

PROPOSED PLAN

Interim Remedial Action

Groundwater Operable Unit at the Dump Road Area Site at Martin State Airport Middle River, Maryland

January 2012

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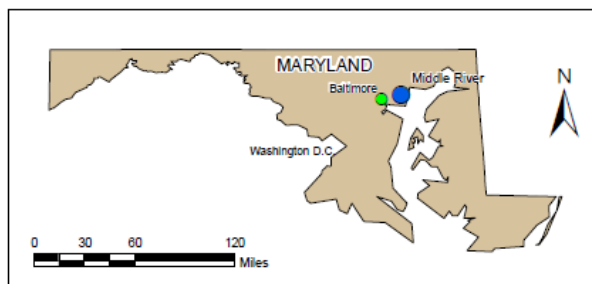
INTRODUCTION

Lockheed Martin Corporation (Lockheed Martin) is seeking public comment on a Proposed Plan for the groundwater Interim Remedial Action (IRA) at the Dump Road Area (DRA) Site at Martin State Airport (MSA) in Middle River, Maryland. The primary goal of this interim action is to capture and treat the contaminated groundwater at the site before it reaches Frog Mortar Creek. This Proposed Plan is the recommended alternative for achieving this goal, and consists of the following:

- Extraction of groundwater;
- *Ex situ* treatment (an action that will be accomplished above ground) using a water treatment facility to clean groundwater;
- Reinjection of treated groundwater in high concentration areas;
- Discharge of treated water to the publicly owned treatment works (POTW) or to surface water;
- Monitoring; and
- Land use controls.

The public is invited to provide written comments on the Proposed Plan between February 8 and March 8, 2012.

This Proposed Plan fact sheet includes a description of the Martin State Airport site and a summary of investigations conducted at the site. This document is based on the *Interim Remedial Action – Feasibility Study for the Groundwater Operable Unit at the Dump Road Area Site at Martin State Airport, Middle River, Maryland, Tetra Tech, October 2010* (Groundwater FS). Also included is a discussion on the Remedial Action Objectives (RAOs) for the site, and a summary of the alternatives evaluated for the site cleanup. A detailed description of the preferred alternative is presented at the end of this document.



PURPOSE OF THE PREFERRED ALTERNATIVE

The preferred alternative meets the Interim Remedial Action goal in that it captures and treats trichloroethene (TCE), 1,4-dioxane, and other site contaminants before groundwater reaches Frog Mortar Creek. This approach also will provide for additional groundwater extraction and treatment, if it is needed in the future.



PUBLIC COMMENT PERIOD
FEBRUARY 8 – March 8, 2012

PUBLIC INFORMATION SESSION
FEBRUARY 8, 2012

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SITE DESCRIPTION

Martin State Airport (MSA) is located at 701 Wilson Point Road in Middle River, Maryland, and is bounded by Frog Mortar Creek to the east and Stansbury Creek to the west. Both creeks join the Chesapeake Bay at the southern side of the airport. The Dump Road Area (DRA) Site is on the southeast portion of Martin State Airport, and is bounded by Frog Mortar Creek to the east and Taxiway Tango and the main airport runway to the west. See the figure to the left for a site wide aerial photograph.

SITE HISTORY

Martin State Airport was owned and operated by the Glenn L. Martin Company (a predecessor firm of Martin Marietta Corporation, and Lockheed Martin) from approximately 1929 to 1975. The facility was originally used for aircraft manufacturing, which began in 1932. Runways and hangars were built in 1939–1940. The Glenn L. Martin Company consolidated with American Marietta Corporation in September 1961 to form Martin Marietta Corporation. Lockheed Corporation and Martin Marietta merged in 1996 to form Lockheed Martin Corporation. In July 1955, the Maryland Air National Guard (MDANG) began leasing a portion of the property from the Glenn L. Martin Company. In September 1975, the Maryland Aviation Administration (MAA) purchased the land now used as the airfield.



Environmental issues associated with the Dump Road Area Site were initially identified in July 1991, when the Maryland Aviation Administration encountered four drums adjacent to Taxiway Tango during trenching to install an electrical cable. These drums were subsequently disposed of properly in an off-site licensed landfill. The discovery of these buried drums led to an investigation of the surrounding area for possible soil and groundwater contamination. These investigations showed that the Dump Road Area Site had been used as a landfill for wastes associated with industrial activity.

The Maryland Aviation Administration (1991–1997) and Lockheed Martin (1998–present) performed several site investigations and/or sampling events to outline the extent of environmental contamination at the Dump Road Area Site. The early investigations identified four areas of concern:

- Taxiway Tango Median Anomaly
- Drum Area
- Two Existing Ponds
- Petroleum Hydrocarbon Area

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These areas of concern were identified based on analyses of soil samples and observations of debris and waste material found at these locations. Site investigations have included monitoring well installation, soil and groundwater sampling, test pit excavations, and geophysical surveys. These investigations also identified the extent of historical landfilling and waste disposal. More than 540 groundwater samples were collected from 87 permanent monitoring wells, 125 temporary monitoring wells, and temporary groundwater sampling points. More than 320 soil samples were collected from approximately 180 borings and 65 test pits or trenches.

