MSA - 2020 GW OM Report (version with Appendix broken out)

Lockheed Martin
Corporation 6801
Rockledge Drive
MP CCT 246
Bethesda, MD 20817
Telephone (301) 548-2223

December 04, 2020

VIA EMAIL AND PRIVATE CARRIER

Mr. Brian Dietz
Program Administrator Land Restoration Program
Land and Material Administration Maryland Department of the Environment
1800 Washington Road, Suite 625
Baltimore, Maryland 21230

Re: Transmittal of the 2020 Groundwater Monitoring Report
Martin State Airport, 701 Wilson Point Road
Middle River, Maryland

Dear Mr. Dietz,

For your review, please find enclosed two hard copies of the above-referenced document. This prepared annual report details the Dump Road Area groundwater sampling, and synoptic groundwater level measurements collected from wells at the Dump Road Area and the Main Terminal area within Martin State Airport in Middle River, Maryland.

If possible, we respectfully request to receive MDE's document review comments by

If you have any questions or require any additional information please contact me by phone at 301-548-2223, or via e-mail at charles.trione@lmco.com.

Sincerely,

Charles Trione
Project Lead, Environmental Remediation
Lockheed Martin Corporation

cc: (via email without enclosure)
Anuradha Mohanty, MDE
Christine Kline, Lockheed Martin
Norm Varney, Lockheed Martin
Michael Martin, Tetra Tech
Peter Shilland, CDM Smith

cc: (via mail with CD enclosure)
Pete Lekas, EA Environmental

cc: (via shipping courier; with enclosures)
Mark Williams, MAA
Al Pollard, Martin State Airport

cc: (via Secure Information Exchange)
Jann Richardson, Lockheed Martin

2020 GROUNDWATER MONITORING REPORT
MARTIN STATE AIRPORT
701 WILSON POINT ROAD
MIDDLE RIVER, MARYLAND

Prepared for:
Lockheed Martin Corporation

Prepared by:
Tetra Tech, Inc.

December 2020

Approved by:
Lockheed Martin, Inc.

Revision: 0

Michael Martin, P.G.
Regional Manager

Joshua Mullis
Project Scientist

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

LIST OF FIGURES

TABLE OF CONTENTS (continued)

LIST OF FIGURES

LIST OF TABLES

APPENDICES

This page intentionally left blank.

ACRONYMS AND ABBREVIATIONS

BTEX	benzene, toluene, ethylbenzene, and xylenes
CD	compact disc
cis-1,2-DCE	*cis*-1,2-dichloroethene
cVOCs	chlorinated volatile organic compounds
DA	Drum Area
DCE	dichloroethene
DO	dissolved oxygen
DRA	Dump Road Area
DRO	diesel-range organics
GRO	gasoline-range organics
HAA	haloacetic acid
IDW	investigation-derived waste
Lockheed Martin	Lockheed Martin Corporation
MAA	Maryland Aviation Administration
MDANG	Maryland Air National Guard
MDE	Maryland Department of the Environment
µg/L	microgram(s) per liter
mL/min	milliliter(s) per minute
MSA	Martin State Airport
MT	Main Terminal area
NAA	natural-attenuation assessment
NAVD88	North American Vertical Datum of 1988
NTU	nephelometric turbidity unit
ORP	oxidation-reduction potential
pCi/L	picocurie(s) per liter
PHA	Petroleum Hydrocarbon Area
PPE	personal protective equipment
QA/QC	quality assurance/quality control
REC	recognized environmental condition
SVOC	semivolatile organic compound

Tetra Tech	Tetra Tech, Inc.
TB	trip blank
TCE	trichloroethene
TDS	total dissolved solids
TIC	tentatively identified compound
TPH	total petroleum hydrocarbon
TT Area East	Taxiway Tango Area East
TT Median Area	Taxiway Tango Median Area
USDOT	United States Department of Transportation
USEPA	United State Environmental Protection Agency
UST	underground storage tank
VAS	vertical aquifer sampling
VC	vinyl chloride
VOC	volatile organic compound

SECTION 1
INTRODUCTION

On behalf of Lockheed Martin Corporation (Lockheed Martin), Tetra Tech, Inc. (Tetra Tech) has prepared this annual (2020) report detailing Dump Road Area (DRA) groundwater sampling, and synoptic groundwater level measurements collected from wells at the Dump Road Area and the Main Terminal (MT) area within Martin State Airport (MSA) in Middle River, Maryland (Figure 1-1). This report summarizes groundwater sampling procedures and chemical analytical results for groundwater samples collected from late April through early June 2020. The objectives of this investigation, conducted in accordance with the 2020 groundwater monitoring work plan (Tetra Tech, Inc. [Tetra Tech], 2020), were to:

- provide a current round of groundwater data for selected monitoring wells in the Dump Road Area and in the Main Terminal area
- provide synoptic groundwater levels in monitoring wells located within the Dump Road Area and the Main Terminal area
- better understand the nature and extent of contamination in groundwater

These data, in conjunction with previously collected site data, support numerical modeling of shallow-groundwater flow-patterns, including those imparted by the groundwater interim remedial action (IRA) and direct groundwater discharge to Frog Mortar Creek. These data also support review of the ongoing Dump Road Area groundwater extraction and treatment system that has been operating since November 2017.

All groundwater samples were chemically analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) including 1,4-dioxane, total metals, and dissolved metals. Some groundwater samples were also analyzed for perchlorate (a propellant constituent), total petroleum hydrocarbons (TPH)-diesel-range organics (DRO), TPH-gasoline-range organics (GRO), hexavalent chromium, and radium (228, 226, and 224). This report is organized as follows:

Section 2—Site Background: Briefly summarizes the site background and references recent reports containing detailed background information related to the project.

Section 3—Investigation Approach and Methodology: Presents the technical approach for groundwater monitoring and describes the field methodology employed for the investigation.

Section 4—Results: Presents the investigation results.

Section 5—Summary: Summarizes the investigation findings.

Section 6—References: Cites references used to compile this report.

SECTION 2
SITE BACKGROUND

Martin State Airport (MSA) is at 701 Wilson Point Road in Middle River, Maryland. It is bounded by Frog Mortar Creek to the east and Stansbury Creek to the west (Figure 2-1). These creeks conjoin at the southern boundary of the site and continue south to feed Middle River and Chesapeake Bay. The Dump Road Area (DRA), in the southeastern portion of MSA, is bounded by Frog Mortar Creek to the east and the main airport runway to the west. The Main Terminal (MT) area comprises approximately 280 acres in the northwestern portion of MSA, just east of Wilson Point Road and Dark Head Cove. The MT area consists of the main terminal building, aircraft hangars and fueling stations, several taxiways, and the northern portion of the runway. Figure 2-1 shows the locations of MSA, the DRA, and the MT area.

Lockheed Martin Corporation (Lockheed Martin) has conducted detailed investigations at the DRA and at the MT since 1999 and 2010, respectively. Lockheed Martin has also conducted additional investigations at Strawberry Point, Greater Strawberry Point, and Frog Mortar Creek (Figure 2-1). Investigations of these latter areas are not discussed in this report because they are being addressed under separate investigation programs.

2.1 DUMP ROAD AREA

Environmental investigations of MSA began in the mid-1980s, when the Maryland Department of the Environment (MDE) conducted site inspections related to stored drums and a reported chemical dump. In 1989, MDE conducted a preliminary assessment of MSA that identified fill areas and ponds, the latter of which were reportedly used from the 1930s through the 1960s to dispose of spent battery acid, acid-type strippers, and other acidic solutions (MDE, 1989). Detailed investigations of the DRA began after July 1991, when the Maryland Aviation Administration (MAA) encountered four buried drums adjacent to Taxiway Tango during trenching to install an electrical cable (Figure 2-2). Discovery of these drums led to investigation of the surrounding area

for possible soil and groundwater contamination, as MDE required in its letters of January 6, 1992 and January 14, 1997 to MAA (MDE, 1992; 1997).

MAA conducted several investigations of the DRA between 1991 and 1998. These studies identified four areas where subsequent environmental sampling investigations were focused: The Taxiway Tango Median Area, the Petroleum Hydrocarbon Area (PHA), Pond 1, and the Drum Area. These early investigation areas are shown in Figure 2-2.

From 1999–2010, Lockheed Martin conducted a remedial investigation (Tetra Tech, Inc., 2012c) and supplemental fieldwork to further delineate the extent of soil, groundwater, and pond-sediment chemical contamination that had been indicated by earlier DRA studies. Through geophysical surveys, membrane-interface probes, test pits, soil borings, and chemical analyses of soil and pond-sediment samples, the remedial investigation identified large areas of buried fill and debris and surface and subsurface soil contamination, in and around buried fill material and in pond sediment. The extent of buried fill and debris at the DRA was estimated to be approximately 25 acres (see Figure 2-2).

A 2012 review of historical aerial photographs (Tetra Tech, 2013b) identified and mapped what appear to be open burning areas, open pits or ponds, soil or debris piles, possible ammunition bunkers, ground scars, and fill areas (see shaded areas on Figure 2-2). Several of these historical features coincide with areas of elevated contaminant concentrations in soil and/or groundwater; these areas were later identified as possible contaminant-source areas and were subsequently investigated in 2012–2016 (Tetra Tech, 2013a, 2014a-b, 2014d, 2016, 2017, 2018, 2019b). Groundwater sampling of DRA groundwater monitoring wells has been conducted annually from 2006-2020.

Trichloroethene (TCE) (a metal degreaser) and TCE-degradation daughter-products have been detected in groundwater throughout the DRA investigation area, with the highest concentrations appearing in the upper and intermediate regions of the surficial aquifer. TCE has been detected in DRA groundwater at concentrations ranging from 0.5–490,000 micrograms per liter (µg/L) and is therefore a primary contaminant of concern in DRA groundwater. The MDE groundwater standard for TCE is 5 µg/L. 1,4-Dioxane, benzene, toluene, xylenes, and several metals (typically

co-located with chlorinated solvents like TCE) are also considered groundwater chemicals of concern. TCE-degradation daughter-products (e.g., dichloroethene [DCE], vinyl chloride [VC], etc.) are typically co-located with TCE at MSA and are considered primary contaminants of concern in DRA groundwater.

