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"A-STREET DITCH" SEDIMENT REMEDIATION PILOT STUDY - WILMINGTON

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In 2019, DNREC initiated a pilot-scale project utilizing inoculated activated carbon pellets in an attempt to destroy PCBs in sediments in the A-Street Ditch adjacent to the Christina River.

Watershed Information: The Christina River watershed is one of four major watersheds in the 565 sq. mi. Christina Basin, which is part of the 13,000 sq. mi. Delaware River Basin. The White Clay, Red Clay, and Brandywine Creeks are tributaries of the Christina River and flow southward out of the Piedmont geologic province in Pennsylvania and into Delaware near Newark, Yorklyn, and Wilmington, respectively. The Christina River is tidal from just south of the town of Christiana to its confluence with the Delaware River at Wilmington. The Brandywine Creek flows through Wilmington and enters the Christina River just before the Christina flows into the Delaware River. Most of the Christina River watershed is located in New Castle County (DE). Towns in the Christina River watershed include Newark (DE), Wilmington (DE), Elkton (MD), London Britain Township (PA), and Franklin Township (PA).

Problem: Based upon data collected in 2015 by DNREC's Watershed Approach to Toxics Assessment and Restoration (WATAR) Team throughout the Christina Basin, the majority of toxic chemical impacts to sediments, surface water and fish are located within the lower tidal portions of the Christina and Brandywine Rivers. Contaminants of Concern are PCBs, dioxins and furans, and chlorinated pesticides. In order to achieve water quality goals, and subsequently sediment and fish tissue goals, two things need to occur: 1) land-based source control; and 2) in-water sediment remediation. Regulatory measures aimed at land-based source control are ongoing throughout the watershed, and positive results have been seen in the form of relaxed fish consumption advisories (2018 Fish Advisory Update). Although there is still more work to be accomplished in the uplands to fully control the remaining known sources of toxic impact to the Christina Basin, DNREC and its partners are beginning to turn additional attention towards the next phase of improvement, in-water sediment remediation. Similar to the Mirror Lake Project in Dover (Mirror Lake Update Video), DNREC's second sediment remediation test project using SediMite™, an activated carbon-based product, is called the "A-Street Ditch Pilot Study." This study aims to enhance the innovative contaminant sequestration technology in order to destroy PCBs and reduce their overall mass in the environment. If the project is a success, then this technology will be available for use in the much larger Christina/Brandywine River Remediation in the future.

A-Street Ditch Pilot Study: The A-Street Ditch in Wilmington, Delaware drains the South Wilmington Wetland to the Christina River. Samples collected by DNREC's WATAR Team in 2015 indicated that the ditch was a pathway/source of PCBs to the river. In conjunction with remedial activities within the South Wilmington Wetland in 2019, DNREC initiated this full-scale pilot project to evaluate the effectiveness of a new inoculated carbon pellet technology developed by partners at the University of Maryland Baltimore County (UMBC). The project aims to sequester, and destroy, the PCBs in the sediments of this drainage feature. In addition, remediation of the A-Street Ditch will minimize recontamination of the newly constructed wetland by surface water and sediments moving

tidally through the system. DNREC initiated the A-Street Ditch Pilot Study as an interim measure to test this innovative sediment remediation technology for possible application at a largescale, and as a compliment to the City of Wilmington's South Wilmington Wetland project (A Street Ditch Video).

The A-Street Ditch project utilizes SediMite™, the same activated carbon technology that was successfully used at Mirror Lake in Dover in 2013.
Therefore, DNREC is very confident that the carbon application will effectively sequester PCBs in the sediment, rendering them unavailable for uptake by benthic aquatic organisms. The pilot will determine the rate at which PCB degradation/destruction can occur in this system with the added inoculant. To begin to answer the question, DNREC and their contractors (Brightfields, Inc. and Rembac Environmental) collected sediment, surface water, and porewater samples in late 2019 (only 5 months after inoculated SediMite™ application) to compare against baseline data collected prior to remedial activities. Additional post-remediation monitoring is scheduled for 1 year and 3 years post-application, or June 2020 and June 2022. The comparison of these data will show the long-term effects of the inoculant.

Initial Results: Based upon the results of the initial 5-month post-remediation monitoring, and comparison to baseline sampling results, the following observations are noted: Total PCB concentrations in surficial sediments across the study area have dropped between 25% and 28%, with an average reduction of approximately 25%. Total PCB concentrations in surface water across the study area have dropped 23% to 47%, with an average reduction of approximately 35%. Finally, and most impressive, concentrations of total PCBs in sediment porewater, have dropped between 49% and 77%, with an average reduction of approximately 67%.

Funding – A Street Ditch:

- Hazardous Substance Cleanup Act (HSCA) funds ($188,313) – For planning, remediation, and long-term monitoring.
- USEPA Multi-Purpose Grant ($30,000) – For 5-month post-application monitoring report, and year one post-application monitoring (sampling, analysis and report).

Previous DNREC Press Release, July 9, 2019

WILMINGTON – A new DNREC YouTube Channel video details an innovative remediation project to remove PCBs from sediment in a ditch that discharges into the Christina River in Wilmington.

