Fact Sheet

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Understanding Lockheed Martin's Feasibility Study for the Cleanup of Sediments Adjacent to the Middle River Complex

Winter 2013

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

Project Summary

In 1928, Glenn L. Martin, founder of the Glenn L. Martin Company, a Lockheed Martin heritage company, purchased land in Middle River, Md., to build and test aircraft.

Lockheed Martin continues to own part of the original property, located at 2323 Eastern Boulevard. At this site, Lockheed Martin's operations include assembling missile-launch systems. It also leases space to General Electric Company's MRA Systems, Inc., subsidiary, known as Middle River Aircraft Systems (GE MRAS), which manufactures and assembles aircraft parts.

Over the years, parcels of the property were sold to industrial companies and also to the state for operation of the Glenn L. Martin State Airport, known locally as Martin State Airport.

In the late 1990s, Lockheed Martin began environmental testing at both the Middle River Complex and Martin State Airport to assess impacts from former industrial operations and disposal practices that were commonplace in the aerospace industry more than half a century ago. Although the historical actions were legal and considered safe at the time, modern-day research has shown that some of the practices may have led to environmental contamination.

Since that time, Lockheed Martin has actively investigated groundwater, soil and sediments at both locations and is in different stages of planning and cleanup on each project.

This fact sheet is designed to help community members understand Lockheed Martin's recommended alternative to cleaning up sediments in waterways — Cow Pen Creek, Dark Head Cove and Dark Head Creek — adjacent to the Middle River Complex.

Cow Pen Creek and Dark Head Cove are tidal surface water bodies that feed into Dark Head Creek, a tributary to Middle River, which is a tributary to Chesapeake Bay. The Middle River Complex lies approximately 3.2 miles upstream of Chesapeake Bay.

The Lockheed Martin team conducted extensive environmental investigations, developed cleanup objectives and goals, and completed an initial screening of possible alternatives for cleaning up sediments in the waterways.

Lockheed Martin Would Like to Invite The Community To A Public Information Session On Proposed Sediment Treatment Plans at the Middle River Complex

Date: Thursday, February 28, 2013
Location: Wilson Point Fire Hall
1100 Wilson Point Road
Times: 5 to 7 p.m. - Informal poster session with personalized attention and questions/answers;
7 p.m. - Formal presentation of proposed plans, followed by a question and answer and comment period

Light refreshments will be served.

The public is invited to make further comments orally or in writing from February 28-March 28.

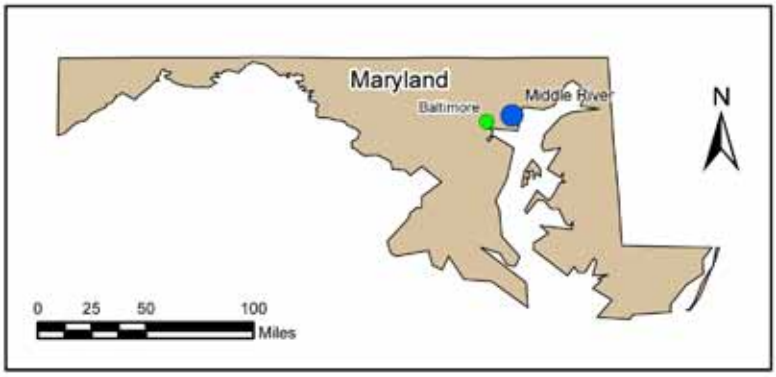
To make comments, please do so by March 28 to:
Lockheed Martin, c/o Kay Armstrong
P. O. Box 2687 Tybee Island, GA 31328
Email: darrylkay@aol.com • Phone: 888-340-2006

The Sediments Feasibility Study can be downloaded from the Lockheed Martin website at:
http://www.lockheedmartin.com/middleriver
and is available in hard copy at the Essex public library, 1110 Eastern Boulevard, Essex, Maryland, 21221.
Hours: Monday through Thursday, 9 a.m. to 9 p.m.
Friday and Saturday, 9 a.m. to 5:30 p.m.

The alternatives were evaluated and a short list was developed of the most-feasible cleanup alternatives.

A feasibility study was conducted to help select the best alternative. That alternative and the reasons for its selection are included in the feasibility study report that was submitted in December 2012 to the Maryland Department of the Environment (MDE) and the U.S. Environmental Protection Agency (EPA), the two regulators for the project.

Lockheed Martin will continue to seek input from the public as well as from these agencies. Public comments will be considered and incorporated, as appropriate. Final remedy decisions will be made by the MDE, by the EPA and by Lockheed Martin.



