PILOT TEST CONDUCTED TO REMOVE PFAS RISK

CASE STUDY:

Michigan Dept. of Military and Veteran Affairs Employs PlumeStop Barrier at Grayling Army Airfield





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New, innovative approach using colloidal activated carbon barrier to eliminate PFAS exposure pathway and protect the community.

Highly collaborative effort amongst interdepartmental groups.

Economical and effective pilot study design.

Remediation efforts were conducted with transparency for the surrounding Grayling community.



Five rounds of post-application monitoring show that PlumeStop has reduced PFAS and PCE to below target levels in each of the downgradient wells.

OVERVIEW

Camp Grayling in Crawford County, Michigan is a year-PFAS contamination is particularly challenging round training center for the Michigan Army National because of its recent discovery, which means that Guard (MIARNG). The Michigan Department of Military few in situ treatments are available. The department's and Veteran Affairs (DMVA) have been remediating environmental task force conducted an evaluation of the chlorinated solvent impacts in the site groundwater from groundwater remedial technology and became aware historical operations at the facility since the late 1980's. of a new approach to eliminate risk using REGENESIS In 2016, the DMVA became aware of the potential PlumeStop, a Liquid Activated Carbon in situ. This contamination of PFAS from historical operations innovative technology has been proven at other sites such as on-site firefighting training and began testing where PFAS contaminants have been found and has groundwater at the Grayling Army Airfield (GAAF). PFAS quickly and effectively eliminated the downgradient risk was found commingled with a chlorinated solvent plume of PFAS compounds, and is expected to be effective for that was migrating towards the property boundary. The decades. DMVA reviewed potential remedial options to test in the field such as pump and treat, but ultimately decided "We have great partners with Wood, to test an in-situ reactive barrier application of colloidal my staff and REGENESIS to come up activated carbon. with a good strategy for an effective pilot study..." Colloidal activated carbon was selected because of

Colloidal activated carbon was selected because of the expected rapid reductions of PFAS through its removal from the dissolved mobile phase. Colloidal activated carbon effectively increases the retardation factor of PFAS constitutent migration by several orders of magnitude and thereby eliminates down-gradient receptor exposure. In addition, colloidal activated carbon was selected due to its expected lower total project costs when compared to operating a mechanical system over a similar timeframe. Because PFAS are contaminants of emerging concern, the state of Michigan wanted to be as proactive and afficient as passible when it came to addressing

The Michigan DMVA decided to conduct a PlumeStop pilot test to determine if this treatment would meet their system over a similar timeframe. site goals prior to a full-scale application. The goals for this pilot project were to utilize an approach that could Because PFAS are contaminants of emerging concern, both protect the Grayling community from exposure and the state of Michigan wanted to be as proactive and be cost-effectively expanded to a full-scale application. efficient as possible when it came to addressing Monitoring has taken place through 170-days post this groundwater threat. In order to accomplish this, application. These results show that PlumeStop has the Governor of Michigan launched an interagency successfully reduced the PFAS and PCE contaminants group called the Michigan PFAS Action Response in all of the downgradient wells to below target levels. Team (MPART) tasked with collaborating on PFAS The MIARNG plans to continue monitoring the results as they conduct their site-wide Remedial Investigation. environmental release prevention and remediation. This group, of which the Michigan DMVA is a member, The promising results seen to-date may serve as a testmeets frequently to address PFAS contamination and case for other military sites where PFAS may be present. collaborate on proactive solutions.



— Jonathon Edgerly, Environmental Manager, Michigan National Guard





BACKGROUND

Camp Grayling is the premier, full-spectrum joint training center in Crawford County, Michigan. As the largest National Guard training installation in the US, Camp Grayling provides year-round training support for the Michigan Army National Guard along with military commanders and civilian leaders to meet their readiness requirements. Camp Grayling has a proud history dating back to the first World War and has been instrumental in training US multi-reserve troops and Michigan National Guards corpsmen and women for every major war over the last 100 years. Camp Grayling is recognized both nationally and internationally for hosting the event, Northern Strike which is a joint training exercise involving all of the armed forces including armed forces from 12 other countries. Additionally, Grayling is home to recreational activities that include hunting, boating, and fishing and is known for its beauty, wildlife, and its many lakes and waterways.

When PFAS contamination was discovered, the first priority was to eliminate the risk that the contamination posed to the community. This is an extremely difficult

class of contaminants to manage because the EPA regulatory guidelines for PFOS and PFOA compounds is set at 70 parts per trillion, which is comparable to a small drop in three Olympic-sized swimming pools. PFAS compounds are also used in many products, adding to the complexity of testing and treating these contaminants. Very soon after detecting the PFAS contamination, the Michigan DMVA hosted a town hall meeting to keep residents well-informed and to announce the residential well sampling plan.

