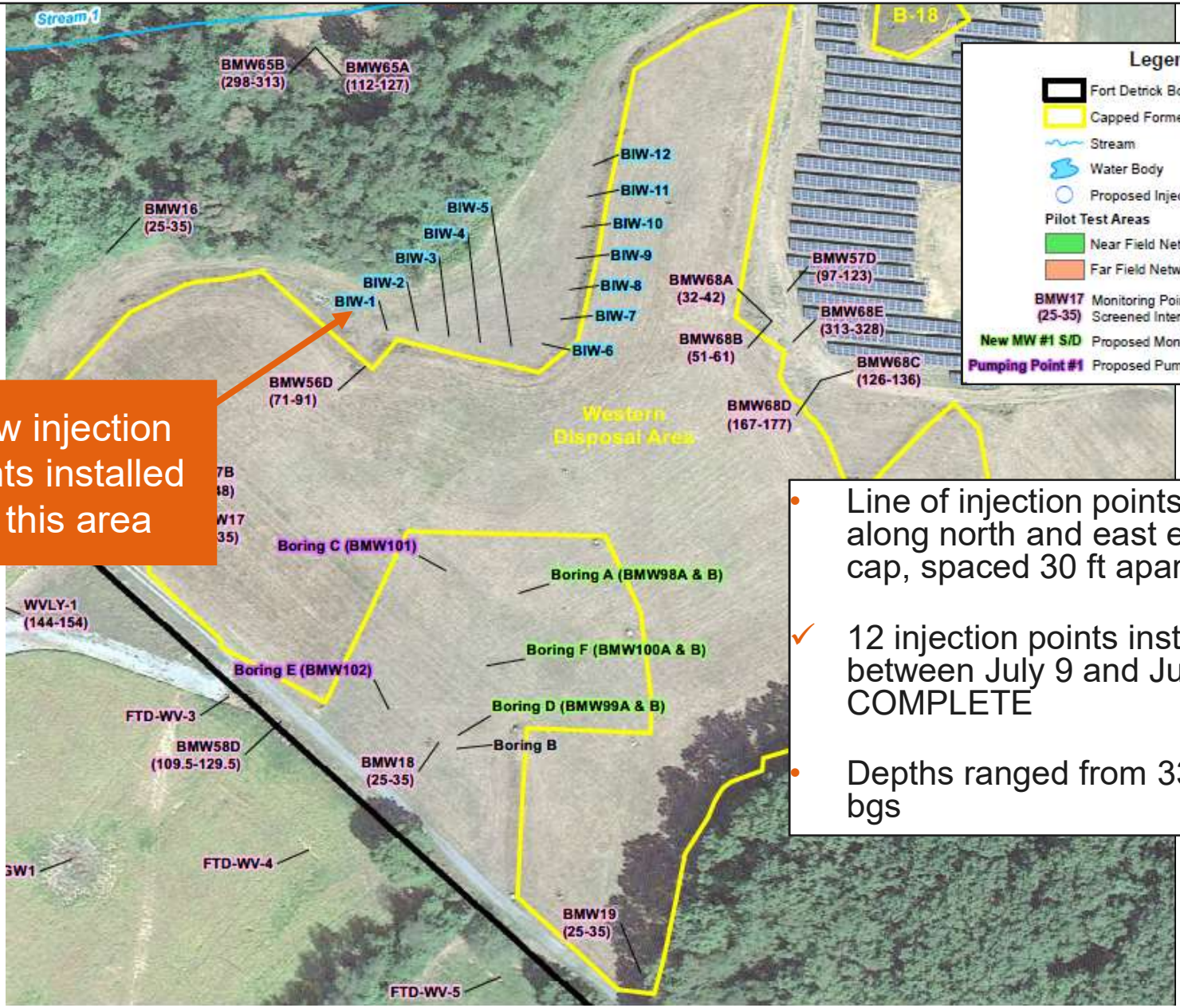
- Injection of carbon solution (e.g., molasses) via 12 shallow injection points (~30-50 feet deep) to stimulate microbial degradation of VOCs in groundwater.