An interim groundwater extraction and treatment system was constructed in 2017 to contain impacts to DRA groundwater, and is currently operational onsite. This groundwater extraction and treatment system consists of 16 extraction wells, underground piping, and a building that houses components that treat groundwater containing volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals detected at concentrations above MDE groundwater standards. The wells and underground piping pump groundwater from the surficial aquifer to the aboveground treatment building, creating a "hydraulic barrier" that captures groundwater and prevents contaminants from migrating off-site. The treatment building is 60 feet wide and 170 feet long (10,200 square feet) and is near Frog Mortar Creek in the east-central portion of the DRA (Figure 2-2). Treated groundwater is tested routinely and is discharged to Frog Mortar Creek via an MDE-permitted outfall. Surface water data collected to date indicate that the magnitude and extent of VOCs detected in surface water has decreased significantly since the treatment plant began operation.Additional details regarding DRA background and history, including details of previous environmental investigations and discussions of contaminant-source areas at the DRA, are in the *Dump Road Area Characterization of Possible Source Areas Report* (Tetra Tech, 2013a) and *Taxiway Tango Soil Characterization Report* (Tetra Tech, 2014c), and therefore are not repeated herein. A detailed chronological discussion of investigations at the DRA from 1985–2012 is included as Appendix A of the *Dump Road Source-Areas Investigation Work Plan* (Tetra Tech, 2012a). Recent DRA groundwater sampling results are provided in annual groundwater monitoring reports (Tetra Tech, 2015, 2016, 2017, 2018, and 2019b).

2.2 MAIN TERMINAL

Previous investigations directly related to the MT area include the Environmental Evaluation Report for Martin State Airport Main Terminal (Tetra Tech, 2010b) and its addendum (Tetra Tech, 2010a). These evaluations concentrated on environmental impacts resulting from practices carried out between 1929–1975, when the Glenn L. Martin Company and Martin Marietta owned

and operated on the property. Possible areas of environmental concern in the MT area were identified through local and federal library documents, historical aerial photographs, facility records, museum records, regulatory data, environmental database reviews, interviews with former employees, and environmental reports and data.

The environmental evaluation identified nine recognized environmental conditions (RECs)[1] (RECs #1–9) in the MT area (Tetra Tech, 2010b), along with five potential RECs (RECs #10–14). The addendum report (Tetra Tech, 2010a) identified eight additional RECs (RECs #15–22) and provided supplemental details on 10 of 14 initial/possible RECs. Additional information obtained during development of the addendum report led to upgrading potential REC #14 to a full REC, because an underground storage tank (UST) had once been located there. MT area RECs (exclusive of potential RECs #10–13) are shown in Figure 2-3.

A Phase II environmental site assessment for the MT area was conducted in 2010–2012 (Tetra Tech, 2012b and 2013c). Soil and groundwater samples were collected and analyzed for possible organic and inorganic constituents. Twelve shallow-aquifer wells (MT-MW-01S through MT-MW-12S) were installed around the perimeter of the airport hangars and the airport terminal building near the identified MT area RECs. Benzene (a petroleum-related volatile organic compound [VOC]) was detected in groundwater samples collected from well MT-MW02S in 2011 (50.5 micrograms per liter [µg/L]) and 2012 (87 µg/L); both concentrations exceed the MDE groundwater standard (5 µg/L) for benzene.

Seven other VOCs (acetone, carbon disulfide, carbon tetrachloride, chloroform, chloromethane, naphthalene, and toluene) were detected in groundwater samples collected in 2012, but concentrations of those analytes were below MDE groundwater standards. However, concentrations of total petroleum hydrocarbons (TPH)-gasoline-range organics (GRO), TPH-diesel-range organics (DRO), beryllium, nickel, and vanadium exceeded MDE groundwater standards in several samples. Detected concentrations of semivolatile organic compounds

[1]*Recognized environmental conditions (RECs) are based on the presence or likely presence of hazardous substances and/or petroleum products under conditions that could indicate a historical, existing, or potential release to the property's structures, soil, groundwater, or surface water.*

(SVOCs), including 1,4-dioxane, did not exceed MDE groundwater standards in the 2010–2012 samples.

Groundwater sampling of MT area monitoring wells was conducted annually from 2013-2018. Sampling is continuing every other year on even years, restricted to monitoring wells MT-MW01S and MT-MW02S, for DRO/GRO analysis only. Benzene concentrations between 10 µg/L and 20 µg/L have been detected at MT-MW02S between 2013 and 2018, but benzene has not been detected above 2 µg/L in any other MT well during the same time period. Monitoring wells MT-03S through MT-12S were abandoned by a Maryland licensed driller in 2020; an abandonment report will be generated under a separate cover.

Additional details regarding the background and history of the MT area, including details of environmental investigations, REC discussions, and results of groundwater sampling, are available in several previous documents (Tetra Tech, 2010a-b, 2012b, 2013c-d, 2015, 2016b, 2017, 2018), and therefore are not repeated herein.

This page intentionally left blank.

SECTION 3
INVESTIGATION APPROACH AND METHODOLOGY

This section summarizes the 2020 groundwater sampling program for the Dump Road Area (DRA) and Main Terminal (MT) of Martin State Airport, performed in accordance with the approved work plan (Tetra Tech, 2020). The 2020 investigation also included synoptic groundwater level measurements at the DRA and at two wells in the MT area, and laboratory analysis of groundwater samples collected from both sites. The data collected during this investigation augments previous data obtained from the DRA and MT (between 2003 and 2019).

3.1 SYNOPTIC GROUNDWATER LEVEL MEASUREMENTS

A round of synoptic groundwater level measurements was conducted by a team of two field scientists for DRA and MT wells on April 14-16, 2020. Static water levels were measured using an electronic, graduated, water-level meter. The static water level was determined by lowering the meter's probe into the well until an audible tone indicated that the air/water interface had been reached. The water level relative to the top of the well casing was recorded to the nearest 0.01 foot. Datalogger data from Pond 1, Pond 2, and the staff gauge located along the eastern shore (at Edwards Lane) of Frog Mortar Creek was also downloaded. Groundwater level measurement sheets and datalogger files are in Appendix A. The datalogger information in Appendix A is the raw data downloaded from the transducer and will be converted to determine the groundwater elevation at each location for use in groundwater modeling.

3.2 GROUNDWATER SAMPLING

Groundwater samples were collected from 95 wells at the DRA and two wells at MT from late April to early June 2020 as part of the annual monitoring program (Figure 3-1). The four deep wells (MW-27D, MW-29D, MW-30D, and MW-31D) installed in permeable zones below the surficial aquifer of concern were also sampled as part of this investigation. Table 3-1 summarizes the groundwater sampling program. The following sections describe procedures for well purging

and groundwater sampling, and describe the chemical analyses performed on the samples collected.

Well purging—Monitoring wells were purged using United States Environmental Protection Agency (USEPA) low-flow purging techniques before sample collection. Groundwater was purged using a peristaltic pump fitted with dedicated, disposable high-density polyethylene tubing, or by using a submersible pump positioned in the center of the well's saturated screen. The pumping rate during purging ranged between 100–300 milliliters per minute (mL/min) and was frequently measured using a graduated cylinder. The purge rate was adjusted (but not allowed to fall below 100 mL/min) to minimize groundwater drawdown from the initial static water level.

During groundwater purging, water-level drawdown and groundwater parameters (including pH [a measure of acidity and alkalinity], temperature, specific conductance, dissolved oxygen [DO], oxidation-reduction potential [ORP], and turbidity) were measured and recorded every five to 10 minutes until purging was complete. Data were recorded in the appropriate site-specific logbook and on low-flow-purge data sheets. Water-quality parameters were measured using an inline water-quality meter. Turbidity readings were collected using a separate turbidity meter.

Purging was deemed complete when the monitored water-quality parameters stabilized, when three saturated well-casing volumes had been removed, or when the well had been purged dry, and stabilization was achieved when three consecutive readings (taken at five-minute intervals) were within ±0.1 standard units for pH, ±3% for specific conductance and temperature, ±10% for DO and ORP, and less than 10 nephelometric turbidity units (NTUs) for turbidity. If the monitoring well was purged dry, the water level in the well was allowed to recover a minimum of 80% of its initial static water level before groundwater was sampled. Well-purging and sample-record sheets are in Appendix B.

All purged water from DRA wells was collected in five-gallon buckets and dumped into the sump inside the MSA treatment plant building at the end of each workday. The water in that sump is periodically drained into equalization tanks that are connected to the groundwater treatment system; water within these tanks is directed to the groundwater treatment process along with water obtained from the extraction wells feeding the plant. Water purged from the two MT wells was

collected in United States Department of Transportation (USDOT)-approved 55-gallon steel drums and staged at the secondary containment pad located at Greater Strawberry Point (as described in Section 3.6 below).

Sample collection—Monitoring wells were sampled after purging using the same dedicated tubing or submersible pump that had been used during purging. Groundwater samples were collected using low-flow sampling protocols at the same pumping rate that had been used during well purging. Groundwater was pumped directly into the appropriate sample containers (for all VOC samples), or into a certified-clean disposable container supplied by the laboratory that was then used to pour the collected water directly into the appropriate sample containers.

3.3 LABORATORY ANALYSES

Groundwater samples were collected and analyzed by an off-site laboratory using the following methods (see Table 3-1 for details):

- analysis for VOCs plus tentatively identified compounds (TICs), Freon 22 (dichlorodifluoromethane), and Freon 113 (1,1,2-trichlorotrifluoroethane) by USEPA Method 8260C— (94 wells)
- 1,4-dioxane by USEPA Method 8270C SIM— (94 wells)
- perchlorate by USEPA SW846 Method 6850— (43 wells)
- mercury by SW846 Method 7470A— (94 wells)
- hexavalent chromium by USEPA Method 218.6— (36 wells)
- total and dissolved priority pollutant metals by USEPA Method 6020B— (94 wells)
- gasoline-range organics (GROs) and diesel-range organics (DROs) by SW846 Method 8015B— (39 shallow wells screened in the upper surficial-aquifer)
- radium-224, 226, and 228 by USEPA 900-series methods— (10 wells in the upper, intermediate, and lower surficial-aquifers)

Wells selected for sampling and chemical analyses were based on current data needs for the treatment system monitoring, past sampling results, and optimization of data collection. Perchlorate and radium-224, -226, and -228 were sampled at strategic locations to determine site

concentrations of these "emerging contaminants"[2] in groundwater. Radium samples were collected from 10 groundwater-monitoring wells in the DRA. Samples for TPH-GRO and TPH-DRO analyses were only collected from wells in the upper surficial-aquifer, because petroleum-related constituents are less dense than water and are typically found at or near the water table.

