

April 2017

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

Students Charge Full STEAM Ahead to Protect and Restore Cow Pen Creek

Lockheed Martin engaged hundreds of bright and curious students and their parents at Hawthorne Elementary School's STEAM Night on February 28. STEAM initiatives highlight the importance of studying Science, Technology, Engineering, Art and Math to students. Hawthorne Principal Dwan Pinamonti welcomed the activity as a way to educate local families about the importance of the sediment cleanup, while supporting community safety.

Students from Stemmers Run Middle School partnered with Lockheed Martin's project team, in collaboration with the Chesapeake Bay Foundation, to host hands-on activities demonstrating our cleanup and restoration work in Cow Pen Creek. Middle school science teacher Wintona Cannon, together with her Science Club students, developed one of our three activities. In one activity, clay fish were netted from a shallow-water area, which represented cleanup areas, and moved to a deep-water area, which represented the downstream creek.

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Excavation and restoration projects were presented to help students understand what will be going on.

Lockheed Martin Invites You to a Family Field Day of Fun and Education!

A "Show and Tell" about the Upcoming Sediment Cleanup of Cow Pen Creek

Hawthorne Elementary School Friday, April 28, 2017 – rain or shine

Location: Hawthorne Elementary School,
125 Kingston Road.

If the weather is nice, we'll be outside near the ballfields behind the school; if weather is uncooperative, we'll be in the school auditorium.

Time: 3:30 p.m. to 4:30 p.m.

Lockheed Martin wants all our neighbors and families in the Hawthorne neighborhood to understand the upcoming work in the creek.

Bring your kids, as we'll have hands-on activities that will explain the upcoming sediment cleanup and how they can become "Environmental Protectors."

You can speak one-on-one with the Lockheed Martin project team and get your questions answered, and informational posters will be on display.

Light refreshments will be served.

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Children enjoyed creating work models of the upcoming sediment project.



Middle school students challenge an elementary student to net all the fish within the allotted time.

The other two hands-on activity stations were developed by the Lockheed Martin team and showed the excavation and the creek restoration that will follow. Elementary students were eager to participate. Their parents said they had read in Lockheed Martin's newsletters about the upcoming work, and that the STEAM activities really helped explain the process they would see.

"We appreciate the middle school students' creativity and enthusiasm," said Tom Blackman, Middle River project manager. "We were pleased to see how the STEAM activities helped children and parents understand our cleanup project. We want to ensure the safety of our neighbors as we get this work finished and provide a clean, healthy creek and environment. Then it will be up to all of us to keep the creek protected for the future."

Similar activity stations, including posters, will be presented on April 28th between 3:30 pm and 4:30 pm at a Family Field Day at Hawthorne Elementary School. More information is available on page 1.

Sediment Cleanup in Dark Head Cove and Cow Pen Creek Moves Forward

Season 1 – Work Accomplished

After a winter of intensive work, dredging of Dark Head Cove and the lower portion of Cow Pen Creek to remove sediments contaminated with polychlorinated biphenyls (PCBs) and metals is finished.

The work was planned to be complete by February 14, the date by which in-water work is typically required to be stopped to protect fish during their spawning season. However, several spots required re-dredging to meet cleanup standards, and while most of that work was finished before February 14, Lockheed Martin needed additional time to re-dredge one remaining area in the cove, and the Maryland Department of the



A push-boat moved the barge into position for offloading sediments.

Environment (MDE) granted an extension to March 8. Re-dredging during the time extension was completed on Saturday, February 18. Placement of a layer of sand (a “residual management layer”) over the last dredged area was completed by March 3. All in-water work was finished before March 8.



Sediment dredging began at the lower portion of Cow Pen Creek. Sediments were loaded onto a barge for storage, then transported to the offloading area.