HISTORICAL SITE INVESTIGATIONS

This Proposed Plan is based on the Groundwater Feasibility Study conducted for the Dump Road Area Site at Martin State Airport. Included within the Feasibility Study were summaries of previous investigations, including a Remedial Investigation (RI).

The Remedial Investigation was conducted to define the lateral and vertical extent of landfill material and groundwater contamination and to provide the basis for remedial designs for the landfill area. The Remedial Investigation included an evaluation of the nature and extent of environmental contamination at the Dump Road Area Site, a human health risk assessment (HHRA), and an Ecological Risk Assessment (ERA). The results of the Remedial Investigation were used in the Groundwater Feasibility Study to establish current environmental conditions and to help choose an appropriate remedial action. A summary of the Remedial Investigation, including the Human Health Risk Assessment and the Ecological Risk Assessment, is presented below.

Remedial Investigation Results for Groundwater

Based on the extensive groundwater investigations at this site, TCE, cis-1,2-dichloroethene (DCE), vinyl chloride, and 1,4-dioxane were identified as primary groundwater chemicals of concern (COCs) because they are detected frequently throughout the site at concentrations significantly greater than their preliminary remediation goals (PRGs). Other chemicals detected above preliminary remediation goals, but less frequently, include cadmium and petroleum hydrocarbons. Preliminary remediation goals are concentrations that are established to be protective of human health and the environment.

The following is a summary of the nature and extent of the contamination in groundwater (for the primary chemicals of concern) at the Dump Road Area Site:

- Concentrations of chlorinated volatile organic compounds (cVOCs) such as TCE, cis-1,2-DCE, and vinyl chloride, which were commonly used in industrial processes in the past, exceeded federal and Maryland groundwater standards throughout a large portion of the investigation area and at multiple depths. The figure on the following page shows the groundwater TCE concentrations throughout the site; the other chlorinated volatile organic compounds listed above follow patterns similar to those seen for TCE.
- The compound 1,4-dioxane was primarily detected in groundwater samples from below the ground surface, down to 45 feet deep. It is generally present in areas containing the highest concentrations of chlorinated volatile organic compounds.
- Concentrations of cadmium exceeded the Maryland groundwater standards in 20 percent of samples. The greatest concentrations of cadmium are co-located with high levels of chlorinated volatile organic compounds from 15 feet to 45 feet below the ground surface.
- Petroleum-related compounds such as benzene, toluene, ethylbenzene, and xylenes (BTEX) were detected less frequently, and at lower concentrations with respect to groundwater standards, than the chlorinated volatile organic compounds.

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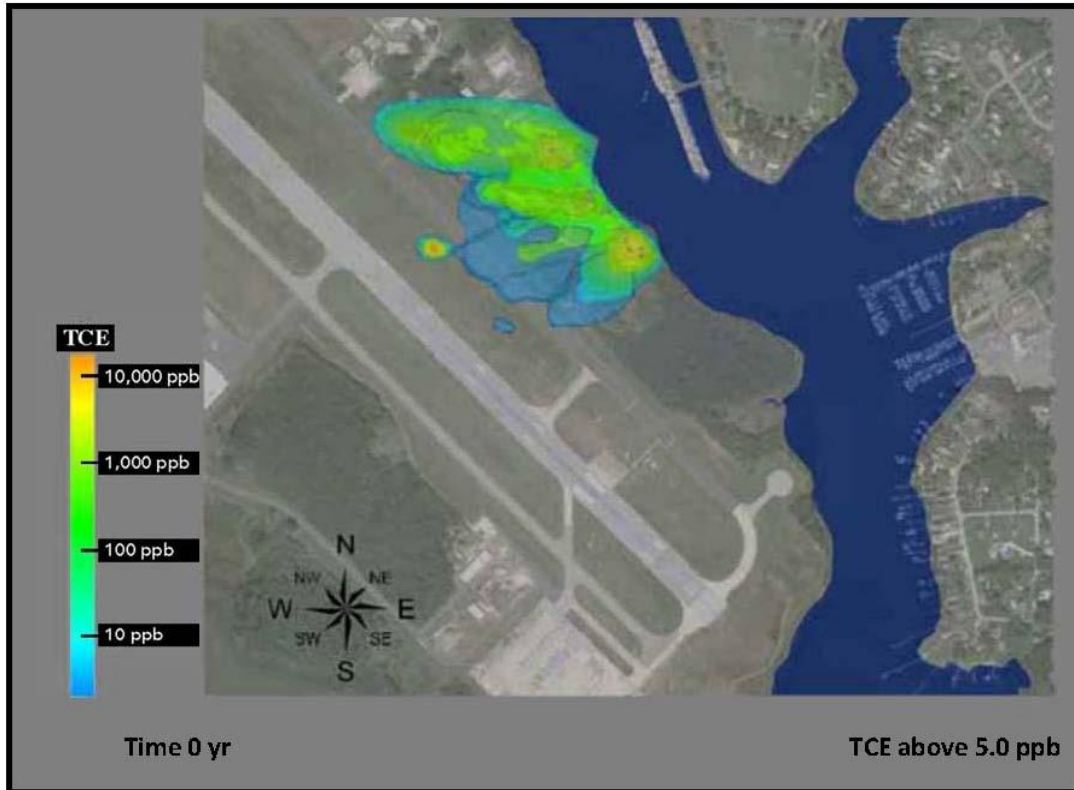
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Groundwater at the site generally flows eastward toward Frog Mortar Creek. Recent sampling in the creek has shown that contaminants such as TCE and vinyl chloride are detectable in the creek. The primary goal of this Interim Remedial Action is to capture and treat the contaminated groundwater before it reaches the creek.