Middle River Complex Site Location and Vicinity Map

In the late 1990s, Lockheed Martin began environmental testing at both its Middle River Complex and the Martin State Airport to assess impacts from former industrial operations and disposal practices that were commonplace in the aerospace industry more than half a century ago.

Community Participation

As part of Lockheed Martin's ongoing commitment to the Middle River Complex site and the surrounding community, Lockheed Martin established a community outreach and involvement program to inform and receive input from the community on potential remedial actions related to Middle River Complex sediments.

Lockheed Martin works closely with local civic association leaders, gathering their input on a regular basis and keeping them informed of progress on the project.

In early 2012, interested community members participated in a Lockheed Martin Sediments Working Group that met three times to learn about the sediments investigation process and to hear about and provide feedback on cleanup alternatives. Valuable feedback received through the process was incorporated into the feasibility study.

The high level of community involvement will continue as the cleanup alternative is selected and while the cleanup work progresses. Lockheed Martin will hold a public information session in February to explain details of the recommended alternative and to gather community input before the final cleanup decision is made. *(See page 1 for details.)*

Words to Know

Sediment: Sediment refers to sand, silts and clays washed from the land into water, usually after rain or snowmelt. Sediment is found under water in storm drains, ponds, lakes, creeks, streams, rivers and oceans.

In situ treatment: In situ (which means "in place") treatment reduces the toxicity of the sediments by adding natural materials that bind up chemicals of concern and make them less accessible to organisms.

Monitored natural recovery: Monitored natural recovery relies on natural processes of ongoing sedimentation to return sediment concentrations back to natural levels. Conditions are monitored over time to confirm recovery occurs.

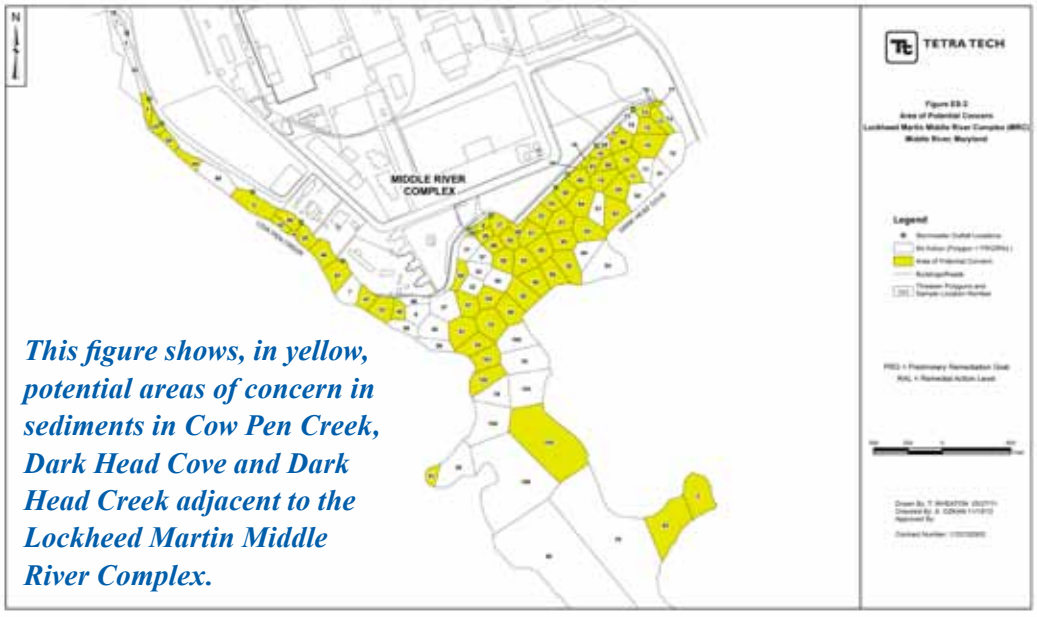
Summary of Recommended Alternative

Details about the recommended alternative, called 4G in the feasibility study, are described in detail later in this fact sheet. To summarize, the recommended alternative would entail:

- Removal of about 48,800 cubic yards (about 3,300 truckloads, or 6,600 one-way truck trips) of contaminated sediments from more than 12.5 acres in Cow Pen Creek and the area in front of the bulkhead in Dark Head Cove,
- *In situ* (in place) treatment of contaminated sediments over the remaining 8.5 acres of potential concern,
- Monitored natural recovery of about 4 acres of the *in situ* treatment area,
- Shoreline stabilization, habitat enhancement and riparian (the area where the land and surface water meet) planting in the zone between the land and the waterway after the remedial construction, if necessary,
- Long-term monitoring, operation and maintenance of *in situ* treatment areas to verify the remedy,
- Public outreach and education.