The last truckload of sediment left the site on March 7. Erosion and sediment controls are being left around the materials-handling area (which was cleaned out) near Cow Pen Creek in anticipation of the work to be performed in the creek beginning in June. Other erosion and sediment controls are protecting former work areas and will be removed once Baltimore County inspectors determine that the area is stabilized. The turbidity curtain with buoys that was placed to protect the water quality of the cove and to keep boat traffic out of the dredging area was removed on March 13.

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Hoppers filled with sand were barged to dredged areas of Dark Head Cove and Cow Pen Creek for placement.

During this past winter's dredging, approximately 36,000 cubic yards of sediment were removed and shipped in approximately 2,000 truckloads to the permitted landfill in York, PA. Before being moved the sediment was drained and dried in specially constructed bins located in the materials-handling area. The approximately 160,000 gallons of water that drained off the sediments were treated and discharged under permit to the Baltimore County sewer system. The drained water was tested following treatment and the quantity of contaminants in the water was within permit requirements.

This past winter's work included replacement of the shore-retention bulkhead on the north side of Dark Head Cove. Marine-grade sheet-metal pilings were driven on the water side of the old corroded sections by a vibrating pile-driver mounted on a barge. Storm drains passing through the new bulkhead were extended or repaired as needed. In one area, Lockheed Martin's contractors encountered softer material in the cove bottom. Although bulkhead installation was completed in this area, additional measures to ensure the long-term stability of this part of the bulkhead are being investigated and will be installed.

"This was a very successful cleanup operation," Tom Blackman, Lockheed Martin's project manager, said. "There were lots of challenges within a very tight work window. The lessons we learned from our work in 2014-15 when we dredged the area around Outfall 005 helped us a great deal here. Now we're ready to move on to Season 2 and the remainder of Cow Pen Creek."

Season 2 – Work Remaining

Season 2 work consists of digging out Cow Pen Creek this summer and *in situ* (in place) treatment of portions of Dark Head Cove during this coming winter's work window.

Mobilization for Season 2 excavation will begin in June. Contractors will be working in Cow Pen Creek between

the Hawthorne neighborhood and the Lockheed Martin property. The creek is more shallow than the cove, and the sediment removal approach is different. Cofferdams using sand bags or inflated bladders will be used to isolate work areas for excavation, moving in sections from upstream to downstream.

Water trapped in each cofferdam will then be pumped out to expose the creek bottom. Any fish or critters exposed by the receding water will be hand-netted and moved to open water. The streambed will be dug out and the sediment will be moved to the materials-handling area on the Lockheed Martin property before being trucked to one of the permitted landfills in Pennsylvania and Virginia that have been approved by Lockheed Martin and the State of Maryland. Unlike Dark Head Cove, where the dredging targeted PCB removal, the removal in Cow Pen Creek

A photo tour and project bulletin of the Sediment Season 1 project are available at www.lockheedmartin.com/middleriver; and similar information will be available for Season 2.



The bulkhead was repaired and is shown at Block F.

primarily targets metals contamination. It is anticipated that over 12,600 cubic yards (about 630 truckloads) of sediment will be removed from the creek.

Lockheed Martin has applied for a National Pollutant Discharge Elimination System (NPDES) permit from the MDE to discharge treated-sediment drain water and rain water from the dammed work areas back to the creek and cove below the work areas. The treatment system for this water will be the same as the one used successfully during Season 1. The MDE has published a public notice of Lockheed Martin's application, and will follow this notice with a notice of a draft permit. The public may comment on the application and draft permit once MDE releases notification of its availability.

After sediment removal, Cow Pen Creek will be restored to a natural condition. The upper section of the stream bed will be restored with an organic mixture capable of withstanding erosion and supporting vegetation. A channel resembling the original course of the stream will be recreated. In the lower sections of the creek, where the streambed is more of a mud flat, sand will be placed over the surface where material has been removed.

Restoration will also include replanting banks and disrupted upland areas with native plants or trees and placing submerged structures such as root wads to provide good conditions for fish spawning. Subaquatic vegetation (SAV) will be reestablished, protected, and its return monitored over the next five years to confirm that it has become established. SAV also provides healthy habitat for fish spawning.