Hexavalent chromium was analyzed using USEPA Method 218.6 (ion chromatography), with a specified detection limit of 0.02 µg/L, a value lower than the method's published detection limit (0.10 µg/L). Perchlorate was analyzed for by USEPA Method 6850, with a specified detection limit of 1 µg/L.

One trip blank per cooler of VOC samples was collected per day for quality assurance/quality control (QA/QC) purposes. Matrix-spike and matrix-spike-duplicate samples were collected on a 1:20 basis. Chemical results for this sampling event are discussed in Section 4. A table listing chemical results for all samples is in Appendix C.

3.4 DOCUMENTATION

A master site logbook was maintained by the field sampling team as an overall record of field activities. Sample documentation consisted of completed chain-of-custody reports and matrix-specific sample-log sheets. The chain-of-custody report is an individual laboratory-supplied standardized form summarizing and documenting pertinent sample information, such as sample identification and type, matrix, date and time of collection, preservation, and requested analyses. Sample custody procedures document sample acquisition and integrity. Chain-of-custody reports are with the data-validation reports in Appendix D, and full laboratory analytical reports are in Appendix E.

3.5 EQUIPMENT DECONTAMINATION

Reusable equipment (e.g., water-level meter) was decontaminated before and after each use. Small, reusable equipment was decontaminated as follows:

[2]*Emerging contaminants are chemicals not commonly monitored by regulatory agencies, but which have recently been identified by USEPA or MDE as contaminants that pose possible environmental or public health risk if present in drinking water supplies or groundwater.*

- Liquinox® and potable-water wash
- potable-water rinse
- distilled-water rinse
- air drying
- collecting decontamination solutions for disposal

Decontamination rinsate was first containerized in a five-gallon bucket and then transferred to the sump inside the MSA groundwater treatment plant. Dedicated and/or disposable equipment used for groundwater purging and sampling did not require decontamination.

3.6 WASTE MANAGEMENT

Investigation-derived waste (IDW) consisting of decontamination-rinsate water, monitoring well purge water, disposable sampling equipment, and personal protective equipment (PPE) was generated during groundwater sampling. PPE was brushed off, placed in trash bags, and disposed of in a designated facility trash receptacle. Disposable equipment was also rinsed off and disposed of in a facility-approved trash receptacle. Well purge-water and decontamination fluids were collected in five-gallon buckets with secondary containment and transferred to the MSA groundwater treatment plant sump at the end of each workday; 244 gallons of purge water were generated and dumped into the plant sump over the duration of the investigation. IDW water generated from MT wells was placed in 55-gallon USDOT-approved drums and stored at the Greater Strawberry Point secondary containment pad. IDW water from MT was then characterized, profiled, and disposed of offsite. Appendix F provides the signed nonhazardous waste profile, the shipment manifest, and the certificate of disposal for IDW water generated at MT during this sampling round.

3.7 GENERAL SAMPLING PROCEDURES, NOMENCLATURE, AND HANDLING

Each sample received a unique sample identification consisting of the site location, well number, and six-digit sampling date. For example, a groundwater sample collected on May 12, 2020 from monitoring well MSA-MW-06S was labeled MSA-MW-6S-051220. Trip blanks were labeled with

a "TB" prefix, followed by the blank's six-digit submittal date (e.g., TB-050120). Field-related sample-handling considerations include selection of sample containers, preservatives, allowable holding times, and requested analyses.

Proper chain-of-custody procedures were followed throughout all phases of sample collection and handling. Empty sample containers were released under signature from the laboratory and accepted under signature by the sampler or other individual responsible for maintaining custody until the sample containers were transferred to the sampling team. Groundwater samples were collected in these containers, released under signature from the sampling team, and then accepted under signature by the laboratory. Transport containers returning to the laboratory were sealed with strapping tape and a tamper-resistant custody seal. The custody seal shows the signature of the individual releasing the transport container, along with the date and time.

3.8 DATA VALIDATION

Data validation involves having an independent (non-laboratory) party review data provided by the laboratory to ensure that specific criteria have been met. These criteria concern specifications that are not sample dependent; they specify performance requirements that should be fully under a laboratory's control. For data analyses of organic chemicals, specific validation areas include blanks, performance-evaluation standard materials, and instrument performance checks. For data analyses involving inorganic chemicals, specific validation areas include blanks, calibration standards, calibration verification standards, laboratory control standards, and interference check standards. The analytical laboratory supplies the chemical data as hard-copy reports and electronic databases.

Once the investigation was complete, chemical data were validated by Tetra Tech, Inc. (Tetra Tech) in accordance with established USEPA protocols to assess the reliability and accuracy of the data. This review was based on the USEPA *National Functional Guidelines for Organic Superfund Methods Data Review* (USEPA, 2017a), the *National Functional Guidelines for Inorganic Superfund Methods Data Review* (USEPA, 2017b), and the specifics of the analytical method used. Data validation reports are in Appendix D (on compact disc).

Validation of these data concluded that they are acceptable for their intended uses (i.e., risk screening and risk assessment), except for data qualified as unreliable (UR flags). The data qualifiers (i.e., flags) applied to the chemical results during data validation are listed below:

J The analyte is considered present in the sample, but the value is estimated and may not meet highest accuracy or precision standards. In this program, samples were also qualified with "*J*" because quantitation was above the method detection limit but below the laboratory reporting-limit.

J+ The analyte is considered present in the sample, but the value is estimated and is biased high.

J– The analyte is considered present in the sample, but the value is estimated and is biased low.

NJ The analyte has been tentatively identified. This qualifier indicates presumptive evidence of a compound. Special methods may be required to confirm its presence or absence in future sampling efforts.

U Not detected; the analyte was not detected at the reported value.

UJ The analyte was not detected. However, the quantitation or detection limit may be inaccurate or imprecise.

UR The non-detect result is considered qualitatively or quantitatively unreliable. Four results were flagged with "UR" data qualifiers in this sampling round; these were for hexavalent chromium samples collected from four DRA wells.

All data qualifiers are noted in Appendices C, D, and E.

This page intentionally left blank.

SECTION 4
RESULTS

This section presents groundwater-elevation data and chemical analysis results for wells in the Dump Road Area (DRA) and the Main Terminal (MT) area of Martin State Airport (MSA) between April and June 2020. These groundwater results are compared against current Maryland Department of the Environment (MDE) groundwater standards (MDE, 2018) and other pertinent federal/state standards/criteria (if MDE has not established standards for an analyzed chemical).

At present, MDE has not established an advisory level or standard for 1,4-dioxane in drinking water or groundwater. Several states (e.g., California, Colorado, Connecticut, Florida, Maine, Massachusetts, Michigan, and North Carolina) have established drinking water standards or action levels for 1,4-dioxane. These values range from the Massachusetts Office of Research and Standards guideline of 0.3 micrograms per liter (µg/L) to Michigan's drinking water standard of 7.2 µg/L (Massachusetts Department of Environmental Protection, 2015, and United States Environmental Protection Agency [USEPA] 2006, respectively). USEPA has published a preliminary remedial goal of 6.1 µg/L for 1,4-dioxane in tap water (USEPA, 2006) and a risk-based regional screening-level of 0.46 µg/L for tap water (USEPA, 2017c); the latter risk-based value (0.46 µg/L) is used as the comparison criterion to evaluate 1,4-dioxane groundwater concentrations in this report.

Groundwater samples were collected for chemical analyses from 95 DRA and two MT monitoring wells over a period of seven weeks (April 21–June 9, 2020). DRA and MT groundwater levels were measured on April 14-16, 2020.

Note that since all groundwater well designations at the DRA contain the same "MSA" prefix, this prefix is omitted in the following discussions to increase readability. Main terminal wells contain the "MT" prefix; this prefix is not omitted in the following discussions, thus the MT wells are distinguished from the DRA wells. In addition, qualifying flags (e.g., *J*) associated with analyte concentrations are omitted to increase readability. However, these data validation flags are shown on applicable Section 4 tables and figures.

4.1 DUMP ROAD AREA

4.1.1 Groundwater Level Data

Table 4-1 lists the April 2020 groundwater level measurements and computed groundwater elevations for sampled MSA wells. Figures 4-1 through 4-3 show groundwater-elevation contour maps for the upper, intermediate, and lower surficial-aquifer zones (respectively) at the DRA. Table 4-1 lists static groundwater levels, recorded as groundwater depths measured from the top of the sampled well casings, and includes a column with converted elevations based on the North American Vertical Datum of 1988 (NAVD88).

Groundwater elevations for the surficial aquifer range from 1.49 feet below NAVD88 at well MW-18D (in the north-central portion of the DRA) to 8.40 feet above NAVD88 at well MW-44S (adjacent to Pond 2). Accounting for well-casing stick-up for aboveground well-casing risers and well stick-down for flush-mounted well designs, groundwater depths in the surficial aquifer range from approximately 1 foot to 22 feet below grade. Shallow groundwater was encountered adjacent to Pond 2 (well MW-44S) and in the western part of the site near the airport runway (e.g., well DMW-11S); deeper groundwater was found in the eastern portion of the site along the top of the fill embankment near Frog Mortar Creek (e.g., wells DMW-02S, DMW-04S, and DMW-05S).

As shown in Figures 4-1 through 4-3, groundwater in the upper, intermediate, and lower surficial-aquifers generally flows east–northeast from the runway and taxiway toward Frog Mortar Creek. Consistent with previous water-level measurements, the 2020 results show higher groundwater levels at DMW-03S, MW-53S, MW-43S, and MW-44S (Figure 4-1), indicating local groundwater mounding near Ponds 1 and 2. The shallow wells installed there are in a clay-rich material above more permeable sand (in which the surrounding wells are installed). Therefore, groundwater levels in these wells likely reflect localized perched groundwater.