This spring, DNREC's Watershed Approach to Toxics Assessment and Restoration (WATAR) Team and its partner University of Maryland, Baltimore County and contractor Brightfields, conducted a full-scale pilot test, using approximately 7 tons of Sedimite pellets inoculated with PCB-degrading micro-organisms to isolate and destroy legacy PCB contamination in a one-acre wetland area on A Street in Wilmington. With PCBs as the main cause of fish consumption advisories in the Christina Basin, the goal of the project is to prevent the contaminants from entering the food chain and impacting fish and other aquatic life.

Sedimite™ was the same product used for the Mirror Lake Remediation and Restoration Project in Dover in 2013, which has resulted in more than 80 percent reduction of PCBs in resident fish tissue in the five years since it was applied. The difference in this application – the first commercial application of bio-amended Sedimite™ in the country – was the inclusion of the PCB-destroying micro-organisms.

The WATAR Team expects successful results from the innovative pilot project and that the technology may become another tool that can be utilized in cleaning up legacy PCB contamination in other water bodies in the state.

The video can be found on the DNREC YouTube Channel at A-Street Ditch.

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DNREC's innovative Mirror Lake clean-up earns more national acclaim, while a groundbreaking enhancement to the same approach reduces pollutants in the Christina River

DOVER, Del. – For Earth Day 2020, the Department of Natural Resources and Environmental Control announced it has successfully used an innovative approach to reduce polychlorinated biphenyls (PCBs) in two Delaware waterways. Newly released scientific data are validating the new method of sequestering pollutants with activated carbon, which render them unavailable for uptake by fish and other aquatic organisms.

The first success was with an activated carbon product called SediMite™ at Mirror Lake in Dover in 2013. The project is featured in a new article co-authored by several project participants, including two DNREC scientists, and published in the May issue of *Journal of Environmental Engineering*. The article, titled "Full-Scale Application of Activated Carbon to Reduce Pollutant Bioavailability in a 5-Acre Lake" presents a summary of the monitoring data collected at the site between 2013 and 2018. Highlights include an approximate 80% reduction in PCB concentrations in sediment porewater, which is the water trapped between grains of sediment in the bottom of a water body. The study also found an approximate 70% reduction in PCB concentrations in Mirror Lake's resident fish.

"The recognition by the *Journal of Environmental Engineering* reflects how Delaware is on the leading edge of environmental technology, an area DNREC is exploring more and more" said DNREC Secretary Shawn Garvin. "Mirror Lake was a successful pilot, so DNREC's team sought a second opportunity to try the technology."

The A Street Ditch project became a focus for DNREC's Watershed Approach to Toxics Assessment and Restoration (WATAR) team after samples confirmed drainage ditch sediments were a continuing source of PCBs to the Christina River. The project, in coordination with cleanup efforts at the adjacent South Wilmington Wetland Park site, provided an opportunity to evaluate an enhanced carbon sequestration technology

developed by DNREC's partners at the University of Maryland Baltimore County (UMBC).

The enhanced technology involves the use of SediMite™ with the addition of PCB-destroying micro-organisms (inoculant). In theory, the activated carbon will sequester PCBs, as shown in Mirror Lake. However, the micro-organisms (which exist naturally in the environment in much smaller numbers) will effectively degrade the PCB molecules over time. Initial results, collected only 5 months after the inoculated Sedimite™ was applied to the ditch sediments, show total PCB concentrations in the top layer of sediments across the A Street Ditch study area dropped by an average of 25%. In addition, surface water PCB concentrations across the site area have dropped by an average of 35%. Most impressive is that concentrations of total PCBs in sediment porewater have dropped by an average of 64%. Additional monitoring will occur in July 2020, and again in July 2022.

Another harbinger for clean water in Delaware is that sequestering or destroying legacy PCBs – the primary risk driver for most of the fish consumption advisories issued by DNREC and the Delaware Division of Public Health – prevents these contaminants from entering the food chain. With increasing confidence in these innovative sediment remediation technologies, DNREC is beginning to plan for larger-scale projects, in key watersheds across Delaware, with similar water quality impairments.

"What these projects have achieved brings the longstanding goal of clean water for all Delawareans a little closer," said Secretary Garvin. "DNREC's dedicated scientists and staff are committed to improving water quality and making smarter use of resources at our disposal, including the technology that has driven both the Mirror Lake and A Street Ditch projects."

DNREC's A Street Ditch pilot project was supported by $188,000 in Hazardous Substance Cleanup Act (HSCA) funds and a $30,000 US Environmental Protection Agency multi-purpose grant. For more information, view the DNREC YouTube video about the WATAR team's A Street Ditch pilot and another video on the Mirror Lake project or visit the DNREC website.

About DNREC
The Delaware Department of Natural Resources and Environmental Control protects and manages the state's natural resources, protects public health, provides outdoor recreational opportunities and educates Delawareans about the environment. The Division of Watershed Stewardship develops and implements innovative watershed assessment, monitoring and implementation activities. The Division of Waste and Hazardous Substances ensures Delaware's wastes are managed to protect human life, health, safety and the environment. For more information, visit the website and connect with DNREC on Facebook, Twitter or LinkedIn.

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