“We believe we can clean up and restore most of Cow Pen Creek between June and the end of 2017,” Tom Blackman said, “possibly even earlier. Barring any unforeseen circumstances, we should then be able to complete the *in situ* treatment of Dark Head Cove during the upcoming winter work window. The *in situ*

treatment will place activated carbon granules onto areas where levels of PCBs were so low as to not warrant dredging. The MDE has approved this approach and it's been used in similar situations across the country.”

The *in situ* treatment will be placed over 14 acres of Dark Head Cove where concentrations of PCBs were so low that dredging didn't make sense. *In situ* treatment is the placement of activated carbon onto sediment. (Activated carbon is commonly found in the home in water and aquarium filters, among other uses.) A thin layer of small pebbles coated with activated carbon will be spread over the bottom of the cove. PCBs are strongly attracted to and will combine with activated carbon, keeping them out of the food chain. The process has been successfully used in Bremerton, Washington and Mirror Lake, Delaware. The U.S. Environmental Protection Agency (USEPA) has approved using the *in situ* technique for Dark Head Cove, with final approval pending documentation of successful results. In 2016 Lockheed Martin conducted a study to assess the biological conditions on the bottom of Dark Head Cove before the activated carbon is applied. The biological conditions and the effectiveness of the treatment of the cove will be assessed again 1, 3 and 5 years after the placement of the activated carbon.

Martin State Airport Groundwater Treatment Facility on Track to Begin Operating in Late-Summer 2017



The steel framework for the groundwater treatment facility was fabricated off-site and erected in place early this past winter.

The mild winter of 2016-2017 helped Lockheed Martin make significant progress on the Martin State Airport Groundwater Treatment Facility. The majority of the building's steel skeleton was finished by the end of December 2016. The treatment system's large tanks (10 feet in diameter and 12 feet tall) were then moved into place in January, along with the largest pieces of water treatment equipment. Once the large equipment was in the building, the pre-fabricated concrete wall panels were lifted into place. The main work on the wall panels was finished by the end of February.

Roof panels were installed in early March, followed by windows, doors, and final trim pieces during the remainder of the month. The building should be declared watertight by the end of April.

Installation of the treatment system piping has already begun. Once the building is watertight, the interior finish work will ramp up. This will include installation of the rest of the treatment piping, conduits and wiring for the electrical and control system, electrical and control

connections to the groundwater extraction wells, installation of the fire protection system, and interior finish work such as the control and electrical rooms, plumbing and office space. Exterior work such as road paving, storm water controls and landscaping should be complete by the end of May.

By the end of June the building and treatment system should be complete. Once the Maryland Aviation Administration has conducted final inspections and



Groundwater treatment tanks were installed while the building was still open to the elements and easily accessible.



Roof panels were placed after the concrete walls were raised. The building should be watertight by the end of April.

issued an occupancy permit, operational testing will begin. The system will be tested initially using clean water from the water main. This phase of testing will check for leaks and make sure that pumps and control systems operate as designed. Following successful completion of these tests,

groundwater will be drawn from the extraction wells and testing of groundwater treatment will begin. The treated water will be tested to make sure the system has removed all the contaminants and the treated water is ready for discharge to Frog Mortar Creek. Until then, all the treated water will be stored in large tanks onsite. Once the treated water is shown to meet the Maryland Department of the Environment's discharge limits, the treatment plant

will begin continuous, around-the-clock operation and the treated water will be discharged through the outfall marked by the yellow buoys near the shore of Frog Mortar Creek. Continuous operation should begin by late summer.

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Yellow cautionary buoys mark the area of the treatment facility outfall pipe in Frog Mortar Creek

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The operation of the treatment system will be monitored frequently by operators who will routinely staff and maintain the plant. Reports documenting system performance will be submitted to MDE on a quarterly basis.