4.1.2 Groundwater-Chemical Data

Groundwater samples were collected from the DRA wells to evaluate and confirm the horizontal and vertical extent of groundwater contamination at the DRA and to evaluate any changes in groundwater conditions in the groundwater treatment system flow field. Validated groundwater-

chemical data were used to generate a statistical summary table (Table 4-2) and a data summary table (Table 4-3) that list only detected analytes.

Table 4-3 lists positive detections (or "hits") generated from these data. Gray shading in Table 4-3 indicates results that exceed analyte-specific screening criteria (MDE groundwater standards or the Massachusetts advisory level for 1,4-dioxane). Table C-1 in Appendix C summarizes results for both detects and nondetects but does not list screening criteria. Data-validation reports and chain-of-custody forms are in Appendix D, and full analytical reports are in Appendix E. Results of the groundwater-chemical analyses for the DRA are below.

4.1.2.1 Volatile Organic Compounds

Several volatile organic compounds (VOCs) were detected in groundwater (Table 4-2) during this sampling event. *cis*-1,2-Dichloroethene (*cis*-1,2-DCE), trichloroethene (TCE), and vinyl chloride (VC) are the most frequently detected constituents. These chlorinated VOCs (cVOCs) were detected in approximately 77%, 64%, and 61% of the samples collected, respectively (Table 4-2). The maximum detected concentrations of TCE (58,000 µg/L), *cis*-1,2-DCE (45,000 µg/L), and VC (5,600 µg/L) are several orders of magnitude (i.e., powers of 10) greater than their groundwater standards (5 µg/L, 70 µg/L, and 2 µg/L, respectively).

Petroleum-related VOCs (e.g., benzene, toluene, ethylbenzene, and xylenes [BTEX]) were detected less frequently, ranging from 6% of samples for ethylbenzene to 27% of samples for benzene. In general, the maximum BTEX concentrations are lower as compared to concentrations of the three most frequently detected cVOCs; e.g., the maximum BTEX concentration was for toluene (26,000 µg/L in DMW-11S), while the maximum concentrations (in the same well) of *cis*-1,2-DCE and TCE were 45,000 µg/L and 58,000 µg/L (respectively).

Chlorinated VOCs exceeding groundwater standards in the upper, intermediate, and lower surficial-aquifer zones are shown in Figures 4-4, 4-5, and 4-6, respectively. The results for the current round are similar to those of previous groundwater sampling rounds. The lateral and vertical distributions of cVOCs in groundwater confirm that several source areas contribute to groundwater contamination at the site (Figures 4-4 through 4-6). These areas include the Taxiway Tango Median Area (TT Median Area), the Petroleum Hydrocarbon Area (PHA), Taxiway Tango

Area East (TT Area East), former Pond 3, the Drum Area (DA), and the area east of Pond 1; see Figure 2-2 for the locations of these areas.

***Taxiway Tango Median Area*—**The TT Median Area is in the western portion of the DRA near wells MW-54S/I and DMW-11S (Figures 4-4 through 4-6; Tables 4-2 and 4-3). Historically, DMW-11S has contained the highest concentrations of cVOCs in this area (up to 52,000 µg/L for TCE, and up to 53,000 µg/L for *cis*-1,2-DCE in 2004). Wells MW-54S/I were installed northeast of wells DMW-11S/I, in an area where elevated cVOC concentrations had been detected in the upper and intermediate surficial-aquifer zones during vertical aquifer-sampling (VAS) in 2013, and recent sampling has indicated that these wells (MW-54S/I) now have the highest concentrations in the TT Median Area. Groundwater samples collected from MW-54S and MW-54I in 2020 have TCE concentrations (18,000 µg/L and 54,000 µg/L, respectively), a pattern that appears to be opposite to what was observed in wells DMW-11S and DMW-11I (58,000 µg/L and 24,000 µg/L, respectively). That is, at DMW-11, higher TCE concentrations were detected in the upper surficial aquifer, while the converse is true for wells at MW-54 (the higher TCE concentration was detected in the intermediate surficial aquifer). Note that the TCE concentrations detected in 2020 surpass previous maximum concentrations for TCE in this area (referenced above for 2004). The MDE groundwater standard for TCE is 5 µg/L.

In monitoring wells MW-54S and MW-54I, respective concentrations of carbon tetrachloride (6,000 µg/L and 6,100 µg/L), chloroform (2,000 µg/L and 4,600 µg/L), toluene (2,000 µg/L and 24,000 µg/L), *cis*-1,2-DCE (4,800 µg/L and 42,000 µg/L), and VC (290 µg/L and 3,100 µg/L) also exceed their respective MDE groundwater standards. Exceedances were also observed at DMW-11S and DMW-11I (respectively) for several of these analytes: carbon tetrachloride (6,900 µg/L and 8,200 µg/L), chloroform (5,200 µg/L and 2,200 µg/L), toluene (26,000 µg/L and 2,000 µg/L), *cis*-1,2-DCE (45,000 µg/L and 5,500 µg/L), and VC (4,300 µg/L and 380 µg/L). Carbon tetrachloride, chloroform, toluene, *cis*-1,2-DCE, and VC have MDE groundwater standards of 5 µg/L, 80 µg/L, 1,000 µg/L, 70 µg/L, and 2 µg/L, respectively.

From 2004–2010, TCE concentrations at DMW-11S ranged from 29,000 µg/L to 52,000 µg/L, but concentrations had declined sharply since 2011, to a low of 1,500 µg/L in 2019. However, the TCE concentration (58,000 µg/L) detected at MDW-11S in this sampling round (for 2020 annual

groundwater sampling) is the maximum thus far. Historical data are not available for MW-54S/I, so it is unclear if TCE at DMW-11S has migrated downgradient to MW-54S/I, or if MW-54S/I is simply an extension of the TCE-source area at the TT Median Area. An elevated TCE concentration (260,000 micrograms per kilogram) was detected in a shallow soil sample (at 6–8 feet below ground surface) when MW-54S/I was installed, suggesting that elevated TCE concentrations detected in this area are an extension of the TT Median Area source area (Tetra Tech, 2014d).

Petroleum Hydrocarbon Area—This area is in the central portion of the site (Figure 2-2) near well DMW-09 and Pond 1 (Figures 4-4 through 4-6). Wells DMW-09D and DMW-09I, each with six VOC exceedances, have the highest number of VOC exceedances among PHA wells (see Figures 4-4 through 4-6, and Table 4-3). At DMW-09D, TCE (4,100 µg/L), *cis*-1,2-DCE (760 µg/L) and VC (84 µg/L) were approximately 800 times, 11 times and 42 times above their respective criteria (5 µg/L, 70 µg/L, and 2 µg/L). At DMW-09I, TCE (1,200 µg/L), *cis*-1,2-DCE (1,600 µg/L), and VC (500 µg/L) were approximately 240 times, 23 times, and 250 times above their respective criteria. Groundwater sampled from MW-20S, near DMW-09 and Pond 1, also contained a VC exceedance (8.7 µg/L) and a slight TCE exceedance (5.4 µg/L).

The benzene concentration at DMW-09S (110 µg/L) is the highest detected during this groundwater monitoring round (Table 4-2 and Figure 4-7); this concentration is 22 times higher than its groundwater standard (5 µg/L). Another well (MW-16S) in this area with a benzene exceedance (7.9 µg/L) is hydraulically downgradient of DMW-09S (Figure 4-1). TCE exceedances (5.3 µg/L, 19 µg/L, and 21 µg/L) were detected in respective upper (DMW-09S), intermediate (DMW-09I), and lower (DMW-09D) surficial aquifer wells at the DMW-09 location. The groundwater sample from monitoring well DMW-09S also exhibited elevated concentrations of 1,2,4-trimethylbenzene (37 µg/L), and several exceedances were also detected in samples collected from DMW-09I and DMW-09D (with respective detections of TCE [1,200 µg/L and 4,100 µg/L], *cis*-1,2-DCE [1,600 µg/L and 760 µg/L], and VC [500 µg/L and 84 µg/L]). The highest concentration of ethylbenzene detected at the DRA during this sampling round was at DMW-09S.

TT Area East—This area is in the central portion of the DRA; wells sampled in this area in 2020 include wells MW-45S and MW-41S/I. Historical aerial photographs indicate that an open burning

area and a pond/pit formerly occupied this area. Groundwater from well MW-45S, installed in the apparent TCE source-area at TT Area East, had exceedances of benzene (63 µg/L), TCE (8,000 µg/L), VC (5,600 µg/L), and *cis*-1,2-DCE (9,200 µg/L), and a total cVOC concentration of 22,800 µg/L. Lower exceedances for the same four analytes (benzene, TCE, *cis*-1,2-DCE, and VC) were detected in the remaining two wells in this area, although the benzene concentration at MW-41S was below its screening criterion.

Former Pond 3—This area is in the central portion of the DRA, south of Pond 1 (Figure 2-2), at wells MW-53S/I and DMW-08S/I/D. Wells MW-53S/I were installed in the former Pond 3 area, where elevated concentrations of cVOCs were detected in the upper and intermediate surficial-aquifer zones during VAS in 2013. The TCE concentration detected in the upper surficial aquifer at MW-53S (1.8 µg/L) in 2020 is similar to those detected in 2019 (1.4 µg/L) and 2018 (1.8 µg/L). Although the TCE concentration (510 µg/L) detected at MW-53I in 2020 exceeds the screening level (5 µg/L) by two orders of magnitude (or 100 times), it has decreased from concentrations detected in previous annual sampling rounds (6,100 µg/L in 2019, and 5,600 µg/L in 2018). Groundwater concentrations of TCE in 2020 are much lower than the range of previously detected TCE concentrations (3,600–490,000 µg/L, during the 2013 VAS) at similar depths. VC exceedances of the screening criterion (2 µg/L) were detected at MW-53S (6.5 µg/L) and MW-53I (110 µg/L) in 2020.

