

June 2015

Lockheed Martin Middle River Complex
2323 Eastern Boulevard
Middle River, Maryland

Middle River

Cleanup of the Soil at the Middle River Complex has Begun

Cleanup of the soil at the Middle River Complex began in April. Lockheed Martin's contractors are removing more than 10,000 tons of soil (up to 500 truckloads), containing elevated concentrations of oil-related products and heavy metals from the five blocks of land that form a semi-circle within the southern half of the Middle River Complex. The Blocks planned for cleanup this year are H, G, F, D and D Panhandle (see map). Block E will be remediated at a later time. Cleanup at Blocks A and B is complete and no further action is required. We expect to complete the

Beginning the soils cleanup work is a major step in the remediation of the Middle River Complex

Middle River Complex soil cleanup project in about 6 months.

The cleanup follows approval by the Maryland Department of the Environment (MDE) of Remedial Action Plans (RAPs) developed by Lockheed Martin and

presented to Baltimore County leaders and the general public over the last few years. Information outreach regarding the plans included meetings with civic associations, public information sessions, articles in local news media, newsletters hand delivered in neighborhoods, exhibits at Middle River events and information made available at the Essex Public Library and on the Lockheed Martin website. Employee informational sessions at the Middle River Complex also were held.

Excavation in the various Blocks is shallow and near the ground's surface, approximately two to three-feet deep (a few areas will be dug a little deeper). The contaminated soil is being loaded onto trucks and hauled off-site for treatment and recycling at an approved facility or for

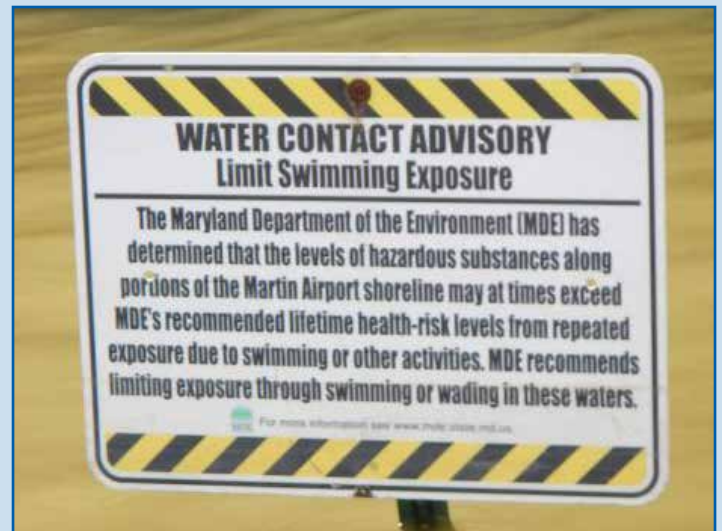
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Martin State Airport

You May Recall...