For all the Interim Remedial Action (IRA) alternatives addressed in the Groundwater Feasibility Study (FS) (and thus this Proposed Plan), the primary objective is containment. Active remediation of groundwater with the highest contaminant concentrations would decrease the duration of containment. Therefore, limited treatment of the high concentration areas was also considered in developing some of the remedial alternatives in the Groundwater FS.

Further identification of high concentration areas is planned for 2012 and, if needed, additional active remediation of these areas may be added to the IRA at a later date.

Human Health Risk Assessment

A Human Health Risk Assessment (HHRA) was conducted in 2010 and included in the Remedial Investigation report. It used the Remedial Investigation results to evaluate the levels that would be necessary to negatively impact human health, and it considered whether people could be exposed to the groundwater contamination under current and likely future land uses. The Human Health Risk Assessment was conducted in accordance with U.S. Environmental Protection Agency (EPA) and Maryland Department of the Environment (MDE) guidelines. The Human Health Risk Assessment considered potential exposure under non-residential (e.g., industrial, recreational) land use scenarios. Although the site is not expected to be used for residential purposes in the foreseeable future, residential land uses also were evaluated to identify what cleanup goals may be required under all potential land uses.

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Chemicals of potential concern (COPCs) identified in the Human Health Risk Assessment, based on direct contact exposure, are the following:

- chlorinated volatile organic compounds (via direct contact with soils, groundwater, and pond sediments),
- benzene, toluene, ethylbenzene and xylenes (via soils and groundwater),
- substituted benzene compounds (via soils and groundwater),
- polycyclic aromatic hydrocarbons, referred to as PAHs (via soils and pond sediments), and
- several heavy metals such as cadmium, lead, copper, chromium, nickel (via soils and groundwater).

Groundwater is not currently used as a source of drinking water (potable) or industrial water at the site, nor is such use likely in the future. A groundwater user survey indicated the possibility of wells near Martin State Airport, but these wells, if they exist, would be upgradient of Martin State Airport and would not be affected by any on-site contaminant sources. Groundwater remediation at this site is appropriate due to the risks identified in the Human Health Risk Assessment, and the presence of groundwater contaminants at concentrations greater than EPA and MDE standards.

Ingestion of groundwater at the Dump Road Area Site is expected to be limited to exposures that might occur under an unlikely future residential scenario. Incidental ingestion of groundwater by construction workers might occur during construction/excavation activities. Future workers and residents could be exposed to unacceptable concentrations of volatile organic compounds via vapor intrusion into buildings built over the contaminant plume. Trespassers/visitors could incidentally ingest surface water from the on-site ponds while on site. However, no chemicals of concern were detected in the pond water.

The Human Health Risk Assessment considered only on-site risk and did not specifically evaluate risk in Frog Mortar Creek. Recent surface water data has indicated that groundwater contaminants are likely moving to Frog Mortar Creek. More comprehensive surface water monitoring began in 2011, and monitoring will continue in 2012. The data will be used to conduct risk assessments to evaluate if any negative or undesirable effects to the creek are occurring.

Ecological Risk Assessment

An Ecological Risk Assessment also was conducted in 2010 as part of Remedial Investigation activities, in accordance with EPA guidelines, to evaluate risk to potential ecological receptors in surface soil, pond sediment, and groundwater. The central area of the site northwest of Pond No. 1 appears to be the area of greatest ecological risk, based on sampling data. Surface soil ecological chemicals of potential concern for invertebrates and plants include:

- | | | |
|---------------|--------------|------------|
| • TCE | • manganese | • chromium |
| • cis-1,2-DCE | • antimony | • zinc |
| • copper | • molybdenum | |

Additionally, polycyclic aromatic hydrocarbons are chemicals of potential concern only for soil invertebrates; and cadmium, lead, nickel, and selenium are chemicals of potential concern only for plants. Several metals (mercury, cadmium, lead, and molybdenum) in the surface soil were identified as risks to wildlife (e.g., quail, shrews, and robins). VOCs, PAHs, polychlorinated biphenyls (PCBs), and several metals in Pond No. 1 sediment were considered an ecological risk. For groundwater evaluated as surface water, several VOCs and metals exceeded criteria.