State of Maryland (MDE) fish consumption advisories are expected to remain in effect for the Middle River area, as they are based on regional as well as local conditions.

See "Recommended Remedial Alternatives" section on page 6 and graphic on page 7.



This figure shows, in yellow, potential areas of concern in sediments in Cow Pen Creek, Dark Head Cove and Dark Head Creek adjacent to the Lockheed Martin Middle River Complex.

Environmental Investigations

Environmental investigations fieldwork for sediments was conducted from 2005 through 2011.

The Lockheed Martin team tested surface water, surface sediments as well as subsurface sediments for a number of chemicals. It studied benthic organisms (worms and similar organisms that live in the bottom sediments) and analyzed fish tissue. Lockheed Martin also did a bathymetric survey that measures the depths and shape of the bottom of the waterways, assessed how quickly sediments accumulate in the cove and modeled what would happen in a major storm like Hurricane Isabel in 2003.

Analytical data from surface and subsurface sediment samples show that polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and metals are the most frequently detected compounds in the sediments.

The highest detected concentrations of PCBs and PAHs were observed within Dark Head Cove in shallow sediment along the bulkhead near the outfalls of the Middle River Complex.

Elevated metal concentrations, primarily cadmium, were observed within Cow Pen Creek and in the deeper sediments of Dark Head Cove and Dark Head Creek. Other metals detected include chromium, copper, lead, mercury and zinc.

Words to Know

***Benthic Organisms*: Those creatures that live in the benthic zone of a body of water, which includes the sediment surface and shallow subsurface. Benthic organisms include worms and insects.**

***Polychlorinated biphenyls*: Polychlorinated biphenyls (PCBs) are mixtures of up to 209 individual chlorinated compounds. PCBs are either oily liquids or solids that are colorless to light yellow and were commonly used in electrical equipment such as transformers. There are no known natural sources of PCBs.**

***Polycyclic aromatic hydrocarbons (PAHs)*: Polycyclic aromatic hydrocarbons are a group of chemicals that are formed during the incomplete burning of coal, oil, gas, wood, garbage or other organic substances. There are more than 100 different PAHs.**

Sediments Risk Assessment

The Lockheed Martin team looked at the ways, or "pathways," that people and other living creatures might come in contact with the contamination in the sediments.

The team's human health risk assessment found that people could come in contact with the contamination through direct contact with the sediments and by consuming fish that have accumulated chemicals from the sediments.

The comprehensive human health risk assessment determined, however, that there are no acute or short-term risks for people. The assessment found that under realistic exposure scenarios, there is not a risk above state and federal guidelines for direct human contact with the contamination. The U.S. Environmental Protection Agency (EPA) has agreed with this assessment.

The comprehensive human health risk assessment determined that there are no acute or short-term risks for people.

There is risk above state and federal guidelines from consuming fish, and people can limit this risk by adhering to fish-consumption advisories issued by the Maryland Department of the Environment (MDE). This is a regional condition with contributions from many sources.

The ecological risk assessment considered potential impacts to benthic organisms such as worms and insects as well as fish, birds and mammals. The assessment identified potential risk for benthic organisms through direct contact with contaminated sediments. No risks were identified for birds, mammals or fish.

Cleanup Objectives and Goals

Lockheed Martin based its sediment cleanup objectives — called Remedial Action Objectives, or RAOs — on the outcome of the risk assessments. The RAOs for this project are:

- Reduce, to the extent practicable, human health risks associated with the consumption of resident fish by reducing bioavailable sediment concentrations of chemicals of concern.
- Reduce, to the extent practicable, human health risks associated with exposure to chemicals of concern through direct contact with sediments and incidental sediment ingestion by reducing sediment concentrations of chemicals of concern.
- Reduce, to the extent practicable, risks to benthic organisms by reducing bioavailable sediment concentrations of chemicals of concern.