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

Remedial alternatives for contaminant other than VOCs will be evaluated in a future Feasibility Study (FS)

Enhanced Reductive Dechlorination Pilot Test Area



New injection points installed in this area

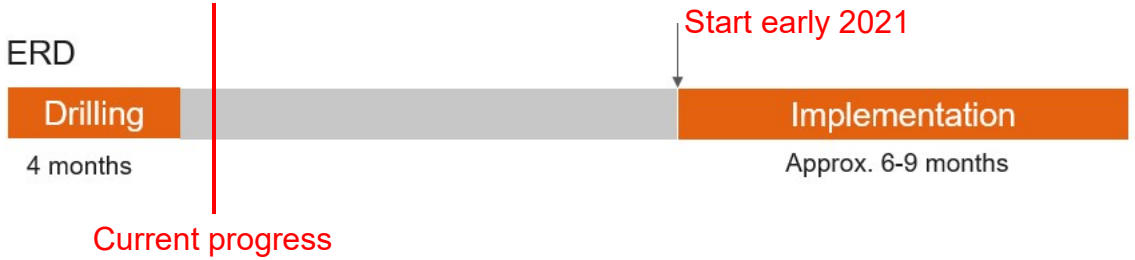
- Line of injection points placed along north and east edges of cap, spaced 30 ft apart
- ✓ 12 injection points installed between July 9 and July 18--COMPLETE
- Depths ranged from 33’ to 53 bgs

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

- 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.
    - A conservative tracer (deuterium AKA “heavy water”) will be used as part of injections.

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.



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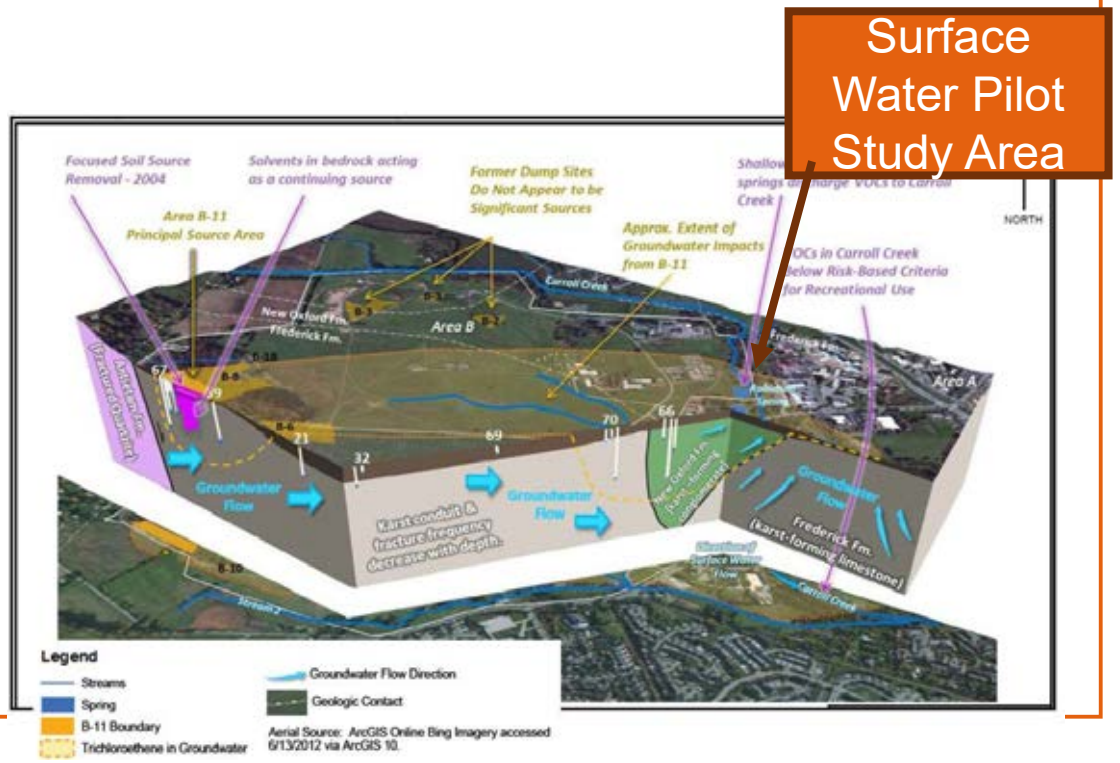
3rd Technology: *Pond Aeration*