“This has been a very exciting time for our project,” Lockheed Martin’s project manager, Paul Calligan, said. “All the pieces have come together well, and we look forward to a successful test run, culminating in the moment we begin releasing treated groundwater into Frog Mortar Creek.”



A hardener and sealant were applied to finish concrete floors and containment walls.



Fencing surrounds the site, including extraction wells, and includes a locked gate allowing access to the outfall pipe on Frog Mortar Creek.

Frog Mortar Creek Water Sampling Update

Lockheed Martin samples and tests the quality of surface water in Frog Mortar Creek adjacent to Martin State Airport six times a year, including the summer months of June, July, August, and September. In the summer of 2016 the average concentration of one chemical, vinyl chloride, was higher than usual compared to the same time during previous years. Vinyl chloride is a product created when natural bacteria in soil breaks down chlorinated solvents such as trichloroethylene (TCE), a cleaning solvent.

Typically, the vinyl chloride summer average for the area in Frog Mortar Creek near the Martin State Airport shoreline is 0.7 parts per billion (ppb), which is also the threshold level above which the Maryland Department of the Environment (MDE) issues a water contact advisory.

The average measurement for vinyl chloride this past summer was 1.4 ppb. Sampling results typically vary because of such things as the amount of rainfall and water flowing into the creek. Another factor contributing to the higher average this past summer was that additional samples were collected specifically targeting Frog Mortar Creek shoreline locations where higher concentrations have been found in the past. These additional samples help develop a more complete picture of the extent of contamination along the creek bank, which will improve Lockheed Martin's ability to determine the effectiveness of the new groundwater treatment facility now under construction.

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A photo tour of the groundwater treatment facility construction is available at www.lockheedmartin.com/martinstate and will be updated as construction progresses.

Groundwater Plume Expansion Identified Under Blocks E and F

Lockheed Martin contractors recently identified additional areas with elevated concentrations of trichloroethene (TCE, formerly used as a cleaning solvent), in the groundwater under Blocks E and F. They also found detectable concentrations of TCE nearby in the surface water of Dark Head Cove. Elevated concentrations were noted initially in soil and groundwater after a tank containing TCE was discovered during installation of piping for a bioremediation system near the water tower in Block E, the location of former D Building. An extraction system was installed that removed a substantial amount of TCE from depths below the tank after it was removed. To map the impacted groundwater, samples were collected by probes at depths of 40 feet and analyzed for TCE and related chemicals

in Block F in the open area across Martin Boulevard next to Dark Head Cove. As a result of the findings, samples were then taken of the surface water in Dark Head Cove.

The highest concentration of TCE in the surface water in Dark Head Cove was low (7.8 parts per billion [ppb]), which is well below the Maryland Department of the Environment's (MDE) surface water quality guidance and below concentrations that would cause risk

to swimmers, and so the state is not posting an advisory regarding swimming in the cove.

"We recognize there's a TCE plume near the shore of Dark Head Cove," Tom Blackman, Lockheed Martin's project manager said. "Past sampling has indicated concentrations in the cove below levels of concern to MDE, and we have continued to monitor the surface water as a precaution. Going forward, we'll be monitoring the surface water in the cove more often, with three sampling rounds planned for

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A part per billion (ppb) is approximately equal to one drop of contaminant in an Olympic-size swimming pool.

Water Conditions in Frog Mortar Creek Versus Dark Head Cove

A water contact advisory is posted for Frog Mortar Creek. The contaminant of concern there is vinyl chloride, a breakdown product of TCE that is more concerning. No vinyl chloride has been detected in Dark Head Cove. Water in Frog Mortar Creek is sampled regularly for concentrations of vinyl chloride and TCE. (See Frog Mortar Creek Water Sampling Update story above.) The summer average for vinyl chloride in the area in Frog Mortar Creek near the shoreline is typically below 0.7 parts per billion (ppb), which is the level above which the Maryland Department of the Environment (MDE) becomes concerned. In summer 2016, vinyl chloride averaged 1.4 ppb in an area near the shoreline of Martin State Airport. The groundwater treatment facility is being constructed at Martin State Airport to prevent contaminants from flowing into Frog Mortar Creek.