Drum Area—This area is in the southern portion of the site between wells MW-02/MW-19, MW-05/DMW-07, and MW-40S/I. It extends downgradient and to the east at wells DMW-04, DMW-05, MW-50, and MW-51. The highest VOC concentrations in this area are in the upper surficial-aquifer near wells DMW-07S, MW-40S, and DMW-05S; one or more of the three primary cVOCs (TCE, *cis*-1,2-DCE, and VC) exceed their respective groundwater standards in these wells (see Figures 4-4 through 4-6 and Table 4-3). The highest total cVOC concentrations (33,400 µg/L in 2007) in this area were generally detected at well DMW-07S. Concentrations of TCE (930 µg/L), *cis*-1,2-DCE (7,800 µg/L), and VC (2,300 µg/L) at DMW-07S in this round (2020) total 11,030 µg/L; all are exceedances of their respective MDE groundwater standards (5 µg/L, 70 µg/L, and 2 µg/L).

***Area east of Pond 1*—**This area is in the northeastern portion of the site between Pond 1 and Frog Mortar Creek. The highest cVOC concentrations are generally near Frog Mortar Creek (Figures 4-4 through 4-6). In 2020, TCE concentrations at wells MW-52I (3,600 µg/L) and MW-52D (5,900 µg/L) were consistent but generally lower than levels detected in these wells over several years (2014 through 2019). This area is east of a wetland and a former pond or pit observed in historical photographs and appears to be at the lowest drainage point behind the berm that was constructed when the former Limehouse Cove was filled.

Groundwater concentrations of TCE, VC, and *cis*-1,2-DCE were above respective screening criteria at wells MW-46I/D and MW-47I/D, and well MW-47S had an exceedance for VC only. Previously detected cVOC concentrations (2015–2019) were more than 100 times their respective MDE groundwater standards. These concentrations (at the area east of Pond 1) suggest that high cVOC concentrations extend north of the area currently being monitored at the DRA. Additional wells with notable concentrations of cVOCs greater than screening levels were DMW-03S (with *cis*-1,2-DCE [930 µg/L] and VC [1,900 µg/L] concentrations 13 times and 950 times their standards, respectively); and DMW-03I (with *cis*-1,2-DCE [640 µg/L], TCE [1,100 µg/L], and VC [310 µg/L] concentrations ranging from nine times (*cis*-1,2-DCE) to as much as 220 times (TCE) higher than their respective standards [70 µg/L and 5 µg/L]).

***Taxiway Tango Area North*—**TCE exceeds its groundwater standard (5 µg/L) at several intermediate wells north and west of Pond 2, with exceedances of 1,500 µg/L and 1,800 µg/L (respectively) detected at wells MW-16I and MW-17I (see Table 4-3 and Figure 4-5). These exceedances suggest that the groundwater-contaminant plume extends northwest of wells DMW-09S/I/D (Figures 4-4 and 4-5).

***Shoreline wells*—**Wells MW-46S/I/D through MW-52S/I/D form a northwest–southeast trending line on the embankment along the Frog Mortar Creek shoreline. Nondetect results for TCE in wells MW-46S, MW-48S, and MW-52S, and trace TCE concentrations in wells MW-47S (0.74 µg/L), MW-48I (0.12 µg/L), and MW-49S (0.98 µg/L) were the only detected concentrations along the shoreline below the MDE groundwater standard (5 µg/L). TCE concentrations in shoreline wells range from 0.12 µg/L (MW-48I) to 5,900 µg/L (MW-52D), with an average concentration (detects only) of approximately 853 µg/L. TCE concentrations at least one order of magnitude (10 times)

higher than the MDE groundwater standard were detected in approximately two-thirds (14 wells) of the 21 shoreline monitoring wells, with nearly 28% (six wells) of these wells having TCE concentrations two orders of magnitude (or 100 times) higher than the MDE groundwater standard (5 µg/L). TCE concentrations north of the central area at MW-52D (5,900 µg/L) and in the central area at MW-49D (1,800 µg/L) are the highest detected TCE concentrations of the shoreline wells screened in the surficial aquifer. These TCE concentrations are similar to those detected in shoreline wells in 2016-2019. Note that over the last seven annual monitoring events (2013–2020), TCE concentrations in some surficial-aquifer wells along the shoreline have fluctuated (e.g., at MW-51S, TCE was detected at 13,000 µg/L in 2013, 730 µg/L in 2014, 250 µg/L in 2015, 160 µg/L in 2016, 5,500 µg/L in 2017, 4,300 µg/L in 2018, 56 µg/L in 2019, and 24 µg/L in 2020). The concentrations of TCE daughter products *cis*-1,2-DCE and VC trending over time appear proportional to those of TCE.

***Deep confined-aquifer wells*—**VOCs were not detected in the four wells (MW-27D, MW-29D, MW-30D, and MW-31D) screened in the deep confined aquifer.

***Natural-attenuation assessment parameters and haloacetic acids*—**No groundwater samples were collected for natural-attenuation assessment (NAA) parameters or haloacetic acids (HAA) in 2020 as these analyses have been removed from the sampling program. Historical results for NAA and HAA are included in previous annual monitoring reports.

4.1.2.2 1,4-Dioxane

In general, 1,4-dioxane levels in high cVOC-concentration areas have decreased from initial sampling in 2009 to 2020, but tend to fluctuate over time. 1,4-Dioxane was detected in 54% of groundwater samples collected in 2020 (Table 4-2 and Figure 4-8), at concentrations ranging from 0.9 µg/L (MW-14D) to 770 µg/L (DMW-03S). The average of the detected 1,4-dioxane concentrations is 73.17 µg/L. 1,4-Dioxane exceeded its United States Environmental Protection Agency (USEPA) 1×10^{-6} regional screening level criterion (0.46 µg/L) in all samples in which it was detected (51 of 94 samples). Higher concentrations occur primarily in the upper and intermediate surficial-aquifer zones, in wells east of Pond 1 (DMW-03S [770 µg/L], and MW-52I/MW-52D [74 µg/L and 120 µg/L, respectively]). Elevated 1,4-dioxane concentrations are also present in the TT Area East (MW-45S, MW-41S, and DMW-09I [280 µg/L, 230 µg/L,

and 100 µg/L, respectively]) and the area downgradient (MW-53I [94 µg/L]). The highest concentration of 1,4-dioxane (770 µg/L) was detected east of Pond 1 at DMW-03S followed by 500 µg/L detected in the TT median Area at MW-54I.

An elevated 1,4-dioxane concentration (240 µg/L) was also reported for MW-16S, north of the PHA. Substantially lower concentrations of 1,4-dioxane are reported for wells at the Drum Area plume (the highest concentration in the area was 39 µg/L [DMW-07S]). 1,4-Dioxane was not detected in the deep confined-aquifer groundwater samples (i.e., MW-27D, MW-29D, MW-30D, and MW-31D).

4.1.2.3 Metals

Tables 4-2 and 4-3 summarize descriptive statistics and detections, respectively, of total metals (unfiltered groundwater samples) and dissolved metals (filtered groundwater samples) in DRA monitoring wells. Metal concentrations that exceed MDE groundwater standards are listed in Table 4-3 and Figures 4-9 through 4-13 Nine total metals and seven dissolved metals were detected at concentrations exceeding groundwater standards in one or more groundwater samples collected in 2020.

As shown in Table 4-3, the maximum concentrations of cadmium, chromium, iron, manganese, nickel, and vanadium exceed standards by more than one order of magnitude in both the total and dissolved metals fractions. Maximum concentrations of arsenic in both the total and dissolved metals fractions (both 19 µg/L) are nearly two times its standard of 10 µg/L. Well MW-45S appears to be installed in the cadmium and chromium source-area in TT Area East. Total cadmium and chromium concentrations at MW-45S during this round (520 µg/L and 550 µg/L, respectively) are typically several times higher than the respective cadmium and chromium concentrations in nearby wells DMW-01A and DMW-01B. DMW-01A/B were not sampled in 2020.

Maximum concentrations of total and dissolved nickel (540 µg/L and 550 µg/L, respectively) and vanadium (100 µg/L and 71 µg/L, respectively) were detected in well MW-24S, southwest of Taxiway Tango in the grassy area between Taxiway Tango and the airport runway.

Hexavalent chromium was detected in three of 36 samples in which it was analyzed for. All three detections exceeded the MDE screening criteria of 0.035 µg/L; detected concentrations were

0.23 µg/L (MW-29D), 0.76 µg/L (MW-15D), and 1.1 µg/L (MW-48S). Only the common-earth metals iron and/or manganese exceed groundwater standards in samples collected from the deep confined-aquifer wells (i.e., in MW-27D and MW-31D).

4.1.2.4 Petroleum Hydrocarbons

Thirty-nine samples from the upper surficial-aquifer were submitted for total petroleum hydrocarbons (TPH)-diesel-range organics (DRO) and TPH-gasoline-range organics (GRO) analysis. As shown in Table 4-2, TPH-DRO were detected in 62% of the groundwater samples collected in 2020, at concentrations ranging from 220 µg/L to 7,600 µg/L, whereas TPH-GRO were detected in 38% of groundwater samples, at concentrations ranging from 51 µg/L to 67,000 µg/L. TPH-DRO and TPH-GRO exceedances of the groundwater standard (47 µg/L for both) are in Figure 4-14. The average detected concentration of TPH-DRO is 1,146 µg/L; the highest concentration reported is for well MT-MW-02S. The average detected concentration of TPH-GRO is 6,364 µg/L, with the highest concentration reported for 2020 at well DMW-11S.

4.1.2.5 Perchlorate

Forty-three groundwater samples were analyzed for perchlorate (Table 4-2). Perchlorate was detected in 17 of 43 (40%) groundwater samples, at concentrations (0.093 –1.1 µg/L) below its MDE groundwater standard (2.6 µg/L).

4.1.2.6 Radium-228 and Total Alpha Radium

As shown in Table 4-2, radium-228 and total alpha radium were detected in seven and six of 10 groundwater samples, respectively. Radium-228 concentrations range from 0.62 picocuries per liter (pCi/L) to 13 pCi/L. The average detected radium-228 concentration is 4.27 pCi/L, with the highest radium-228 concentration reported at well DMW-06I, screened in the intermediate surficial aquifer in the southeastern portion of the DRA. The radium-228 concentration at DMW-03I (11.2 pCi/L), east of Pond 1, also exceeded its groundwater standard (5 pCi/L). All concentrations of total alpha radium are less than the groundwater standard (5 pCi/L).