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REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are goals that a cleanup plan should achieve. They were established during the Groundwater Feasibility Study, based on investigation data and risk assessments, to assist in the development of remedial alternatives for protection of human health and the environment. At the Dump Road Area Site, the following Remedial Action Objectives were developed for groundwater for the interim remedial action:

- Groundwater RAO No. 1 — Prevent lateral movement of contaminated groundwater toward Frog Mortar Creek.
- Groundwater RAO No. 2 — Prevent human exposure (by showering, drinking and irrigation) to groundwater containing chemical-of-concern concentrations greater than preliminary remediation goals.
- Groundwater RAO No. 3 — Prevent exposure of industrial workers, construction workers, and hypothetical residents to volatile organic compounds resulting from vapor intrusion from groundwater into buildings that cause unacceptable risk (defined as a total incremental lifetime cancer risk [ILCR] greater than 1×10^{-5} [or one in 100,000], or a hazard index [HI] greater than 1).

In the Proposed Plan, RAO No. 1 will be met by the installation of the groundwater extraction and treatment system. RAO Nos. 2 and 3 will be met by land use controls such as limiting land use to industrial purposes, prohibiting residential use, and prohibiting surficial aquifer use for drinking and industrial purposes.

As part of Lockheed Martin's "Go Green" program, sustainability was a factor in selecting the recommended remedial alternative, and sustainability practices will be included in the design, installation, and operation of the IRA for groundwater.

Sustainability practices in general are those that consider economic and natural resources, ecology, human health and safety, quality of life, and reduction of the overall environmental "footprint."

SUMMARY OF ALTERNATIVES

Remedial alternatives, or cleanup options, that would meet the Remedial Action Objectives were identified in the Groundwater Feasibility Study and are summarized below. These alternatives are different combinations of methods or plans to restrict access and/or to contain, remove, or treat contamination, in order to protect human health and the environment.

- **Alternative G-1** — No action

Alternative G-1 was developed and analyzed as a baseline against which the other alternatives can be compared, as required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

- **Alternative G-2** — Hydraulic control by extraction, *ex situ* treatment of groundwater, discharge to Baltimore County sanitary sewer or discharge to surface water, monitoring, and land use controls.

Alternative G-2 was developed as a base case with hydraulic control of the plume only. Groundwater contaminants upgradient of the extraction wells will flow to the extraction wells. This design does not incorporate groundwater cleanup in the high concentration areas.

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- **Alternative G-3** — Hydraulic control by extraction, *ex situ* treatment of groundwater, reinjection of groundwater, discharge to publicly owned treatment works or discharge to surface water, monitoring, and land use controls.

Alternative G-3 is a modification to Alternative G-2, where a portion of the treated groundwater will be reinjected along with biodegradable chemicals in the high concentration areas to promote *in situ* biological remediation. The treatment system in this alternative is sized for a larger flow rate to address the potential for flexibility in future operations, including the final site groundwater remedy.

- **Alternative G-4** — Hydraulic control by extraction, extraction in high concentration areas, *ex situ* treatment of groundwater, reinjection of groundwater, discharge to publicly owned treatment works or discharge to surface water, monitoring, and land use controls.

Alternative G-4 is an extraction and treatment approach similar to Alternative G-3 that includes additional extraction wells in the high concentration areas, along with reinjection of treated groundwater (with amendments to promote biological activity that degrades the contamination). Treating additional groundwater may reduce the time required to restore groundwater quality.

- **Alternative G-5** — Hydraulic control by extraction, *ex situ* treatment of groundwater, *in situ* bioremediation of high contaminated areas, discharge to publicly owned treatment works or discharge to surface water, monitoring, and land use controls.

Alternative G-5 is similar to Alternative G-4 in that highly contaminated groundwater in the high concentration areas is treated. In Alternative G-5, highly contaminated groundwater in the high concentration areas is treated *in situ* by adding amendments to promote biological activity that degrades the contamination to reduce the time to restore groundwater quality, but extracted groundwater is not reinjected. The treatment system in this alternative is also sized for a larger flow rate to permit flexibility in future operations.

- **Alternative G-6** — Zero-valent iron (ZVI) permeable reactive barrier (PRB), monitoring, and land use controls.

Alternative G-6 uses a permeable reactive barrier for passive treatment instead of a groundwater extraction and treatment system. A description and detailed analysis of all the listed alternatives are presented in the Groundwater Feasibility Study.

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What are the evaluation criteria used for selection of the alternative?

Threshold Criteria (The selected remedy must satisfy these criteria):

Overall Protection of Human Health and the Environment: determines whether an alternative eliminates, reduces, or controls threats to public health and the environment.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs): evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

Balancing Criteria (These criteria are used to weigh the relative merits of the alternatives):

Long-Term Effectiveness and Permanence: considers the ability of an alternative to maintain the reduction of risk over the long-term.

Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment: evaluates an alternative's use of treatment to reduce the amount of contamination present, and to reduce the harmful effects of contaminants and their ability to move in the environment.

Short-Term Effectiveness: considers the length of time needed to implement an alternative, and the risk the alternative poses to workers, residents, and the environment during implementation.