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)

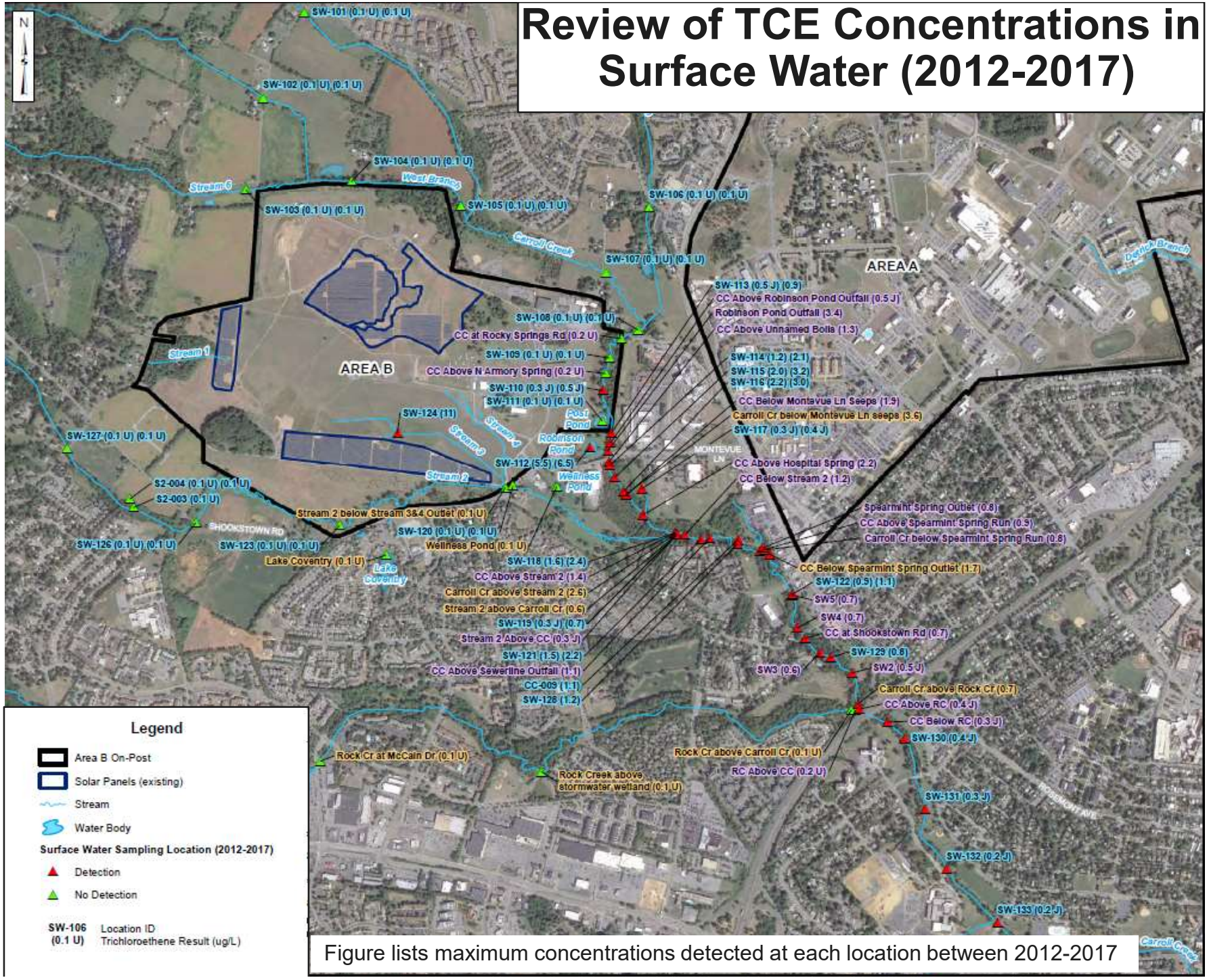


Figure lists maximum concentrations detected at each location between 2012-2017

Background Info
-2017 Field Work – Observations

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

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.