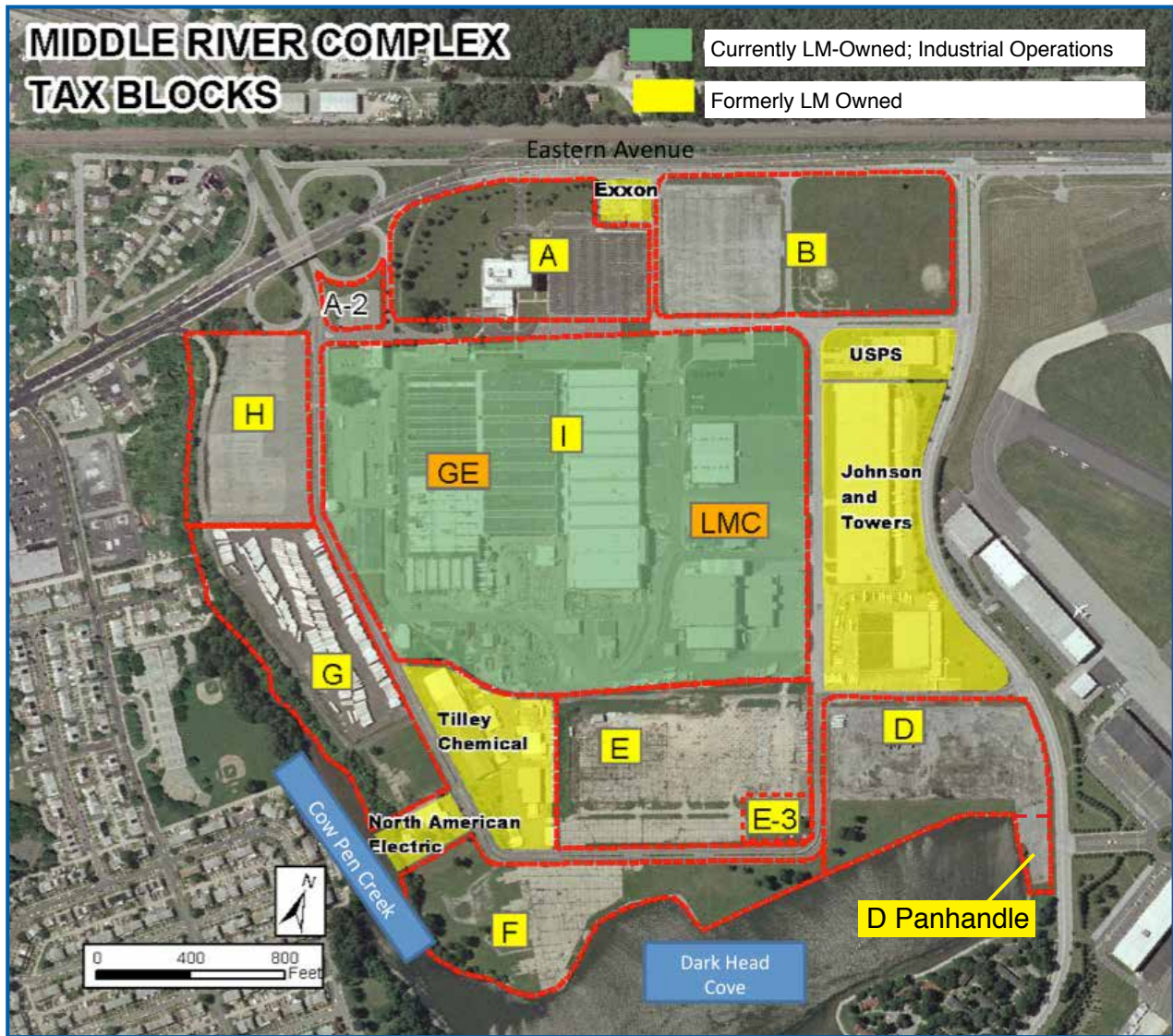
Testing of water quality in Frog Mortar Creek in the vicinity of the Dump Road Area has been going on for a number of years. This began when an elevated concentration of trichloroethene was found in the creek in that area in March 2011. As a result two things occurred: a water contact advisory was established by the Maryland Department of the Environment (MDE) in April 2011, and an annual sampling program was established. Surface water is sampled six times each year, including all four months of the summer swimming season—June through September.

For the past three years, a summary of the average concentration of trichloroethene found during the four months of the summer swimming season has been provided on an informational poster on the Lockheed Martin website (www.lockheedmartin.com/martinstate). Overall average summer concentrations of volatile organic compounds in Frog Mortar Creek in the Dump Road Area have been acceptable for swimming based on the levels established by MDE. However, please be aware that a water contact advisory is still in place for the shallow water close



