Technical Memorandum Supplement to Remedial Investigation Report Martin State Airport 701 Wilson Point Road Middle River, Maryland

Prepared for:

Lockheed Martin Corporation

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ACRONYMS

cis-1,2-DCE	*cis*-1,2-dichloroethene
cVOC	chlorinated volatile organic compound
DRA	Dump Road Area
FMC	Frog Mortar Creek
HHRA	human health risk assessment
IRA	interim remedial action
Lockheed Martin	Lockheed Martin Corporation
MDE	Maryland Department of the Environment
µg/L	microgram(s) per liter
MSA	Martin State Airport
RI	remedial investigation
TCE	trichloroethene
TM	technical memorandum
VC	vinyl chloride
VOC	volatile organic compound

1.0 INTRODUCTION

In October 2012, Lockheed Martin Corporation (Lockheed Martin) submitted a comprehensive *Remedial Investigation Report (RI) Report for Martin State Airport (MSA), 701 Wilson Point Road, Middle River, Maryland* (referred to herein as the MSA RI) that included a human health risk assessment (HHRA). The RI and HHRA focused on the impacts to MSA on-site environmental media such as soil, groundwater, and pond sediments from subsurface contamination originating from the Dump Road Area (DRA) of the site. As a separate task of the RI, a surface water investigation and monitoring program was initiated for the adjacent Frog Mortar Creek (FMC). FMC surface water is impacted by contaminants from on-site MSA source areas via groundwater discharge to the creek. FMC surface water monitoring reports have been submitted and continue to be submitted separately from the MSA RI. This technical memorandum (TM) supplements the MSA RI and HHRA with an overview of the FMC surface-water volatile organic compound (VOC) contamination resulting from DRA groundwater migration. This TM discusses both the short-term (swimming advisory) and long-term (source investigations and groundwater remediation) actions taken and planned by Lockheed Martin Corporation and the Maryland Department of the Environment (MDE) to protect public health and to address the surface water contamination.

2.0 VOC IMPACT AND MIGRATION TO FROG MORTAR CREEK

The Dump Road Area is in the southeastern portion of MSA, bounded by Frog Mortar Creek to the east and the runway to the west. Frog Mortar Creek is a brackish tidal-water tributary to the middle Chesapeake Bay. The soil, groundwater, and on-site pond-sediment data collected from the Dump Road Area indicate that past activities have released contaminants to the surrounding environment. Past dumping and backfilling have led to large groundwater VOC plumes extending over 30 acres and up to a depth of 80 feet below grade. The most frequently detected VOCs in groundwater include trichloroethene (TCE), *cis*-1,2-dichloroethene (*cis*-1,2-DCE), and vinyl chloride (VC.) The groundwater plumes generally flow toward the northeast and discharge into Frog Mortar Creek.

3.0 SURFACE WATER INVESTIGATIONS AT FROG MORTAR CREEK

Forthcoming monitoring reports to be published in early 2013 will provide a comprehensive summary of the environmental investigations conducted for Frog Mortar Creek. In overview, environmental investigations of the MSA area began in 1991; intensive investigations of Frog Mortar Creek began in 2007 and are ongoing. The most frequently detected chlorinated VOCs (cVOCs) detected in surface water samples are also the primary VOCs detected in groundwater plumes migrating from the Dump Road Area: TCE, *cis*-1,2-DCE, and VC.

In July 2010, unexpectedly high levels of cVOCs, particularly of VC, were detected in surface water samples collected from Frog Mortar Creek. In March 2011, VC was detected at a concentration of 140 micrograms per liter (µg/L) in a shoreline sample. Consequently, beginning in July 2011, and in coordination with the Maryland Department of the Environment (MDE), Lockheed Martin began a rigorous surface-water sampling program to evaluate if cVOC concentrations in Frog Mortar Creek varied over the course of the tidal cycle or with the seasons, and to determine if cVOC concentrations present regulatorily unacceptable risks to human receptors involved in recreational activities along Frog Mortar Creek. Sampling frequency was increased to include summer sampling in addition to the quarterly monitoring rounds. During each event, surface water samples were collected at four locations along 10 lines perpendicular to the shoreline: at the water's edge, and at 50, 100, and 200 feet from the shoreline.

The investigative program indicates that cVOC concentrations discharging to the shoreline may vary seasonally. For example, the highest detected VC concentration was reported for samples collected in March 2011 (140 µg/L), while the highest observed summertime level of VC (32 µg/L) was detected in July 2010. The maximum detected concentrations of TCE, *cis*-1,2-DCE, and VC in the most recently collected surface water samples (September 2012) were 1.4, 3.4, and 8.0 µg/L, respectively.

Human health risk screening-levels have been developed for the surface waters of FMC to be protective of swimmers near the Dump Road Area shoreline. All sampling data are reviewed against these risk-based levels, which were derived to protect local residents who swim, or are assumed to be in the water, for four hours per day, 70 days per year, over the course of 30 years

from childhood through adulthood. The swimming screening levels developed for VC, *cis*-1,2-DCE, and TCE are 0.7 µg/L, 300 µg/L, and 10 µg/L, respectively. Except for the VC results, detected cVOC concentrations have been less than these risk-based screening levels. The vinyl chloride exceedances have consistently been limited to one shoreline location near the DRA, where the highest levels of VOCs in groundwater have been detected.