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The Maryland Department of the Environment (MDE) continues to recommend that people limit their swimming in the water close to the airport shoreline to no more than four hours a day, for a total of 70 days a year. MDE has not found that the sample results warrant a prohibition of swimming in Frog Mortar Creek. Additional swimming precautions can be found on MDE's website: (http://www.mde.state.md.us/programs/Land/MarylandBrownfieldVCP/ERRP_Superfund/Pages/FrogMortarCreekWaterContactAdvisory.aspx).

Lockheed Martin has conducted surface water and sediment investigations in Frog Mortar Creek since 2004. Surface water contaminant levels first appeared to increase in July 2010, which resulted in MDE issuing the water contact advisory for the 2,000-foot long stretch of shoreline next to Martin State Airport.

Since the advisory went into effect, Lockheed Martin has sampled six times a year, focusing on the summer

swimming months (June-September), plus two off-season months (March and December). A total of 40 samples are collected during each sampling round, including four samples from the eastern shoreline of the creek at 3301 Edwards Lane. Surface water sample results collected from the eastern shoreline are consistently below swimming screening levels, so the eastern shoreline area is not included within the swimming advisory area. The test results are made available to the public at the Martin State Airport project website (www.lockheedmartin.com/martinstate). The results are updated annually on the website and are also posted at the Parkside Marina.

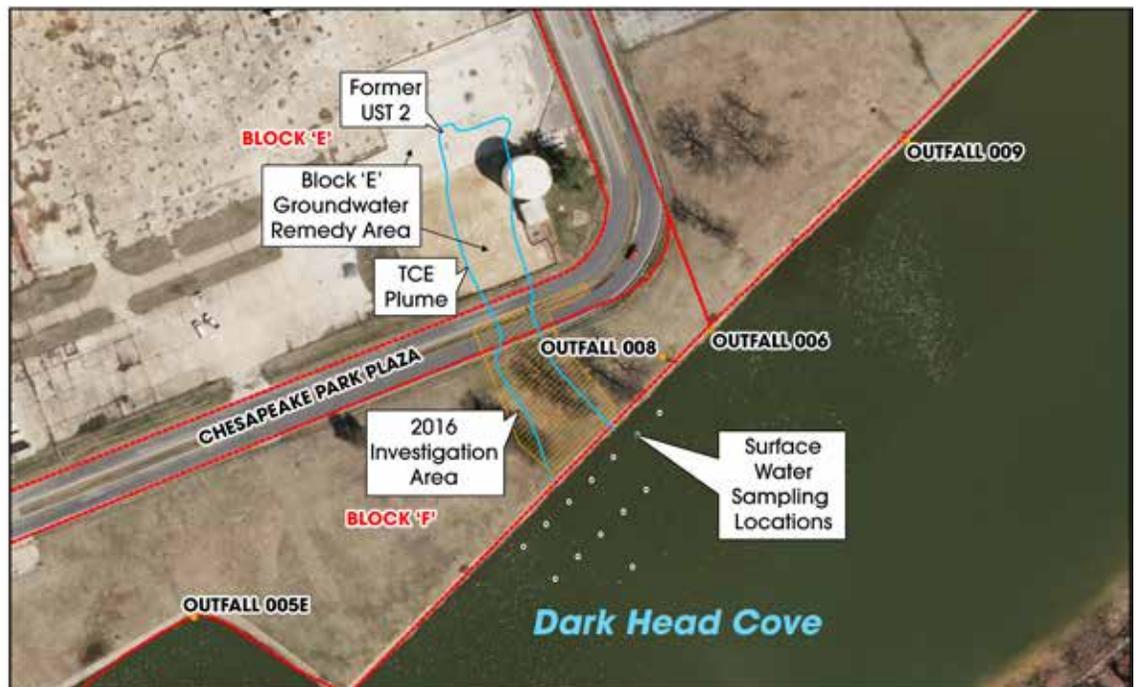
Lockheed Martin is constructing a groundwater treatment plant on the Martin State Airport property to capture and treat contaminated groundwater before it reaches Frog Mortar Creek. The groundwater treatment plant construction is nearing completion and is scheduled to be online this summer.