Water Contact Advisory Sign

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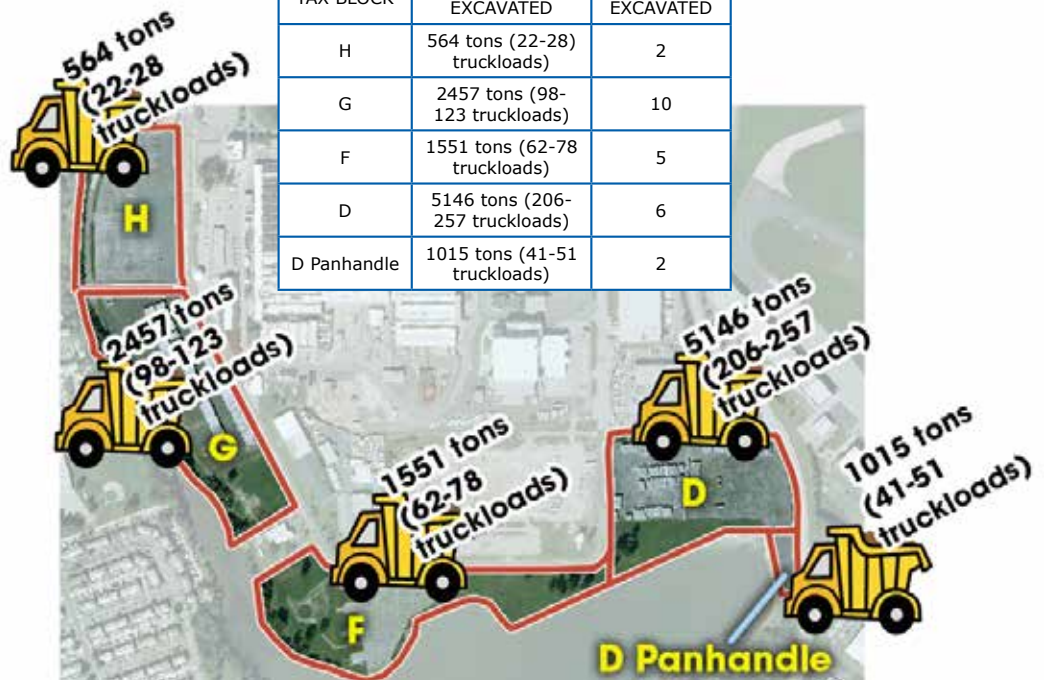
Layout of Middle River Complex

TONS OF SOIL TO BE REMOVED

TAX BLOCK	SOIL TO BE EXCAVATED	AREAS TO BE EXCAVATED
H	564 tons (22-28 truckloads)	2
G	2457 tons (98-123 truckloads)	10
F	1551 tons (62-78 truckloads)	5
D	5146 tons (206-257 truckloads)	6
D Panhandle	1015 tons (41-51 truckloads)	2

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disposal at an approved landfill. Trucks are being inspected and, if necessary, cleaned before leaving each Block; for example, tires are being washed if necessary to prevent transport of dirt to local roadways. Each Block will have its own entrance, exit and inspection/cleaning area. When tire or other cleaning is necessary, all wash water is being collected, containerized and analyzed to determine the appropriate disposal. This water and any water that may come in contact with open excavations will be disposed of at a Lockheed Martin-approved wastewater disposal facility.



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Excavation under asphalt parking lot in Block H

Trucks enroute to and returning from the recycling or disposal facilities are being routed so as to minimize use of residential streets. The primary truck route is direct exit to Eastern Boulevard by the Exxon Station, followed by Route 43 to Interstate 95. Alternately, trucks may use Martin Boulevard (Route 700) to Pulaski Highway (Route 40) and on to the Baltimore Beltway (Route 695).

Each excavation area will be sampled before being backfilled with clean soil to ensure that all contaminated soil has been removed. With the exception of Block H, excavations may remain open for several days while

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Excavation under asphalt parking lot in Block H

to the shore nearest the Dump Road Area, as shown in the sign below. This information is presented so that people can make informed decisions about swimming in the area.