4.2 MAIN TERMINAL

Static groundwater levels were collected from two remaining monitoring wells in the MT area, as the other 10 wells were abandoned in 2020; elevation data for these two wells are in Table 4-1. Groundwater samples collected from the two MT-area wells (MT-MW-01S and MT-MW-02S) were analyzed for TPH-GRO and TPH-DRO (only) in April 2020 (Tables 4-2 and 4-3). An exceedance of TPH-DRO was detected at both MT wells (900 µg/L at MT-MW-01S, and 7,600 µg/L at MT-MW-02S), but TPH-GRO (390 µg/L, also an exceedance) was detected at only one (MT-MW-02S) of the two wells. Note that the TPH-DRO detection at MT-MW-02S was the highest across the entire study area (i.e., of wells sampled in both for the Main Terminal area and the Dump Road Area) during this sampling round. The MDE screening level for TPH-DRO and for TPH-GRO is the same value of 47 µg/L.

This page intentionally left blank.

SECTION 5
SUMMARY

This section summarizes the findings of the 2020 groundwater sampling and analysis program for the Dump Road Area (DRA) of Martin State Airport (MSA). Groundwater flow directions in both the Dump Road Area and the Main Terminal area are also summarized here.

Dump Road Area—

- Groundwater in the upper, intermediate, and lower surficial-aquifer zones flows east and northeast to Frog Mortar Creek. The Groundwater Interim Remedial Action extraction and treatment system started operation in November 2017 and has operated continuously with a few inactive periods. When the system is operating, the groundwater flow field at all aquifer levels is directed towards the 16 extraction wells in the Dump Road Area. Concentrations of chlorinated volatile organic compounds (cVOCs) exceed Maryland Department of the Environment (MDE) groundwater standards throughout much of the Dump Road Area, and at multiple depths. The two highest trichloroethene (TCE) concentrations observed in the current sampling round are 58,000 micrograms per liter (µg/L) and 54,000 µg/L, reported for upper surficial-aquifer wells DMW-11S and MW-54I (northwest of MW-45S in the Taxiway Tango median area) respectively. Multiple volatile organic compound (VOC) sources at the site have resulted in volatile organic compound plumes in groundwater that extend to areas north of Pond 2, south to wells DMW-06I and DMW-07I, and west to the area between Taxiway Tango and the airport runway. Concentrations of chlorinated volatile organic compounds in groundwater are consistent with the 2019 groundwater results, with some exceptions.

- Volatile organic compounds were detected in groundwater at concentrations greater than the Maryland Department of the Environment groundwater standards in delineated areas north, east, and west of the waste material in the central portion of the Dump Road Area.

- The semivolatile organic compound (SVOC) 1,4-dioxane was detected primarily in groundwater samples from the upper and intermediate surficial-aquifer zones. 1,4-Dioxane is co-located in areas that contain the highest concentrations of chlorinated volatile organic compounds (west of Taxiway Tango at MW-54S, east of Taxiway Tango at MW-45S and MW-41S/I, the area hydraulically downgradient of MW-45S, and near and east of Pond 1).

- Concentrations of nine total and seven dissolved metals exceed groundwater standards in one or more surficial-aquifer groundwater samples. Maximum detected concentrations of cadmium, chromium, iron, manganese, nickel, and vanadium exceed Maryland

Department of the Environment groundwater standards by more than one order of magnitude.

- Well MW-45S is installed in the apparent cadmium and chromium source-area east of Taxiway Tango. During this round, total cadmium (520 µg/L) and chromium (550 µg/L) concentrations at MW-45S are several times higher than any other cadmium and chromium concentrations detected elsewhere during the sampling event. Measured dissolved concentrations of these two metals were nearly two times higher than the concentrations detected for their total metals fraction, at 920 µg/L and 1,200 µg/L, respectively.

- Hexavalent chromium was detected in three of the 36 samples in which it was analyzed. All three detections exceeded the Maryland Department of the Environment groundwater standard of 0.035 µg/L).

- Total petroleum hydrocarbons (TPH) diesel-range organics (DRO) and gasoline-range organics (GRO) were frequently detected in upper surficial-aquifer groundwater samples. Most concentrations exceed the Maryland Department of the Environment groundwater standard (47 µg/L). The highest concentrations of TPH-DRO and TPH-GRO this round (in 2020) were detected at the two sampled main terminal wells.

- Perchlorate was detected in 17 of 43 groundwater samples. However, none of the detected concentrations (ranging from 0.093*J* µg/L to 1.1 µg/L) exceed its Maryland Department of the Environment groundwater standard of 2.6 µg/L.

- Radium-228 and total alpha radium were detected in seven and six of 10 groundwater samples, respectively. Detected radium-228 concentrations range from 0.62 picocuries per liter (pCi/L) to 13 pCi/L, and detected total alpha radium concentrations range from 0.418 pCi/L to 10.9 pCi/L. Detected concentrations of radium-228 exceed the groundwater standard (5 pCi/L) in two monitoring wells, and a concentration of total alpha radium exceeds its groundwater standard (also 5 pCi/L) in one monitoring well.

- Groundwater elevation data for the Dump Road Area indicate that groundwater in the upper, intermediate, and lower surficial-aquifers generally flows east–northeast from the runway and taxiway toward Frog Mortar Creek. Higher groundwater levels at wells MSA-DMW-03S, MSA-MW-53S, MSA-MW-43S, and MSA-MW-44S (Figure 4-1) indicate local groundwater mounding near Ponds 1 and 2. Some of the shallow wells in the Dump Road Area are installed in a clay-rich material above more permeable sand (in which some of the surrounding wells are installed); groundwater levels in these wells may reflect localized perched groundwater.

Main Terminal—

- Historical groundwater elevation data indicate that groundwater at the Main Terminal area flows southwest from the airport terminal area toward Dark Head Cove.

- The two Main Terminal wells (MT-MW-01S and MT-MW-02S) were sampled for TPH-GRO and TPH-DRO in 2020. TPH-GRO (390 µg/L) was detected at MT-MW-02S but was not detected at MT-MW-01S. TPH-DRO was detected at both main terminal wells, at concentrations of 900 µg/L (MT-MW-01S) and 7,600 µg/L (MT-MW-02S). The TPH-DRO detection at MT-MW-02S was the highest site-wide (across Main Terminal and the Dump Road Area) DRO detection of the 2020 sampling round.

This page intentionally left blank.

SECTION 6
REFERENCES

Maryland Department of the Environment (MDE), 1989. *Final Report: A Preliminary Assessment of Martin State Airport, Middle River, Maryland (MD-304)*. Prepared by the Maryland Hazardous and Solid Waste Management Administration, Maryland Department of the Environment, Baltimore, Maryland for the U.S. Environmental Protection Agency, Region 3, Philadelphia, Pennsylvania. March.

Maryland Department of the Environment (MDE), 1992. Letter from Ms. Arlene G. Weiner (MDE, Baltimore, Maryland) to Maryland Aviation Administration: "Subsurface Investigations." Martin State Airport, Middle River, Maryland. January 6.

Maryland Department of the Environment (MDE), 1997. Letter from Mr. Arthur O'Connell (MDE) to the Maryland Aviation Administration, Martin State Airport, Middle River, Maryland. January 24.

Maryland Department of the Environment (MDE), 2018. *MDE Cleanup Standards for Soil and Groundwater, 2018, Interim Final Guidance, Update No. 3*. October.

Massachusetts Department of Environmental Protection (Mass DEP), 2015. "2015 Standards and Guidelines for Contaminants in Massachusetts Drinking Waters." Office of Research and Standards Guidelines. Website: http://www.mass.gov/eea/agencies/massdep/water/drinking/standards/standards-and-guidelines-for-drinking-water-contaminants.html.

Tetra Tech, Inc. (Tetra Tech), 2010a. *Environmental Evaluation Addendum, Martin State Airport Main Terminal, 701 Wilson Point Road, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin Corporation, Bethesda, Maryland. December.

Tetra Tech, Inc. (Tetra Tech), 2010b. *Environmental Evaluation Report for Martin State Airport Main Terminal, 701 Wilson Point Road, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin Corporation, Bethesda, Maryland. September.

Tetra Tech, Inc. (Tetra Tech), 2012a. "Appendix A—Technical Memorandum for the Dump Road Area, Source Area Delineation" in *Dump Road Source-Areas Investigation Work Plan, Martin State Airport, 701 Wilson Point Road, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin Corporation, Bethesda, Maryland. September.

Tetra Tech, Inc. (Tetra Tech), 2012b. *Main Terminal Phase II Site Investigation Report, Martin State Airport, 701 Wilson Point Road, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin Corporation, Bethesda, Maryland. April.

Tetra Tech, Inc. (Tetra Tech), 2012c. *Remedial Investigation Report, Martin State Airport, 701 Wilson Point Road, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin Corporation, Bethesda, Maryland. April.

Tetra Tech, Inc. (Tetra Tech), 2013a. *Dump Road Area Characterization of Possible Source Areas Report, Martin State Airport, 701 Wilson Point Road, Middle River, Maryland.* Prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin Corporation, Bethesda, Maryland. May.

Tetra Tech, Inc. (Tetra Tech), 2013b. *Review and Analysis of Historical Aerial Photographs, Martin State Airport, 701 Wilson Point Road, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin, Bethesda, Maryland. January.

Tetra Tech, Inc. (Tetra Tech), 2013c. *Supplemental Main Terminal Phase II Site Investigation Report, Martin State Airport, 701 Wilson Point Road, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin Corporation, Bethesda, Maryland. September.

Tetra Tech, Inc. (Tetra Tech), 2013d. *Review and Analysis of Historical Aerial Photographs (Draft), Martin State Airport Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin Corporation, Bethesda, Maryland. January.

Tetra Tech, Inc. (Tetra Tech), 2014a. *Dump Road Area Characterization of Possible Source Areas Report*. Lockheed Martin, Martin State Airport. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin Corporation Lockheed Martin Corporation, Bethesda. April.