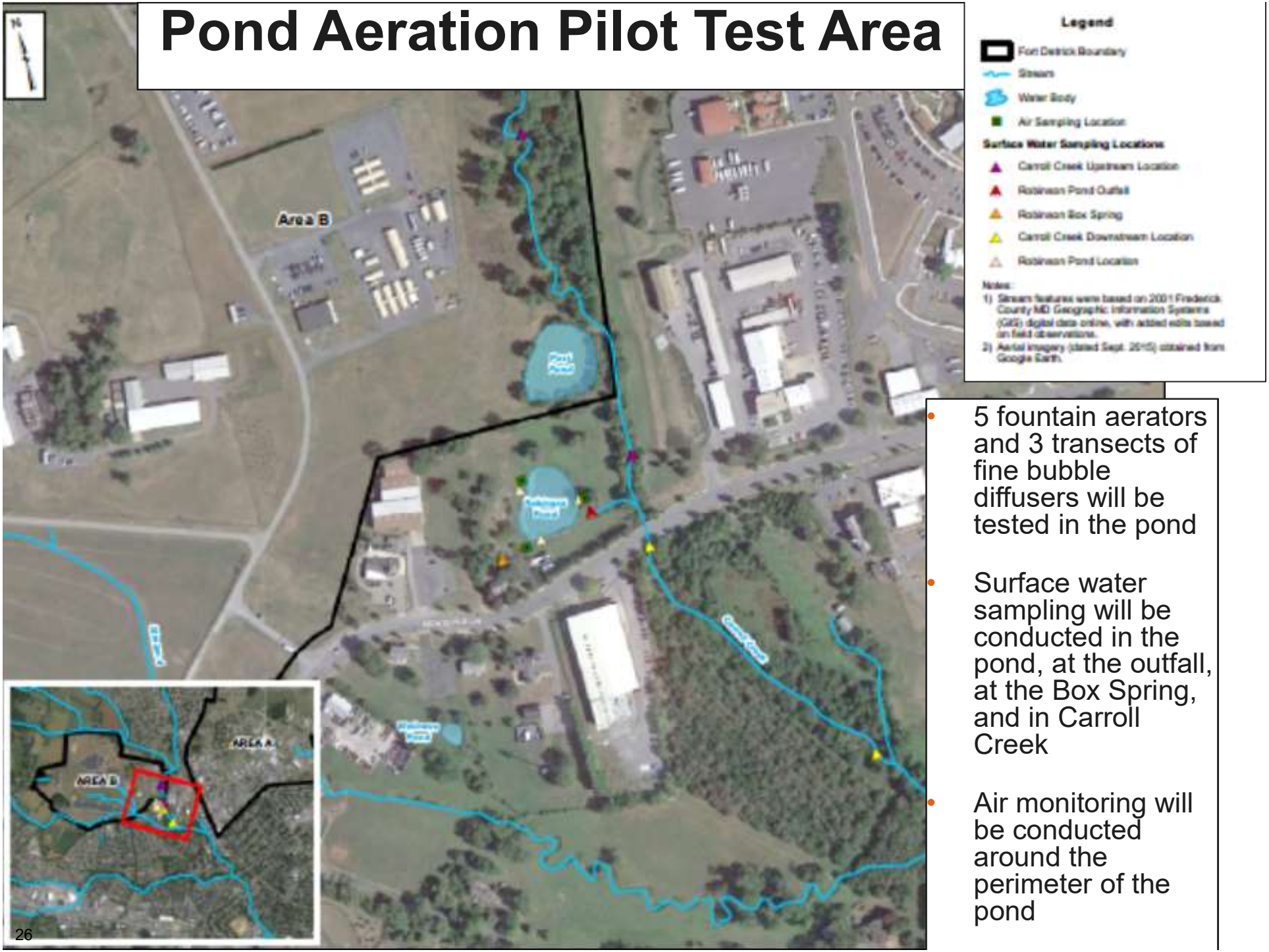
Background Info
-2017 Field Work – Observations

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

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 µg/L.
- Low PCE detections in the primary discharge area (up to 0.6 µg/L compared to drinking water standard of 5 µg/L).