Annual Frog Mortar Creek Water Sampling is Underway

Water in Frog Mortar Creek was sampled in March to determine the level of contaminants present in the creek, part of the regular periodic sampling used to determine contaminant levels in the creek water adjacent to the Dump Road Area.

In 2010 sampling detected higher levels of contaminants than anticipated in the creek near the Dump Road Area shoreline. The contaminants—trichloroethene, cis- 1,2-Dichloroethene and vinyl chloride—appear to come from a groundwater plume originating from the Dump Road Area and moving towards Frog Mortar Creek. In consultation with Maryland Department of the Environment, signs advising that swimming should be limited have been posted along the shoreline of Martin State Airport.

Creek sampling occurs quarterly between September and June, and monthly from June to September. A poster summarizing the 2014 average results can be found on the Lockheed Martin webpage (lockheedmartin.com/martinstate).

Progress on Building the Groundwater Treatment Facility

The process for hiring a contractor to build the groundwater treatment facility at Martin State Airport is underway and contractor selection is anticipated by June. Meanwhile, the process for obtaining permits for construction continues; timing of facility construction is based on securing all necessary permits.

More information will be made available as the construction schedule becomes clear; community notification and comment opportunities will be announced for the remaining permits as they become available.

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Erosion and sediment controls limit movement of disturbed soil during storms

samples are being tested. Block H is an active parking lot with two areas of contamination. In order to keep the parking lot in service, the excavated holes will be filled with gravel while samples are being tested so that, if necessary, the holes can be more easily re-excavated to remove additional contaminated soil, after which the area will be paved. Because excavations will not stay open, Block H will not require erection of erosion and sediment control fencing, as will be necessary in the other Blocks.

Ongoing Middle River Complex soil cleanup should be complete by the end of 2015.

Nine possible underground storage tanks have been identified in Blocks G and F, based on historical documents. Sites of possible underground storage tanks will be searched using ground-penetrating radar. If any tanks are found, they will be removed and disposed of following state

guidelines. Any soil containing oil and petroleum or other contaminants will also be removed and properly disposed.

Lockheed Martin will clean up the Blocks to the point where no further action is necessary in order for the land to continue under current industrial use. Restrictions and requirements will be placed in Baltimore County land records to maintain this use as well as prohibit the use of groundwater. Additionally, Lockheed Martin has soil characterization and safe-handling procedures for any intrusive (i.e., excavation) activities that may disturb the soil in the future to protect worker safety during facility operations.

Lockheed Martin has decided to clean up the Block D Panhandle to a level that permits recreational activity. This will require removal of the asphalt-paved extension

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Upcoming Permit Requests for Which Public Comment Opportunities are Available

The Environmental Assessment required by the National Environmental Policy Act (NEPA) will include an opportunity for the public to comment, as will the National Pollutant Discharge Elimination System (NPDES) permit for treated water discharge (see Middle River Complex and Martin State Airport Newsletter, Summer 2014 at lockheedmartin.com/martinstate). Agency websites include information on how the public may submit comments and newspaper notifications will announce comment periods.

For additional background information go to lockheedmartin.com/martinstate

Water Flow Sensors Placed in Frog Mortar Creek

Early in April 2015 Lockheed Martin contractors again placed water flow sensors in Frog Mortar Creek in order to gather additional baseline information on groundwater discharge through the creek sediment. The sensors, called passive flux meters, indicate how much groundwater is discharging to the creek in the location of each meter, and whether it contains volatile organic compounds. This study will help our understanding of the locations and extent of contaminated groundwater discharging to the Creek.

The sensors were placed in rows perpendicular to the airport shoreline, with sensors contained in plastic pipes placed at 50-foot intervals from the shoreline. The first



Divers installed and retrieved water flow sensors

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of parking lot No. 6. To support the soil cleanup effort, Lockheed Martin will also be replacing a small, collapsed storm drain at the corner of Block D and the Block D Panhandle.