Tetra Tech, Inc. (Tetra Tech), 2014b. *Dump Road Area Source-Areas Design-Characterization Groundwater-Investigation Work Plan, Martin State Airport, 701 Wilson Point Road, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin Corporation, Bethesda, Maryland. January.

Tetra Tech, Inc. (Tetra Tech), 2014c. *Taxiway Tango Soil Characterization Report.* Lockheed Martin, Martin State Airport. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin Corporation Lockheed Martin Corporation, Bethesda. January.

Tetra Tech, Inc. (Tetra Tech), 2014d. *Dump Road Area Source-Areas Design-Characterization Groundwater-Investigation Report, Martin State Airport, 701 Wilson Point Road, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin Corporation, Bethesda, Maryland. November.

Tetra Tech, Inc. (Tetra Tech), 2015. *Groundwater Monitoring Report, Martin State Airport, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin, Bethesda, Maryland. December.

Tetra Tech, Inc. (Tetra Tech), 2016. *2016 Groundwater Monitoring Report, Martin State Airport, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin, Bethesda, Maryland. November.

Tetra Tech, Inc. (Tetra Tech), 2017. *2017 Groundwater Monitoring Report, Martin State Airport, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin, Bethesda, Maryland. November.

Tetra Tech, Inc. (Tetra Tech), 2018. *2018 Groundwater Monitoring Report, Martin State Airport, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin, Bethesda, Maryland. December.

Tetra Tech, Inc. (Tetra Tech), 2019a. *2019 Groundwater Monitoring Work Plan, Martin State Airport, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin, Bethesda, Maryland. December.

Tetra Tech, Inc. (Tetra Tech), 2019b. *2019 Groundwater Monitoring Report, Martin State Airport, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin, Bethesda, Maryland. November.

Tetra Tech, Inc. (Tetra Tech), 2020. *2020 Groundwater Monitoring Work Plan, Martin State Airport, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin, Bethesda, Maryland. April.

United States Environmental Protection Agency (USEPA), 2006. *Treatment Technologies for 1,4-Dioxane: Fundamentals and Field Applications*. Office of Solid Waste and Emergency Response. EPA 542-R-06-009. December.

United States Environmental Protection Agency (USEPA), 2009. *Emerging Contaminant 1,4-Dioxane*. Office of Solid Waste and Emergency Response fact sheet. EPA 505-F-09-006. September.

United States Environmental Protection Agency (USEPA), 2014. *Technical Fact Sheet—1,4-Dioxane*, Office of Solid Waste and Emergency Response fact sheet. EPA 505-F-14-011. January.

United States Environmental Protection Agency (USEPA), 2017a. *National Functional Guidelines for Organic Superfund Methods Data Review*. January.

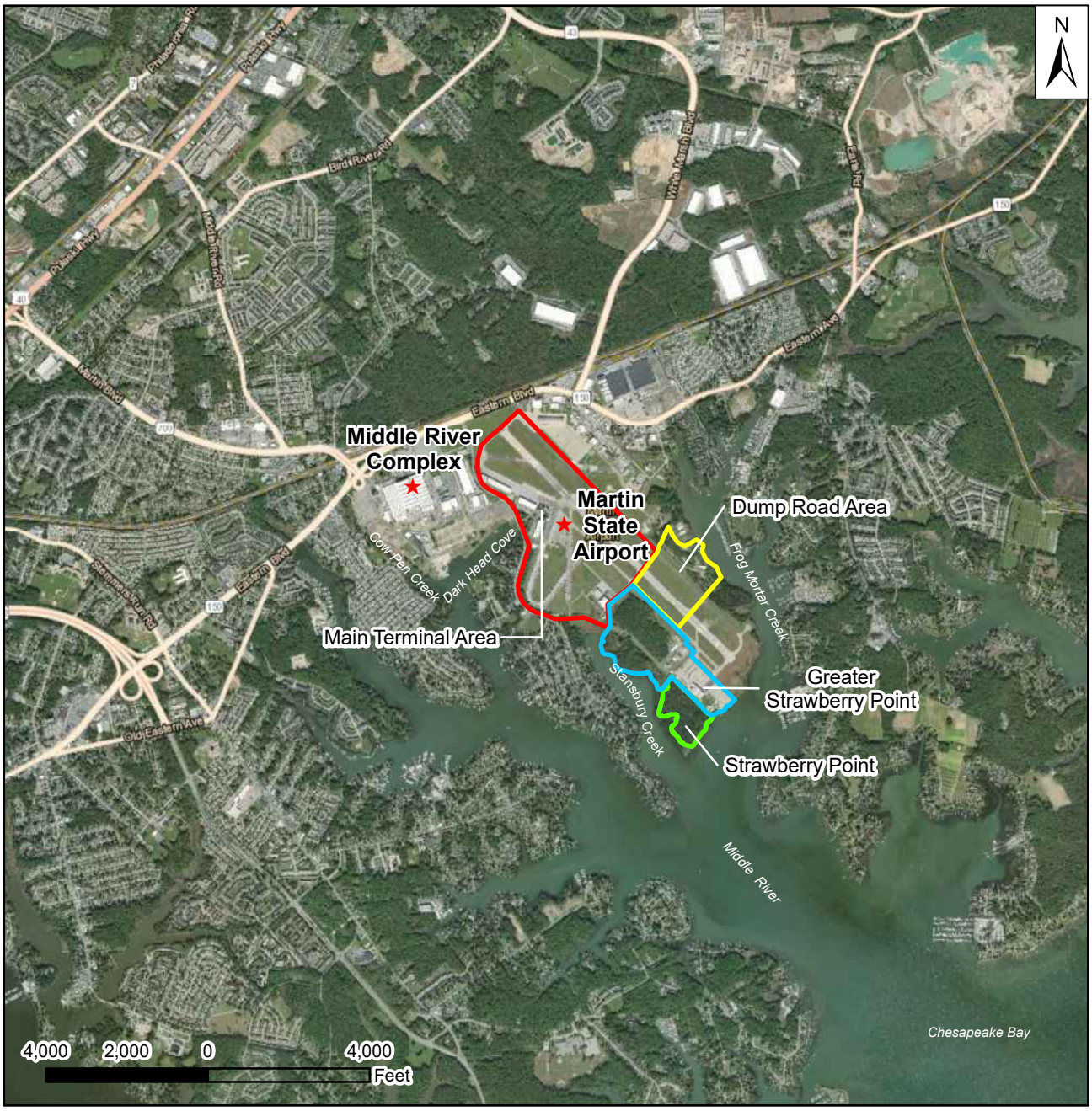
United States Environmental Protection Agency (USEPA), 2017b. *National Functional Guidelines for Inorganic Superfund Methods Data Review*. January.

United States Environmental Protection Agency (USEPA), 2017c. *Regional Screening Levels for Chemical Contaminants at Superfund Sites*. Prepared by the U.S. Department of Energy's Oak Ridge National Laboratory. June. http://epa-prgs.ornl.gov/chemicals/index.shtml.

FIGURES

Figure 4-13 Concentrations of Total and Dissolved Metals Exceeding Groundwater Standards, 2020—Lower Surficial and Deep Confined Aquifers, Dump Road Area

Figure 4-14 Concentrations of Petroleum Hydrocarbons Exceeding Groundwater Standards, 2020—Upper Surficial Aquifer, Dump Road Area



Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (© 2017 ESRI and its data suppliers).

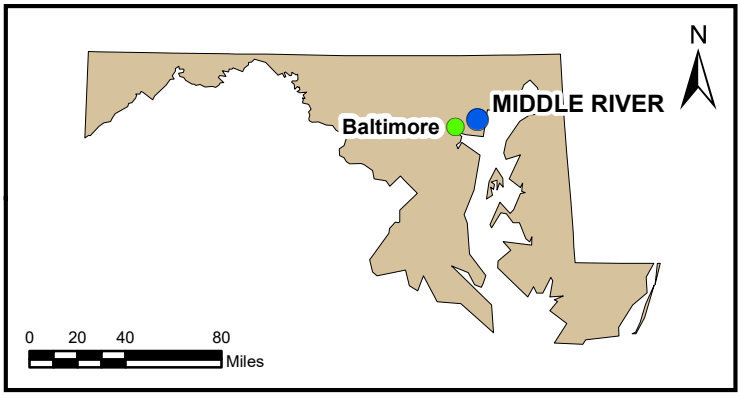


FIGURE 1-1

MARTIN STATE AIRPORT
SITE LOCATION MAP

Lockheed Martin, Martin State Airport
Middle River, Maryland

DATE MODIFIED:	CREATED BY:
11/19/18	JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\msa_overview_map_feb2017.mxd)
11/19/18 -- JEE

2017 aerial photograph provided by the State of Maryland.