Data collected to date led MDE to issue a water-contact advisory for Frog Mortar Creek areas adjacent to the MSA, particularly the Dump Road Area. MDE recommends limiting exposure through swimming or wading along a limited portion of the Frog Mortar Creek shoreline adjacent to the MSA. However, the advisory does not prohibit swimming or wading in these areas, as concentrations are not at levels that would present an acute health risk.

4.0 FUTURE INVESTIGATIONS AND REMEDIAL ACTIVITIES IMPACTING CONTAMINANT MIGRATION TO FROG MORTAR CREEK

Ongoing activities planned by Lockheed Martin to further address the groundwater plumes discharging to Frog Mortar Creek are discussed in the following sections.

4.1 Continued Surface Water Sampling of Frog Mortar Creek

Lockheed Martin is currently completing the extensive surface water sampling program for 2012, which involved sampling 40 surface water locations six times throughout the year (March, June, July, August, September, and December). Surface water samples were analyzed for VOCs and the results were reported to MDE and to the community. Lockheed Martin will continue to work with MDE regarding the need for water contact advisories for the area. The surface water sampling program will continue in 2013.

4.2 Source Area Investigations

Lockheed Martin is currently completing additional source area investigations of on-site soil and groundwater to identify and better define high contaminant concentrations areas. These investigations include sampling discrete depth intervals of soils at multiple locations throughout the Dump Road Area, sediment sampling of the on-site ponds, and additional lithologic investigations. The results of these investigations will be used, in part, to evaluate if the treatment of on-site source areas might reduce the contaminant mass discharging to Frog Mortar Creek.

4.3 Implementation of a Groundwater Interim Remedial Action

An interim remedial action (IRA) for groundwater is planned to minimize off-site migration of contaminants. The chosen remedy for the IRA is hydraulic control by extraction, *ex situ* treatment of groundwater, reinjection of groundwater in high concentration areas, discharge to publicly owned treatment works/surface water, monitoring, and land use controls. The system will consist of 16 wells installed to various depths in areas of contaminated groundwater near the Frog Mortar Creek shoreline.

The extraction wells will create a hydraulic barrier to prevent groundwater flow to the creek. Following treatment, the water will initially be discharged to Frog Mortar Creek under permit. This alternative meets the IRA requirement in that it will provide containment to minimize off-site migration of MSA groundwater contaminants. Extensive treatment of high contaminant concentrations in groundwater on-site is not a primary goal of the IRA; the need for such action will be addressed in the future.

Future expansion of this alternative could include groundwater recirculation and *in situ* bioremediation in high concentration areas to destroy some cVOCs; such expansion could be designed for implementation in conjunction with the on-site soil/landfill-waste remedy for the MSA. This alternative is economical, operationally flexible, and will effectively treat all chemicals of concern. Groundwater IRA activities are currently in the design and permitting phase.

4.4 Soil and Waste Feasibility Studies

Lockheed Martin Corporation is preparing feasibility studies to evaluate various methods to address the soil and waste at the Dump Road Area. This could include soil and waste consolidation, installing a soil cover, and/or off-site disposal of soil and waste. Such actions would decrease risks to airport maintenance and construction personnel and potentially reduce continued migration of contaminants to and through the site groundwater to the surface waters of Frog Mortar Creek.

5.0 SUMMARY AND CONCLUSIONS

Groundwater contaminants (primarily cVOCs) originating from MSA source areas are discharging to the surface waters of Frog Mortar Creek. An extensive surface-water sampling program is ongoing in Frog Mortar Creek adjacent to the MSA, and MDE has issued a water-contact advisory for a limited portion of the creek shoreline. The advisory recommends limiting exposure to the surface waters of the creek, but does not prohibit swimming or wading. Lockheed Martin is completing additional investigations of on-site MSA source areas to further investigate the sources of the groundwater plumes, and is designing a groundwater IRA to control the migration of these contaminant plumes to Frog Mortar Creek.

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LOCKHEED MARTIN

February 21, 2013

VIA OVERNIGHT CARRIER

Mr. Art O'Connell
Chief, CHS Enforcement Division
Maryland Department of the Environment
1800 Washington Road, Suite 625
Baltimore, Maryland 21230

Re: Transmittal of the Technical Memorandum Supplement to Remedial Investigation Report
Martin State Airport, Middle River, Maryland

Dear Mr. O'Connell:

For your use and reference, please find enclosed two hard copies of the above-referenced technical memorandum. This technical memorandum discusses both the short-term (swimming advisory) and long-term (source investigations and groundwater remediation) actions taken and planned by Lockheed Martin Corporation and the Maryland Department of the Environment to protect public health and to address the surface water contamination at the subject site.

If you have any questions or require any additional information please contact me by phone at 240-676-5392, or via e-mail at paul.calligan@lmco.com.

Sincerely,

Paul E. Calligan

Paul E. Calligan, P.G.
Project Lead, Environmental Remediation
Lockheed Martin Corporation

Enclosures

cc: (via email without enclosure)
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