“Beginning the soils cleanup work is a major step in the remediation of the Middle River Complex,” Tom Blackman, Lockheed Martin project lead, said in the Project Bulletin that was distributed when work began. “We’ve already begun groundwater cleanup, and this past winter began sediment cleanup. There’s still a lot to do, but at this point cleanup operations have begun in all our areas of concern.”

Planning for Block E Cleanup Continues

Soil cleanup beneath and surrounding former Building D in Block E is more complicated than in other Blocks: it is also the location where polychlorinated biphenyls, or PCBs, have been identified, so both the Maryland Department of the Environment (MDE) and the U.S. Environmental Protection Agency (EPA) are regulators for this portion of the site. At this time further investigations are underway, in particular to learn more about anomalies identified south of the building foundation and to collect additional data to support the design of the removal action. The anomalies may be material that requires removal or other cleanup actions. While the schedule remains fluid, Lockheed Martin anticipates designing cleanup plans and working with these two regulators and other permitting authorities from 2016 through 2018, with actual cleanup work likely to occur in 2019 or 2020.

Successful Sediment Removal at Outfall 005

In a sustained and focused initiative this past winter (2014-15) the Lockheed Martin team successfully removed high concentrations of polychlorinated biphenyls (PCBs) from sediments eight-to-ten feet beneath the water surface immediately adjacent to Outfall 005. The PCB contaminants were identified in the fall of 2013 when Lockheed Martin was taking samples in preparation for the overall cleanup of sediments in Cow Pen Creek and Dark Head Cove. Outfall 005 is located in the bulkhead just south of the foundation of former Building D at Lockheed Martin’s Middle River Complex. PCBs are man-made organic chemicals once used commonly in electrical transformers and may have been released when Building D was dismantled in the early 1970s.

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set of water flow sensors placed last summer provided initial information about the groundwater and contaminant discharge in Frog Mortar Creek. This current study extends the range of the investigation across the width of the Dump Road Area near the shore.



View of water flow sensor, also called Passive Flux Meter



Pontoon boat heads out to install water flow sensors

Lockheed Martin and the Maryland Department of the Environment agreed that this location should be cleaned up as soon as possible because of the relatively high level of PCB concentrations. The winter work window of October 15, 2014-February 15, 2015 was identified as the first opportunity to dredge the sediments without adversely affecting fish spawning and growth of underwater aquatic vegetation.

Working with federal, state and local officials, Lockheed Martin secured all necessary approvals and permits to begin site preparation on November 20, 2014. Dredging began December 10. In spite of the unusually severe winter, dredging was finished by February 11. Offloading of the barge used to transport dredged material to the shore and onshore preparation of the material for proper disposal at approved sites continued after February 11. By March 23, 2015 the dredge and spoil barges were removed and the

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on-shore work area was cleaned and restored to pre-work conditions. Sediment samples taken after the work was completed confirmed the project's success.

A photo tour of the sediment removal project can be viewed at lockheedmartin.com/middleriver

Lockheed Martin's commitment to dredging without harming the environment was evident throughout the operation. Double, and in some places triple layers of silt curtains were placed in the water around the dredging site to ensure that stirred up sediment did not reach open water. Sediment dewatering pads were lined with plastic sheeting and a spill apron installed in the dredge offloading area to control water runoff. Calciment, a drying material, and Portland cement were mixed with the dredged spoil to absorb water and to help harden the dredged material to meet strength requirements of the licensed landfill.

"This project was an extraordinary effort on the part of all concerned, and reflects our commitment to doing things right," Tom Blackman, project lead for the Middle River remediation project, said. "Government officials and the Lockheed Martin team worked diligently to get everything ready in time for the winter work window, and the dredging contractors were meticulous in their efforts to control the spoil and runoff. We've received praise from both the Maryland Department of the Environment and the United States Environmental Protection Agency on our work ethic and commitment to properly handling whatever challenges came our way. I couldn't be more proud of all who helped."