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 aeration system will be run for 2 months, with an expected 7-month study duration
  - ✓ Baseline sampling conducted for a month prior to fountain system operation--COMPLETE
  - ✓ Fountain test conducted for 2 months (with accompanying sampling)--COMPLETE
  - ✓ Second baseline sampling conducted for two months prior to diffuser system operation--COMPLETE
  - Diffuser test will be conducted for 2 months (with accompanying sampling)--ONGOING

Pond Aeration Pilot Test – Fountains

First System Test

- Electric fountains expel water it into the air phase in a cascading, trumpet-shaped spray
- Five fountains have been installed and operated July 18th to September 17th
- 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 – Fountains

- 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

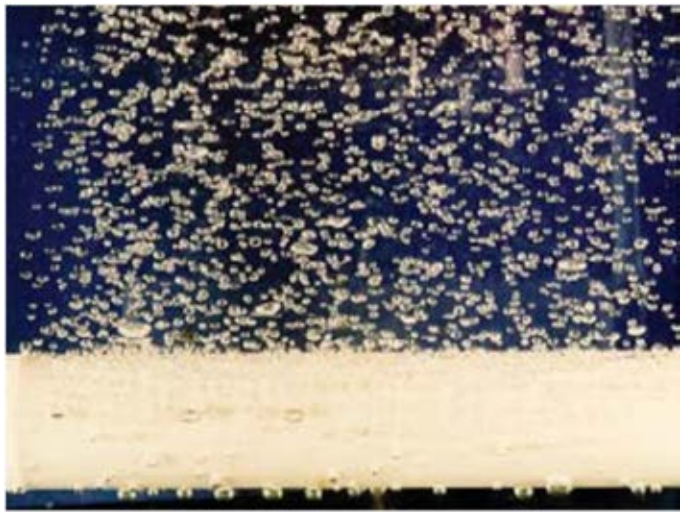
Pond Aeration Pilot Test – Fountains

- Two-month fountain aeration test conducted July 18th to September 17th
- Four surface water/air sampling events conducted
  - August 2nd
  - August 15th
  - August 30th
  - September 13th

Pond Aeration Pilot Test – Diffusers

Second System Test

- Porous air diffuser tubing/piping 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

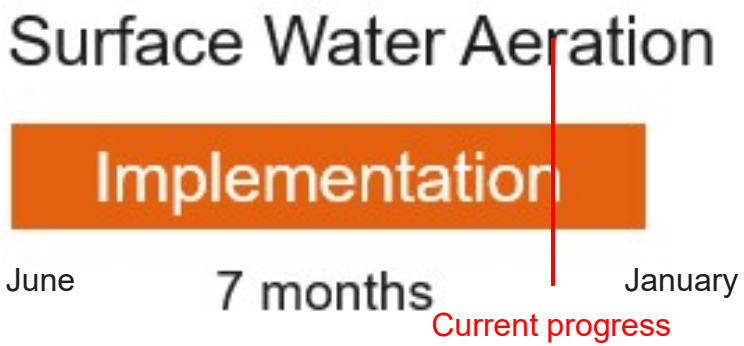
Pond Aeration Pilot Test – Implementation

Phase 3 - Complete

- Buildout of diffuser system piping (*right*) was conducted from October 2nd – 4th
- Two rounds of baseline surface water and air sampling were conducted
  - Round #1 September 26th
  - Round #2 October 25th
- Two-month diffuser aeration test officially began on November 22nd
  - First of four surface water/air sampling events conducted November 26th
  - Sampling results are pending and will be discussed during a future RAB.

Next Steps – Surface Water Aeration

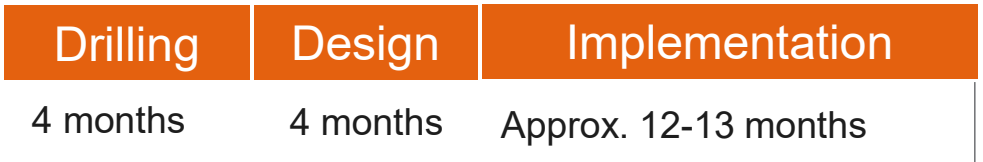
- Diffuser test will be conducted for 2 months (with accompanying sampling). –*run through late-January.*
- *Updates will be provided during future RABs.*



Questions?

General Pilot Study Schedule

Pump and Treat



4 months | 4 months | Approx. 12-13 months

ERD

4 months | Approx. 6-9 months

Surface Water Aeration

7 months