The MVDVA proactively initiated a pilot demonstration of the new colloidal activated carbon technology called PlumeStop. This technology utilizes natural activated carbon milled to the size of a red blood cell that flows into the subsurface, converting contaminated aquifers into purifying filters. The PFAS contamination is tightly sorbed onto the PlumeStop in the subsurface, removing it from the groundwater and eliminating the downgradient risk to the community.

Throughout the remediation process, the DMVA has hosted multiple town hall meetings to ensure clear communication with the Grayling community.

PROJECT TIMELINE



January 2017:

First Town Hall Meeting to Inform Local Residents and Announce the Residential Well Sampling Plan

May 2017: EGLE Supplies Bottled Water to Residents

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

September 2017: Third Town Hall Meeting

November 2016: Initial Testing Results Detect PFAS in On-site Groundwater April 2017: Michigan Army National Guard Begins Collecting (000) Residential Well Water Samples for PFOS/PFAS Analyses July 2017: Second Town Hall Meeting Announces Plan to Supply Point-of-Use Filters **B** November 2017: Sampling Begins at Lake Margrethe Due to EGLE ΠΠΠ 1990 Foam Sampling Results and The Fourth Town Hall is Held to Address Lake Margrethe PFOS/PFOA Results July-August 2018: The NGB and the MIARNG Plan Pilot Test P October 2018: PLUME STOP PlumeStop Application Event

June 2018:

Fifth Town Hall Meeting is Held to Present Initial Results From the National Guard Bureau (NGB) Preliminary Assessment Investigation

September 2018: The NGB Starts the CERCLA Site Investigation







PILOT TEST

REGENESIS and the Michigan DMVA team rapidly developed an effective pilot design using a multi-target approach to address both the PCE and TCE contaminants as well as the PFAS compounds. The pilot test application of PlumeStop was designed as an arc consisting of 9 direct push injection locations upgradient of the existing monitoring well, MW-29. REGENESIS tested numerous injection variables such as flow rate, screen size, injection volume, pressure, and point location in order to refine the approach and optimize the Plumestop horizontal and vertical distribution. The small-scale of the pilot test kept costs low as it minimized the amount of materials needed for the injection while still confirming the success of the product under this site's specific hydrogeologic conditions.

Core samples and settling tubes taken from SB8-2.5 depicting consistent PlumeStop saturation from 15-27'









RESULTS

The Michigan DMVA has worked rapidly and effectively to address the PFAS-impacted drinking water exposure by collaborating with State partners and with the surrounding community to mitigate risk through supplying residents with water treatment filtering systems and have sought out an effective long-term remedy to address PFAS in groundwater.

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Five rounds of post-application monitoring show that PlumeStop has reduced PFAS and PCE to below target levels in each of the downgradient wells.

With PlumeStop in place, there is a safe barrier between the PFAS groundwater contamination and down-gradient human exposure, which is the first priority of the DMVA. The DMVA is pleased with the technology that REGENESIS Remediation Services (RRS) has provided, calling it a technically sound and cost-effective design. Monitoring results through 170 days post-application show that the PFAS and PCE concentrations were reduced to below target levels in the downgradient wells. The Michigan DMVA is continuing their CERCLA Remedial Investigation and is considering the next steps for a successful timely, long-term solution to the presence of PFAS-impacted groundwater at Camp Grayling and in the surrounding affected areas.



Core samples shown pictured illustrate effective PlumeStop distribution at a range of depths shown



TOTAL PCE RESULTS, 170 DAYS POST APPLICATION







ABOUT MPART

Launched in 2017, the Michigan PFAS Action Response Team (MPART) is the first multi-agency action team of its kind in the nation. Agencies representing heath, environment and other branches of state government have joined together to investigate sources and locations of PFAS contamination in the state, to take action to protect people's drinking water, and to keep the public informed as we learn more about this emerging contaminant. The state of Michigan taking action to address this issue in a proactive and innovative way. Ten state departments, in coordination with local and federal officials across Michigan, are working together to ensure that the public health and safety of residents is protected while ensuring our environmental heritage is secure. Additional information regarding the State of Michigan's response to PFAS can be found at: https://www.michigan.gov/pfasresponse/



ABOUT PLUMESTOP



PlumeStop is an *in situ* technology that rapidly reduces dissolved-phase plumes. PlumeStop behaves as a colloidal matrix binding to the aquifer matrix, rapidly removing contaminants from groundwater, and expediting permanent contaminant biodegradation. The benefit to PlumeStop's dispersive properties is its ability to sorb contaminants, quickly removing them from the mobile phase while providing a high surface area matrix which proves favorable for microbial colonization and growth. Key Beneflts:

- *In Situ* remediation technology that rapidly reduces dissolved-phase plumes in days/weeks
- Distributes widely under low injection pressures
- Colloidal biomatrix completely biodegrades contaminants in-place
- Achieves stringent groundwater clean-up standards
- Provides a long-term means of addressing matrix back-diffusion
- Eliminates excessive time and end-point uncertainty associated with groundwater remediation

WE'RE READY TO HELP YOU FIND THE RIGHT SOLUTION FOR YOUR SITE



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