For additional background information go to lockheedmartin.com/middleriver

Planning for Final Phase in Sediment Cleanup Begins

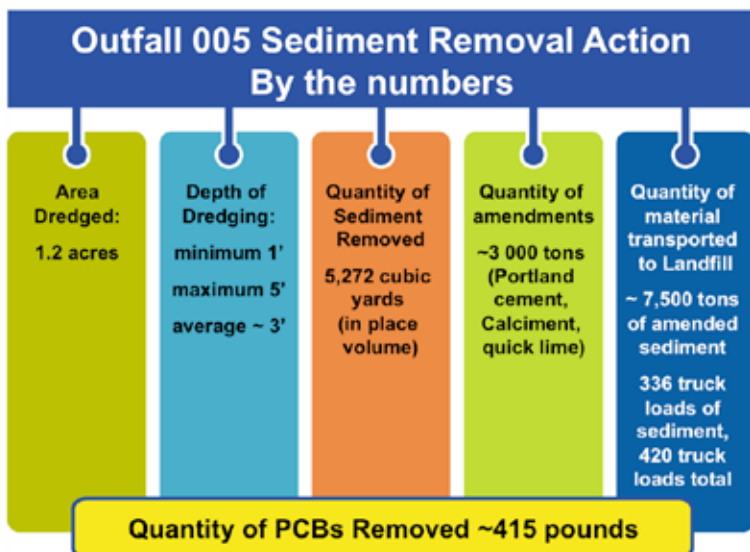
Lockheed Martin has begun developing plans to complete the cleanup of Cow Pen Creek and Dark Head Cove sediments and has been meeting with the various agencies with jurisdiction over the sediment cleanup process—the U.S. Coast Guard, the Maryland Department of Natural Resources, the U.S. Fish & Wildlife Service, the U.S. Army Corps of Engineers, Baltimore County, the Maryland Department of the Environment and the U.S. Environmental Protection Agency. These agencies sit on the Joint Evaluation Committee, which was organized to make sure all agencies involved understand each other's interests and requirements as well as their restrictions in working collaboratively with organizations such as Lockheed Martin.

One of the next steps for Lockheed Martin is to prepare a schedule that provides opportunity for all the agencies and the general public to weigh in on the timing and final plans for the sediment cleanup.

The launch of the process for coordinating and developing the final plans for sediment cleanup follows the successful cleanup of sediments in Dark Head Cove just off the shoreline of Outfall 005 this past winter. (See accompanying story, page 5)

The preferred approach for remediating the sediment in Cow Pen Creek and Dark Head Cove was presented by Lockheed Martin in a feasibility study and approved by the Maryland Department of the Environment and the U. S. Environmental Protection Agency in 2013. The approach includes removing about 41,200 cubic yards (2,750 truckloads) of contaminated sediments from about 10.5 acres of Cow Pen Creek and Dark Head Cove; *in situ* ("in place") treatment of over 13.7 acres of Dark Head Cove to reduce movement of contaminants; and monitored natural recovery that relies on natural processes to return sediment to acceptable environmental levels. The cleanup schedule will be organized around the cycle of the seasons, taking into consideration protection of fish spawning, growth of aquatic vegetation, and the need to protect certain species of bats that may be roosting in shoreline trees.

To proceed with remediation in Dark Head Cove, Lockheed Martin will present the Environmental



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Protection Agency and the Maryland Department of the Environment the plans for the removal and *in situ* treatment of the contaminated sediments and contingency plans for what the corporation will do if the *in situ* treatment plan does not achieve its cleanup goals. Environmental Protection Agency and Maryland Department of the Environment approval will come only after the work is complete and all cleanup goals have been met.

All the agencies involved in approving the final plans and timing for cleaning up the sediment agree with Lockheed Martin's concept for remediation and have expressed their support for moving the planning process forward in a timely manner. Lockheed Martin also is committed to hosting a public meeting that allows the community an opportunity to review the final plans. The planning and review process could require more than a year to accomplish before cleanup work can begin.