Preliminary remediation goals define target sediment concentrations that adequately protect human health and the

Short List of Remedial Alternatives

Remedial Alternatives		Description/Highlights	Cost
No Action	1	• CERCLA baseline alternative used for comparison to other alternatives	None
Complete Removal	3A	• Removal of impacted sediments over the AOPC in CPC, DHC and Dark Head Creek (As depicted in graphic on page 3) • 143,200 cy removal • Remedial Action Objectives (RAOs) achieved at end of construction	$$$$
	3B	• Removal of impacted sediments over the AOPC in CPC and DHC (As depicted in graphic on page 3, except areas in Dark Head Creek) • 99,600 cy removal • RAOs achieved at end of construction	$$$
Combined Action	4F Partial Removal, Reactive ENR	• Removal in CPC, DHC bulkhead and outfalls. • 48,800 cy removal over 12.5 acres; 8.5 acre reactive ENR (13,800 cy); 8.5 acre long-term monitoring • RAOs achieved at end of construction	$$
	4G Partial Removal, *In situ* Treatment, MNR	• Removal in CPC, DHC bulkhead and outfalls. (As depicted in graphic on page 7) • 48,800 cy removal over 12.5 acres; 8.5 acre in situ treatment; 3.7 acre MNR; 8.5 acre long-term monitoring • Progress towards human health RAOs is 99.5% • Benthic RAO is achieved at 93% of the AOPC; average 6 years of MNR to reach benthic RAO in remaining 7% of the AOPC	$$
	4H Partial Removal at DHC, CPC, and MNR	• Removal in CPC, DHC bulkhead and outfalls. • 48,800 cy removal over 12.5 acres; 8.5 acre of MNR; 8.5 acre long-term monitoring • Progress towards human health RAOs is 82% • Benthic RAO is achieved at 82% of the AOPC; average 11 years of MNR to reach benthic RAO in remaining 18% of the AOPC	$$
	4I Partial Removal at DHC, CPC, and MNR	• Removal in CPC, DHC bulkhead and outfalls, additional removal in DHC and in front of the Wilson Point Park over 3.5 acre • 62,900 cy removal over 16 acres; 5 acre MNR; 5 acre long-term monitoring • Human health RAOs achieved at the end of construction • Benthic RAO is achieved at 90% of the AOPC; average 5 years of MNR to reach benthic RAO in remaining 10% of the AOPC	$$
	4J Partial Removal at DHC, CPC, *In situ* Treatment, MNR	• Removal in CPC, DHC bulkhead and outfalls, additional removal in DHC and in front of the Wilson Point Park over 3.5 acre • 62,900 cy removal over 16 acres; 2 acres in situ treatment; 3 acres MNR; 5 acre long-term monitoring • Human health RAOs achieved at end of construction • Benthic RAO is achieved at 93% of the AOPC; average 1 year of MNR to reach benthic RAO in remaining 7% of the AOPC	$$

Acronyms:
AOPC – area of potential concern
CERCLA – Comprehensive Environmental Resource, Compensation, and Liability Act
CPC – Cow Pen Creek
cy – cubic yard
DHC – Dark Head Cove
ENR – enhanced natural recovery
MNR – Monitored natural recovery
$ – each $ represents relatively higher cost
RAO – remedial action objective

environment and achieve the risk reductions identified for each remedial action objective. The preliminary remediation goals will be evaluated by the MDE and the U.S. EPA. Final cleanup levels will be identified in the approval documents from the regulators.

The Initial Evaluation

The Lockheed Martin team conducted an initial review of cleanup approaches, then assembled a list of remedial alternatives.

The alternatives on the list, which included remedial technologies and process options in different combinations, were screened using three broad EPA criteria — effectiveness, implementability and cost. Lockheed Martin also considered input received from the community and site-specific characteristics.

Using this information, the team developed a short list of alternatives well-suited to meet the remedial action objectives and goals.

Short List of Cleanup Alternatives

The Lockheed Martin team evaluated and conducted a comparative evaluation of the alternatives on the short list through the feasibility study.

Certain alternatives, such as Alternative 2, were eliminated from the long list and are no longer under consideration.

The remaining alternatives, which comprise the short list, differ in the remedial action levels applied, the rate at which sediment-contaminant concentrations are reduced, and the type and scale of technologies used.

- **Alternative 1**—No Action: This alternative is retained to provide a baseline against which to compare the other remedial alternatives, and is required under EPA guidelines.
- **Alternative 3**—Complete Removal: This alternative includes dredging the sediments with the highest concentrations of chemicals of concern wherever concentrations (at any depth) of these compounds are greater than cleanup levels. Complete removal includes two subalternatives (i.e., Alternatives 3A and 3B) that define the extent of removal; both were retained for further detailed evaluation. (*See graphic on page 3.)*

- **Alternative 4**—Combined Actions: The combined-action alternatives involve application of a combination of active and passive remedial technologies (i.e., removal, enhanced natural recovery, reactive enhanced natural recovery, *in situ* treatment, and monitored natural recovery) in the area of potential concern to address surface sediments (i.e., the zone where exposure is likely to occur). Five of the 10 combined action subalternatives (i.e., 4F, 4G, 4H, 4I, 4J) were retained for further evaluation in the feasibility study.