continued from page 9 (Groundwater Plume Expansion)

2017, to make sure we stay on top of this issue.”

In April, Lockheed Martin will further delineate the location and concentration of the TCE plume in the groundwater beneath Blocks E and F, and will install two extraction wells. Groundwater will be extracted for about a week, to determine the influence pumping these wells has on the TCE plume and how the plume movement towards Dark Head Cove is reduced. Results of these actions will be used to develop modifications to the existing remediation plan.

Groundwater cleanup has been underway at the Middle River Complex since 2014 using bioremediation, which feeds nutrients (sugars) to naturally occurring bacteria, causing the bacteria to break down contaminants into safe byproducts. Where useful, similar bacteria are added to increase the effectiveness of bioremediation.



A groundwater plume with trichloroethene (TCE) has been identified at the Middle River Complex, and nearby surface water sampling is underway.

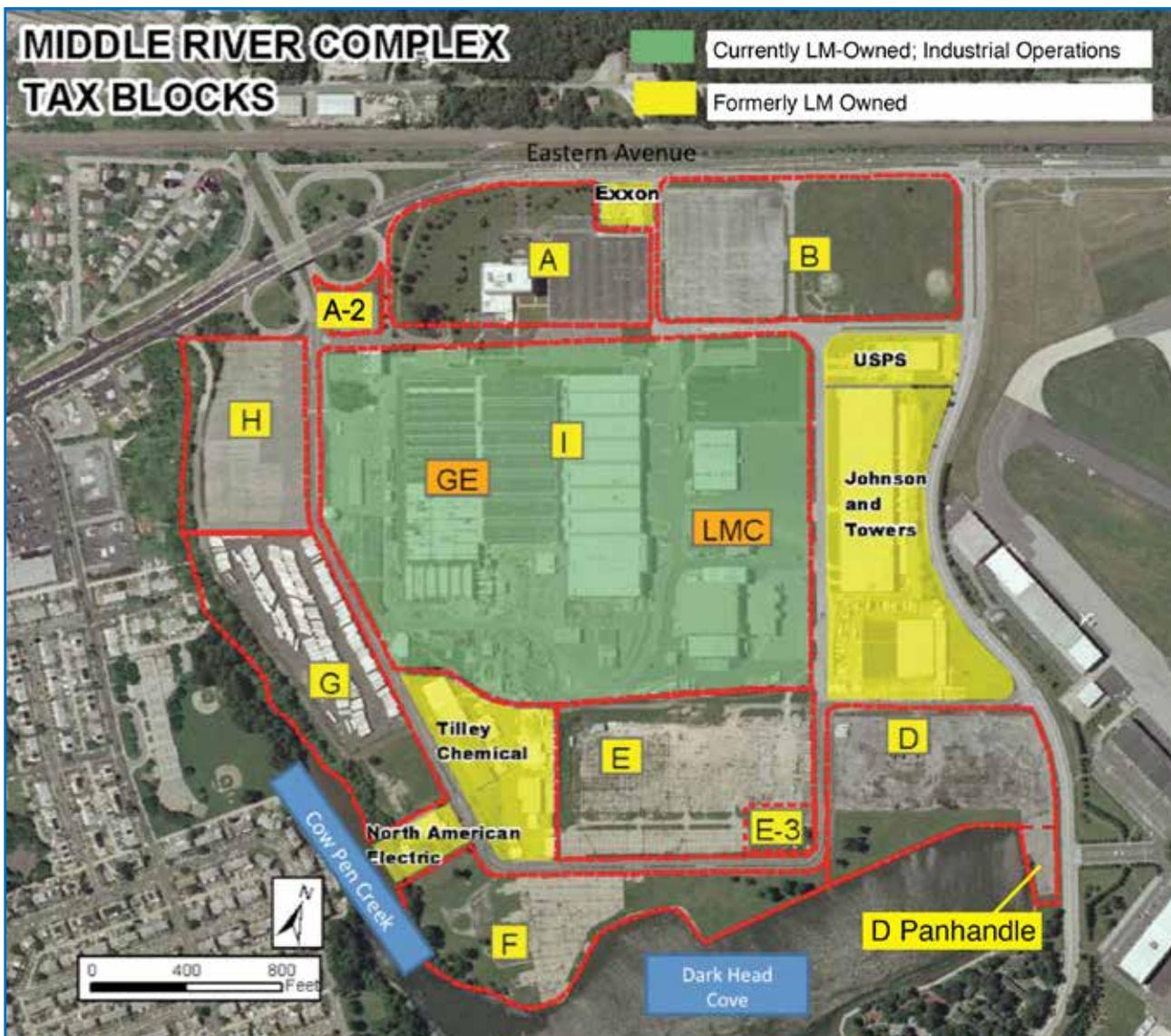
“No Further Action Required” Letters for Soil Clean Up in Blocks D, D Panhandle, F, G and H are Anticipated