For additional background information go to lockheedmartin.com/middleriver

Lockheed Martin and Tetra Tech Support Hawthorne Elementary School

In a recent visit with Hawthorne Elementary School Principal Yvonne Barhight, Lockheed Martin shared a set of classroom books entitled ***Future Engineering: the Clean Water Challenge***, which was provided by its contractor, Tetra Tech. The gift supports the school's



Books on clean water were provided as gifts to Hawthorne Elementary School

focus on STEM (Science, Technology, Engineering and Math), which is also an area of concentration for Lockheed Martin community relations activities in its neighboring communities.

Lockheed Martin periodically coordinates educational activities with Hawthorne students, and plans to organize an activity to help students and their families understand the sediment cleanup work in Cow Pen Creek once that project is scheduled. That work will occur in the creek behind the school's backyard, and will be highly visible to students. The safety of Hawthorne Elementary children will be a critical consideration in performing this important project, so helping both children and their parents understand the work will be a key aspect of the project.

Update on Groundwater Treatment

Bioremediation of groundwater is now underway at two of the three planned treatment sites at the Middle River Complex. Bioremediation is a treatment that uses naturally occurring bacteria and substances to eventually break down hazardous materials into non-toxic substances. Initially, cleanup was addressed by injecting a solution of water, lactate (a non-toxic food additive that is produced from the sugars of corn or beets), and vegetable oil into the ground to stimulate the naturally occurring bacteria in the soil to consume and break down concentrations of trichloroethene (TCE), the contaminant found at the Middle River Complex. TCE is a cleaning solution that was used previously at the site. The bioremediation system was tested early in the summer of 2014 to make sure that the additive was reaching the intended areas of contamination. After making minor adjustments those tests were successful; following that the system began full-scale operation in these two treatment sites.

The Lockheed Martin team samples the groundwater in the treatment area before and after each injection and adjusts the treatment to optimize results. Last year the team learned that the vegetable oil being used as a food additive wasn't flowing well, and was even clogging the pipes and injection wells, especially as temperatures got colder. Consequently, vegetable oil

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was removed from the food recipe. Lactate remains in the recipe, and while the solution moves more easily, it doesn't last as long as the lactate-vegetable oil solution. For that reason, the project team has decided to accelerate the follow-up injections into these areas; these will be completed later this year. The team is also now considering improving the effectiveness of the solution by adding naturally occurring bacteria to speed the degradation of the contaminants in the groundwater. Lockheed Martin will confirm this new approach with this summer's post-injection sampling.

The third planned treatment site is located at Block E, in an area just south of former Building D. During construction of the groundwater treatment system in Block E, an underground storage tank containing trichloroethene was found, as were concentrations of trichloroethene in the soil. These concentrations were too high to be handled adequately by the bioremediation treatment system alone. A temporary extraction system is being used to reduce the contaminant to a level that can be managed by bioremediation. This separate cleanup action uses groundwater pumps and a vacuum pump to extract groundwater and vapors, which are then treated.

The temporary treatment system consists of four groundwater extraction wells, one soil vapor extraction well, pumps and piping, a treatment system and two 21,000 gallon tanks that hold the treated water for testing to ensure it meets all standards, prior to its permitted discharge to the Baltimore County sewer system. Treated air is released to the atmosphere. The system uses an air stripper and activated carbon to treat the groundwater and activated carbon to treat the vapor. (See the Fall 2014 Middle River Complex Newsletter at lockheedmartin.com/middleriver for further background on Block E groundwater treatment.)

The temporary extraction system began operation late last summer (2014) and operated until winter, at which time it was shut down. With warmer spring temperatures, the system once again began operating and should complete its work by mid-summer 2015. At that time, bioremediation system installation in this area will be completed, the system tested, and then operated in a manner similar to the other two bioremediation treatment sites.

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