Comparing the Alternatives

The short list of remedial alternatives was evaluated in detail and compared against criteria prescribed by EPA's Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidance. CERCLA, commonly known as Superfund, is a federal law.

To be eligible for selection as the preferred alternative, each alternative must meet two threshold criteria:

- overall protectiveness of human health and the environment, and
- compliance with applicable or relevant and appropriate requirements of federal or state environmental laws.

In the comprehensive comparative analysis, the alternatives also were evaluated against the following primary balancing criteria:

- long-term effectiveness and permanence,
- reduction of toxicity, mobility and/or volume through treatment,
- short-term effectiveness,
- implementability, and
- cost.

Words to Know

***Sediment Removal**: This process removes contaminated sediment by hydraulic or mechanical dredging. The water is separated from the sediment, and the contaminated material is transported to a licensed landfill for disposal.*

***Enhanced Natural Recovery**: Enhanced natural recovery is a process that adds clean material such as sand as a top layer to the sediment. The process reduces the concentration of contamination and speeds up the natural recovery process.*

***Reactive enhanced natural recovery**: describes the addition of activated carbon materials such as mulch or organic clay, which reduce the bioavailability of chemicals present in the sediment so that they are less toxic and less likely to accumulate in fish tissue. These materials may be added to the clean material used to enhance natural recovery.*

Recommended Remedial Alternative

Lockheed Martin's detailed and comparative evaluation of the short list of alternatives identified Alternative 4G as the recommended cleanup alternative. *(See graphic on page 7.)*

Alternative 4G achieves the site-specific preliminary remediation goals associated with remedial action objectives and also meets the appropriate requirements.

The work would include contaminant removal of about 48,800 cubic yards (about 3,300 truckloads, or 6,600 one-way truck trips) of contaminated sediments from more than 12.5 acres, *in situ* treatment to reduce the mobility of contaminants over 8.5 acres in the remainder of the potential areas of concern, and monitored natural recovery of about 4 acres of the *in situ* treatment area. Additional repair, monitoring, and community outreach and involvement would take place as well.

Alternative 4G is recommended because of the following characteristics:

- It scores the best among the alternatives under the CERCLA criteria.
- The potential for exposure to remaining subsurface contamination is negligible.
- Only low risks would be posed to site workers, the community and the environment during implementation.
- This alternative would be relatively straightforward to implement, both technically and administratively.
- Well-established adequacy and reliability controls will ensure the integrity and performance of the remedy through a combination of monitoring, maintenance and institutional controls (such as signage and public education) that would be designed and implemented over the next 20 years following construction.
- Alternative 4G has the lowest environmental footprint (except for No Action and Alternative 4H) in terms of greenhouse gas emissions, fuel consumption, use of natural resources and landfill volume requirements.
- Alternative 4G achieves equal overall benefits relative to other alternatives at a lower cost, providing the most cost-effective and protective remedy.

Alternative 4G, the Recommended Sediment Remedy

Lockheed Martin will be seeking community input on its recommended cleanup alternative, which is included in the feasibility study that was submitted to the Maryland Department of the Environment in December 2012.

What Happens Next

This feasibility study for the remediation of Cow Pen Creek and Dark Head Cove sediments located adjacent to the Lockheed Martin Middle River Complex was submitted to Maryland Department of the Environment and the U.S. Environmental Protection Agency in December 2012.

Lockheed Martin is seeking regulatory approval of this feasibility study and the supporting studies (i.e., the sediment risk assessment and the sediment characterization reports). Upon selection of the cleanup plan, a public meeting and public comment period will be scheduled by the agencies. Lockheed Martin is expecting to implement the remedial actions in 2015 – 2017.

Lockheed Martin is committed to its partnership with the Middle River community, and is committed to maintaining a high level of community involvement, and outreach and communication, as work progresses. Lockheed Martin will also hold information availability sessions with the community before the remedial construction begins. Lockheed Martin remains committed to two-way communication with the community to ensure that questions are answered and issues and concerns are addressed in a timely manner.

For More Information

Questions may be addressed to:

Gary Cambre, Lockheed Martin
Senior Manager, Communications
800.449.4486
gary.cambre@lmco.com

All documents are available at the Essex Library, 410-887-0295, or on Lockheed Martin's Web site at ***http://www.lockheedmartin.com/middleriver***

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