Tom Blackman, Lockheed Martin’s Middle River project manager, reported that the Maryland Department of the Environment (MDE) has approved the reports documenting successful soil cleanup of Tax Blocks D, D Panhandle, F, G and H (shown in graphic below). “The state is now drafting ‘No Further Action’ letters for these sites,” Blackman said, “which means that no more cleanup is necessary. This is a success for the project team and for the community. The team has been working for many years to get to this point and appreciates the community’s support in achieving this goal.”

The next step for MDE is to develop the environmental covenants for these blocks, which will place binding restrictions on the property, primarily to prohibit the use of groundwater. The covenant will also prevent residential use of the property unless additional work is completed that will ensure that more conservative cleanup standards have been achieved. The environmental covenants will note that Blocks D, F, G and H have been cleaned up to industrial standards, and that D Panhandle has been cleaned up to a recreational standard. The documents will be recorded in Baltimore County land records.

Soil cleanup for these blocks was completed in the spring of 2016. Completion of work on Block G took the longest, while Lockheed Martin followed up on reports from former employees that transformers might still be buried there. While no intact transformers were found, a few highly corroded items that may have been transformers were found.

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For More Information

Questions may be addressed to:
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All documents are available at the Essex Library,
410-887-0295, or on Lockheed Martin's Web site
at www.lockheedmartin.com/middleriver or
www.lockheedmartin.com/martinstae

Essex Library
1110 Eastern Boulevard
Essex, Maryland
410.887.0295

Hours: Sunday, 1 p.m. to 5 p.m.
Monday through Thursday, 9 a.m. to 9 p.m.
Friday and Saturday, 9 a.m. to 5:30 p.m.

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The only block still requiring soil cleanup is Block E, the former site of D Building and the old nuclear division. Lockheed Martin recently completed an additional field investigation for polychlorinated biphenyls (PCBs) for that site, as well as some additional study to determine if radiological impacts are present. This data will be evaluated to determine if any further investigation is needed before a feasibility study of potential remediation alternatives can be developed. Following this step, a Remedial Action Plan (RAP) will summarize Block E contamination, present the cleanup alternatives, and recommend a cleanup plan. The plan will require approval by MDE and the U.S. Environmental Protection Agency, and the community will have the opportunity to provide input. Design and permitting of the approved solution will take several more years to complete.