Implementability: considers the technical and administrative feasibility of implementing the alternative.

Sustainability: incorporates the environmental (i.e. resource consumption and waste generation), economic and social effects of each alternative. The evaluation of sustainability is part of Lockheed Martin's 'Go Green' program.

Cost: includes estimated capital and annual operation and maintenance costs, as well as a net present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

Modifying Criteria (These criteria are also considered during evaluation and may require a modification to the Proposed Plan):

Regulatory Acceptance: Decisions by federal, state, and local regulatory agencies affecting aspects of the Proposed Plan will be incorporated as the project planning progresses.

Community Acceptance considers whether the local community agrees with the preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

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COMPARISON OF GROUNDWATER ALTERNATIVES BY CRITERIA

Alternative	G-1	G-2	G-3	G-4	G-5	G-6
Threshold Criteria						
Protects human health and the environment	○	●	●	●	●	●
Meets federal and state ARARs	○	●	●	●	●	●
Balancing Criteria						
Provides long-term effectiveness and is permanent	○	⊙	●	●	●	⊙
Reduces mobility, toxicity, and volume of contaminants through treatment	○	●	●	●	●	⊙
Provides short-term protection	○	●	●	●	●	⊙
Can be implemented	NA	●	●	●	●	○
Sustainability	●	⊙	⊙	⊙	⊙	●
Cost (\$)						
• Upfront cost to design and construct the alternative	NA	\$12.0 M	\$12.9 M	\$13.1 M	\$14.0 M	\$13.3 M
• Net present worth of operating and maintaining the system associated with the alternative (30 years)	NA	\$8.2 M	\$8.6 M	\$11.7 M	\$8.8 M	\$5.7 M
• Total cost net present worth	NA	\$20.2 M	\$21.5 M	\$24.8 M	\$22.8 M	\$19.0 M
Modifying Criteria						
Regulatory agency acceptance		To be determined after the public comment period.				
Community acceptance		To be determined after the public comment period.				
Relative comparison of criteria and each alternative: ● – High, ⊙ – Medium, ○ – Low; NA – not applicable Cost (\$): M – million						

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SELECTION OF PREFERRED GROUNDWATER ALTERNATIVE

Alternative G-3 (hydraulic control by extraction, ex situ treatment of groundwater, reinjection of groundwater, discharge to publicly owned treatment works or surface water, monitoring, and land use controls) was selected as the Proposed Plan for the Interim Remedial Action at the Dump Road Area site. This alternative meets the primary Interim Remedial Action goal, as it provides for capture and treatment of the contaminated groundwater at the site before it reaches Frog Mortar Creek. It also provides additional groundwater treatment capacity so that the groundwater extraction system can be expanded in the future, particularly after the high concentration areas have been better defined, and the soil and landfill waste are fully managed.

The alternative also provides flexibility for expansion to include groundwater recirculation and *in situ* bioremediation in the high concentration areas to provide some additional destruction of chlorinated volatile organic compounds. Although rated similarly to Alternatives G-2, G-4, and G-5, this alternative provides the significant operational flexibility at a reasonable cost.

Alternative G-2 was not selected primarily because it offers too little flexibility for future operations if higher flow rates or extraction of groundwater from other areas is required. In addition, the overall time to meet preliminary remediation goals under Alternative G-2 is longer than G-3. Alternative G-6 was not selected because 1,4-dioxane and BTEX constituents would not be affected, and the level of metals treated is uncertain. Alternative G-6 has the highest capital cost, and installation of the permeable reactive barrier to the required depth would be very difficult.

Alternatives G-4 and G-5 were not selected because they require a commitment to a greater capital expenditure before the effects of the groundwater capture can be fully evaluated. After several years of Alternative G-3 system operation, components of Alternatives G-4 and/or G-5 could be optimally phased in using data and observations from the Alternative G-3 system operation, and knowledge of the details of the final soil/landfill waste remedy. Therefore, Alternative G-3 was selected to provide hydraulic containment and to allow for a phased approach to remediation of other parts of the plume, such as the high concentration areas.

The six major design components of the Proposed Plan are:

- (1) hydraulic control of the plume by extraction
- (2) *ex situ* treatment of groundwater
- (3) reinjection of some of the treated groundwater to the aquifer
- (4) discharge of treated groundwater to the publicly owned treatment works or surface water
- (5) monitoring
- (6) land use controls

Preferred Alternative

G-3

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Detailed design description of the preferred alternative, G-3:

1) **Hydraulic Control** — This component includes installing an array of 16 groundwater extraction wells parallel to and near Frog Mortar Creek. The system would operate until containment is no longer required.

2) **Ex situ treatment of groundwater** — The total groundwater extraction rate to provide containment is expected to be approximately 40 gallons per minute (gpm). The treatment system conceptual design is sized for 100 gpm to conservatively address uncertainties in groundwater extraction rates and to provide flexibility for future expanded operations. The additional flow capacity would allow significant recirculation to facilitate *in situ* treatment of the high concentration areas as part of a future site remedy. This component would consist of installing a treatment system and operating it until containment is no longer required.

The extracted groundwater would enter the system at a feed tank, then flow through a metals removal system, filter unit, air stripper, advanced oxidation system for the removal of 1,4-dioxane, the liquid-phase granular activated carbon (GAC) and ion exchange (IE) units, and then exit the system. Sludge generated by the metals removal step would be thickened, dewatered, and properly disposed of at a licensed off-site facility.

3) **Reinjection of treated groundwater** — Following a period of successful operation, some groundwater may be reinjected near the high concentration areas under this alternative. Reinjection would enhance the flushing rate of contaminants from these areas, and a compound would be mixed with the reinjected treated groundwater to promote anaerobic reductive dechlorination of cVOCs, a process in which naturally occurring bacteria break down the contamination.

Six injection wells would be placed in areas contaminated with high concentrations of chlorinated volatile organic compounds. Treated groundwater would not be reinjected in areas contaminated with 1,4-dioxane only, because the compound is not effective in degrading 1,4-dioxane. Four wells would be screened in the upper zone and two in the intermediate zone. The total flow rate to upper zone wells would be approximately 10 gallons per minute; the total flow rate to the intermediate zone wells would be 3 gallons per minute. The total injection rate would be approximately 13 gallons per minute.

Sodium lactate would be added to the reinjected treated groundwater as an electron-donor compound to promote treatment of the chlorinated volatile organic compounds. Treated groundwater augmented with the electron-donor compound would be intermittently reinjected to the aquifer to allow the electron-donor compound to be flushed away from the wells. Reinjection facilities may be installed following initial installation of the extraction wells and the groundwater treatment system, potentially in conjunction with the soil/landfill waste remedy.

4) **Discharge to publicly owned treatment works and surface water** — Reporting would be required twice annually because the potential discharge rate of 100 gallons per minute is greater than the 25,000 gallon per day (gpd) threshold for a significant industrial user. Annual user fees are also required, in addition to sewage service charges. A surface water discharge permit would be obtained after two or three years of operation, once treatment system operating parameters have been established. However, because Baltimore County may not accept the discharge due to treatment capacity issues, discharge to surface water, under permit with the State, may be required from the beginning.

5) **Monitoring** — Monitoring would consist of regularly measuring groundwater levels and collecting and analyzing groundwater samples to evaluate changes in contaminant concentrations due to extraction. Water level data will be used to confirm hydraulic capture of the plume. Samples would be collected from existing as well as new monitoring wells installed specifically to evaluate system performance. Wells in the monitoring program would include the extraction wells, five three-well clusters in the plume (between the Taxiway Tango and Frog Mortar Creek), two three-well clusters between the runway and Taxiway Tango, and a newly installed pair of two-well clusters (extending into the intermediate and lower zones), with each pair installed downgradient of the extraction wells. Final selection of monitoring wells will be made in the design phase of the project, with the concurrence of relevant regulatory agencies.

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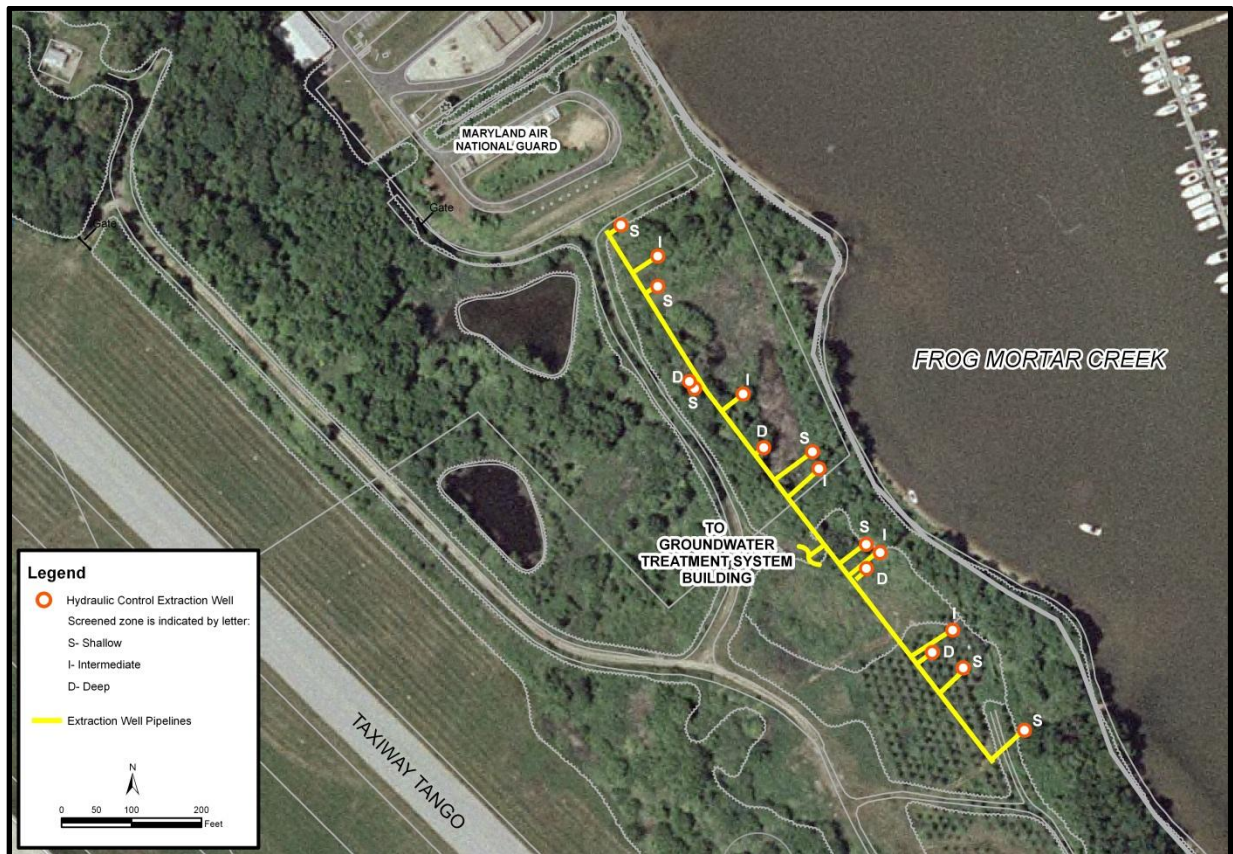
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Groundwater samples will be analyzed for volatile organic compounds, 1,4-dioxane, petroleum hydrocarbons, and metals. The extraction wells would be sampled semiannually for the first three years because concentrations in these wells are expected to change quickly. Thereafter, they will be sampled annually. All other wells would be sampled annually. Groundwater sampling and analysis reports would be submitted annually to the relevant regulatory agencies. The groundwater monitoring program would be reviewed at least every five years to determine if changes are needed in sampling frequency, analyses, or the wells that are sampled. Pumping rates of the extraction wells would also be evaluated for optimization.

Additional monitoring wells may need to be installed to monitor the effect of adding the electron-donor to the injection wells.

6) **Land Use Controls** — Land use controls for groundwater would include limiting land use to industrial purposes, prohibiting residential use, and prohibiting surficial aquifer use for drinking and industrial purposes. Land use controls would also be applied to areas overlying shallow groundwater where volatile organic compound concentrations are greater than the vapor intrusion-based preliminary remediation goals. This land use control would require special construction methods, such as installation of vapor barriers and foundation venting, to prevent unacceptable exposure to volatile organic compounds via vapor intrusion. Deed restrictions would be required to implement the land use controls. Land use controls would be maintained as long as groundwater contaminant concentrations are greater than preliminary remediation goals.



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COMMUNITY PARTICIPATION INFORMATION

The public is encouraged to participate in the decision-making process for the Dump Road Area Site at Martin State Airport by reviewing and commenting on this Proposed Plan during the public comment period.

Dates of public comment period for the Proposed Plan:

February 8, 2012 through March 8, 2012

■ **Time and place for a public information session:**

February 8, 2012 at the Marshy Point Nature Center, 7130 Marshy Point Road, Middle River, Md.

■ **Location of project documents:**

Essex Public Library
1110 Eastern Boulevard, Essex, Maryland, 21221,
open Mon-Thurs. 9 a.m. -9p.m.; Fri-Sat 9 a.m.-5:30 p.m.

<http://www.lockheedmartin.com/us/who-we-are/sustainability/remediation/msa.html>

■ **Contact information:**

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GLOSSARY

This glossary defines the technical terms used in this Proposed Plan. The definitions in this glossary apply specifically to this Proposed Plan, and may have other meanings when used in different circumstances

Anaerobic reductive dechlorination — A natural breakdown or treatment process in which anaerobic bacteria (i.e., bacteria that do not require oxygen) remove chlorine from chlorinated compounds (such as trichloroethene). Once all possible chlorine atoms are taken away, a chemical called ‘ethene’ is formed, which is not harmful to human health or the environment.

Applicable or relevant and appropriate requirements (ARARs) — Environmental cleanup standards and requirements (federal and state laws and regulations) that must be attained during cleanup operations, and maintained at project completion.

Aquifer — An underground layer of rock, sand, silt, or clay that contains water in sufficient amounts to serve as sources of groundwater for wells and springs.

BTEX - benzene, toluene, ethylbenzene and xylenes.

Chemical of concern (COC) — Chemicals, identified by a regulatory agency, that are found at concentrations higher than those considered to be safe, and must be cleaned up and/or monitored.

Chemical of potential concern (COPC) — Chemicals identified during a remedial investigation (RI) which are at concentrations that have the potential to harm human health and/or the environment.

Chlorinated volatile organic compound (cVOCs) — examples include trichloroethene (TCE) and cis-1,2-dichloroethene (*cis*-1,2-DCE), see VOCs for additional information.

Containment — A technology that prevents the movement of contaminants from a site but does not necessarily treat or remove the contaminants.

cis-1,2-Dichloroethene (cis-1,2-DCE) — A degradation product of trichloroethene (TCE).

1,4-Dioxane — A clear, flammable volatile organic compound mainly used as an industrial solvent or solvent stabilizer in a variety of manufacturing processes, including electronics, metal finishing, fabric cleaning, pharmaceuticals, herbicides, pesticides, antifreeze, and paper. It is also found in household products such as detergents, shampoos, body lotions, dishwashing soap, and cosmetics. It does not break

down naturally in the environment, so it tends to linger in soil and groundwater for a very long time.

Ecological Risk Assessment (ERA) — A study that evaluates risk to plants and animals in the ecosystem.

Ex situ — Away from the original location or place where pollutants are found; in this report, *ex situ* means on-site and at the surface, but not in place (under ground).

Granular activated carbon (GAC) — Proven treatment method for VOC removal from contaminated groundwater and air stripper off-gas. Would not be effective on metals and its effect on 1,4-dioxane is uncertain.

Groundwater — Water found beneath the ground surface that fills open spaces between particles such as sand, soil, and gravel, or that fills cracks and fractures in rock.

High concentration areas — Areas where concentrations of TCE, cis-1,2-DCE, or vinyl chloride in the groundwater are significantly greater than preliminary remediation goals and may require additional investigation and/or remediation.

Human Health Risk Assessment (HHRA) — A study that evaluates the harmful effects and risks from eating, breathing or touching a chemical (current and future).

Ion exchange (IE) — Removal of dissolved ions through exchange with similarly charged ions held on the active sites of a synthetic resin that is contacted with the liquid to be treated.

In situ — For this project, *in situ* means on-site and in place.

Land use controls - Engineered and non-engineered (administrative) controls formulated and enforced to regulate current and future land use options. Engineered controls include fencing and posting. Non-engineered controls typically consist of administrative restrictions — **such as deed restrictions** - that prohibit residential development and/or groundwater use.

PROPOSED PLAN

Interim Remedial Action

Groundwater Operable Unit at the Dump Road Area Site at Martin State Airport Middle River, Maryland

January 2012



National Oil and Hazardous Substances Pollution Contingency Plan (NCP) — A federal plan that dictates who will, and how to, respond to an oil spill or a release, or threat of release, of a hazardous substance. It establishes a National Response Team (NRT), which is headed up by EPA, and outlines requirements for accident reporting, spill containment, and cleanup.

Net present worth — A present worth analysis that evaluates costs over a specific period of time by discounting all future costs to a common base year. It represents the amount of money that, if invested in the base year and dispersed as needed, would be sufficient to cover all costs associated with the remedial action over its planned life. Net present worth considers both capital (construction) and annual (such as maintenance and labor) costs.

Operation and maintenance (O&M) — Activities conducted after a site action has been completed to ensure that the action is effective.

Polycyclic aromatic hydrocarbon (PAHs) — A group of carcinogenic compounds derived from the combustion of materials.

Permeable reactive barrier (PRB) — Reactive materials placed in the subsurface (by trenching or drilling) to catch contaminated groundwater and change contaminants, as they pass through the barrier, into less harmful environmentally acceptable products.

Plume — A body of contaminated groundwater moving away from its source. The movement of contaminants is influenced by such factors as local groundwater flow patterns, aquifer characteristics, and the nature and type of contaminant.

Preliminary remediation goal (PRG) — Contaminant concentration goals for soil, sediment, water, and air, listed by land use option, that are considered to be protective to human health and the environment. Customarily used at Superfund, federal facilities, Brownfield, and RCRA sites, PRGs comply with all ARARs. Preliminary remediation goals serve as a target during the initial development, analysis, and selection of cleanup alternatives.

Remedial action — The construction or implementation phase of the selected remedial alternative at a site cleanup program.

Remedial action objectives (RAOs) — Cleanup objectives that specify contaminants to be cleaned up,

the cleanup standard, the area of cleanup, and the time required to achieve cleanup, for the purpose of protecting human health and the environment.

Remediation — The process of correcting and/or cleaning up environmental contamination. Remediation involves taking action to reduce, isolate, or remove contamination from an environmental medium (e.g., soil, air, groundwater, surface water), with the goal of preventing exposure of people or animals to that contamination and reducing impact to the environment.

Trichloroethene (TCE) — A nonflammable, colorless liquid chemical with a slightly sweet odor, commonly used as an industrial solvent and metal degreaser. TCE is also used in household and consumer products such as typewriter correction fluid, paint removers, adhesives, and spot removers.

Vapor intrusion — The movement (migration) of chemical vapors from under the ground into overlying buildings.

Volatile organic compounds (VOCs) — A group of chemicals (organic compounds) that will vaporize or evaporate at room temperature into the atmosphere. They often have a sharp smell and can come from many products such as office equipment, adhesives, carpeting, upholstery, paints, petroleum products, solvents, and cleaning products.

Zero-valent iron (ZVI) — A type of pure iron, typically in the form of small particles, used in the construction of subsurface reactive walls to treat and reduce the levels of contamination in groundwater.