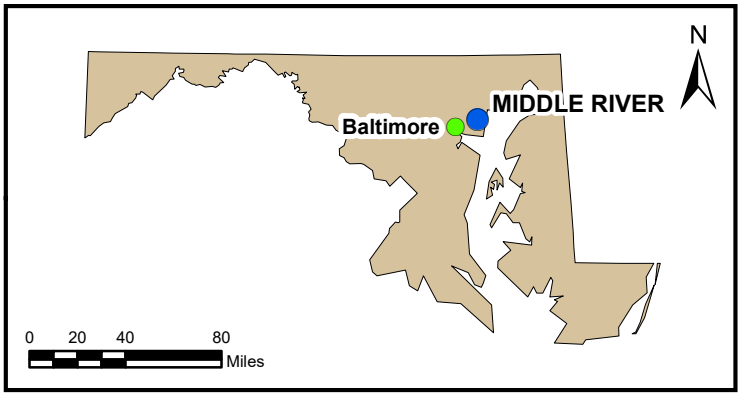


FIGURE 2-1

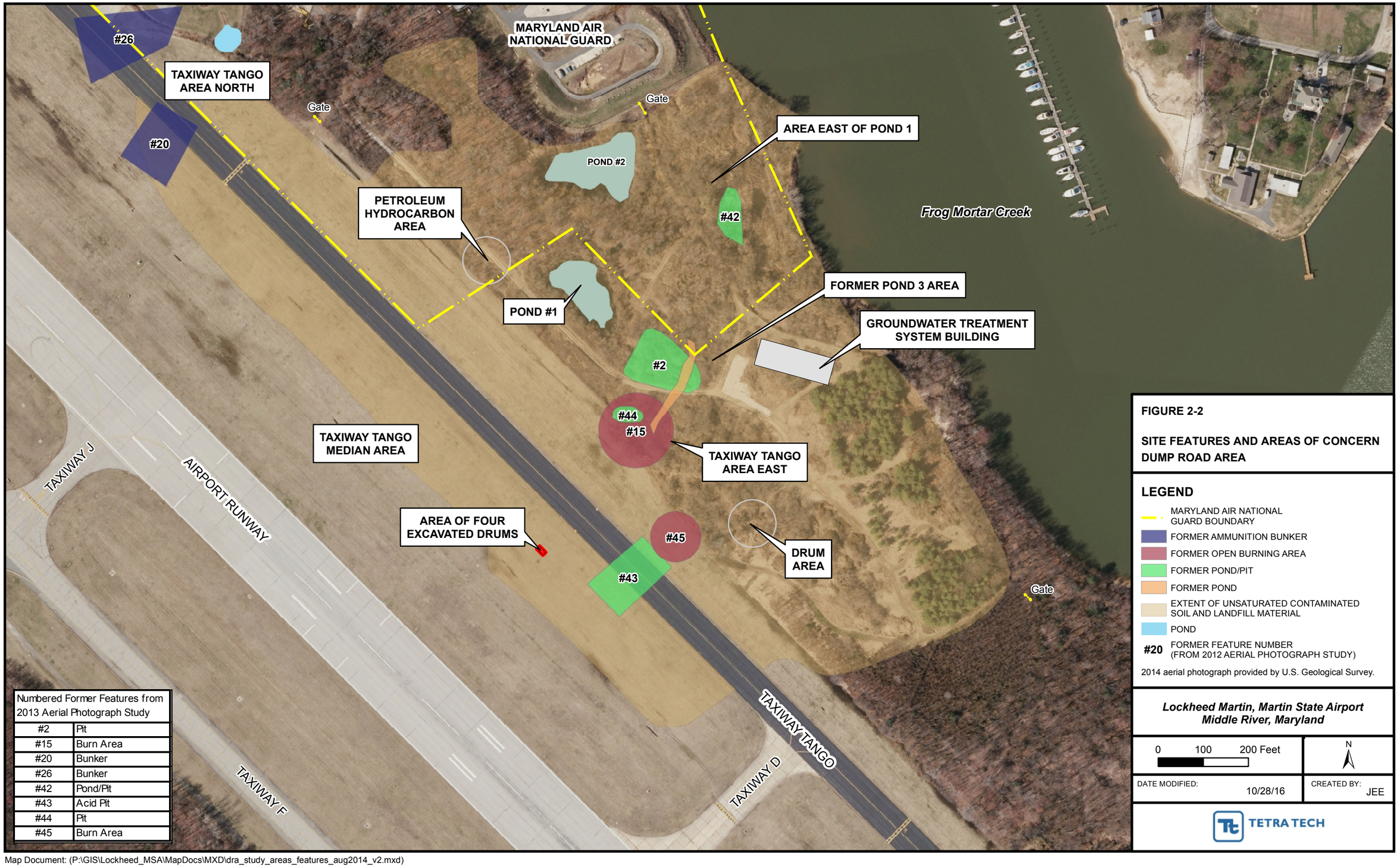
MARTIN STATE AIRPORT AND SURROUNDING FEATURES

Lockheed Martin, Martin State Airport
Middle River, Maryland

DATE MODIFIED:	CREATED BY:
09/12/18	JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\msa_sitemap_sep2018.mxd)
09/12/18 -- JEE



Numbered Former Features from 2013 Aerial Photograph Study	
#2	Pit
#15	Burn Area
#20	Bunker
#26	Bunker
#42	Pond/Pit
#43	Acid Pit
#44	Pit
#45	Burn Area

FIGURE 2-2

SITE FEATURES AND AREAS OF CONCERN DUMP ROAD AREA

LEGEND

- MARYLAND AIR NATIONAL GUARD BOUNDARY
- FORMER AMMUNITION BUNKER
- FORMER OPEN BURNING AREA
- FORMER POND/PIT
- FORMER POND
- EXTENT OF UNSATURATED CONTAMINATED SOIL AND LANDFILL MATERIAL
- POND
- #20 FORMER FEATURE NUMBER (FROM 2012 AERIAL PHOTOGRAPH STUDY)

2014 aerial photograph provided by U.S. Geological Survey.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 10/28/16

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_study_areas_features_aug2014_v2.mxd)
10/28/16 -- JEE

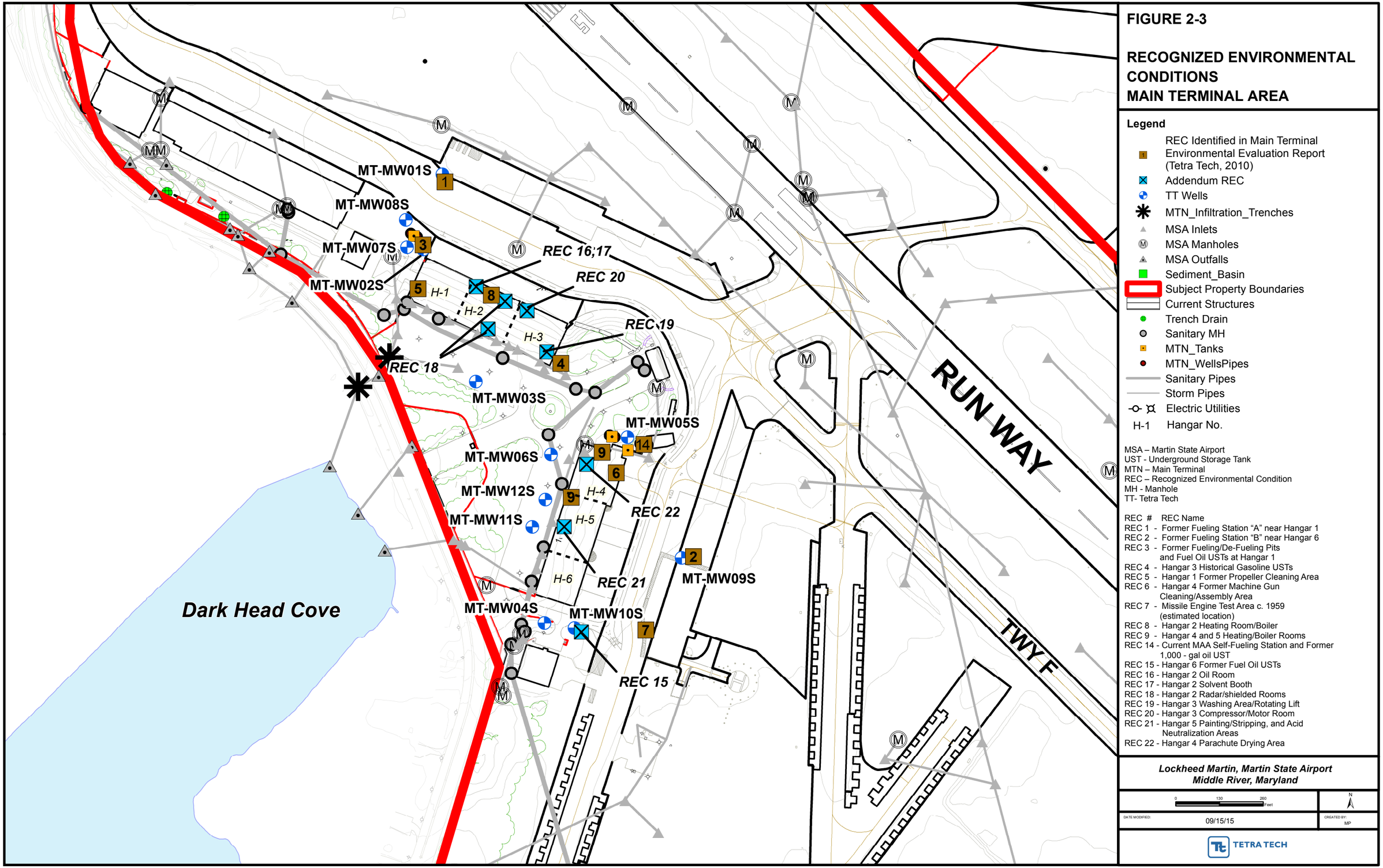


FIGURE 2-3

RECOGNIZED ENVIRONMENTAL CONDITIONS MAIN TERMINAL AREA

Legend

- REC Identified in Main Terminal Environmental Evaluation Report (Tetra Tech, 2010)
- Addendum REC
- TT Wells
- MTN_Infiltration_Trenches
- MSA Inlets
- MSA Manholes
- MSA Outfalls
- Sediment_Basin
- Subject Property Boundaries
- Current Structures
- Trench Drain
- Sanitary MH
- MTN_Tanks
- MTN_WellsPipes
- Sanitary Pipes
- Storm Pipes
- Electric Utilities
- H-1 Hangar No.

MSA – Martin State Airport
UST - Underground Storage Tank
MTN – Main Terminal
REC – Recognized Environmental Condition
MH - Manhole
TT- Tetra Tech

REC # REC Name
REC 1 - Former Fueling Station "A" near Hangar 1
REC 2 - Former Fueling Station "B" near Hangar 6
REC 3 - Former Fueling/De-Fueling Pits and Fuel Oil USTs at Hangar 1
REC 4 - Hangar 3 Historical Gasoline USTs
REC 5 - Hangar 1 Former Propeller Cleaning Area
REC 6 - Hangar 4 Former Machine Gun Cleaning/Assembly Area
REC 7 - Missile Engine Test Area c. 1959 (estimated location)
REC 8 - Hangar 2 Heating Room/Boiler
REC 9 - Hangar 4 and 5 Heating/Boiler Rooms
REC 14 - Current MAA Self-Fueling Station and Former 1,000 - gal oil UST
REC 15 - Hangar 6 Former Fuel Oil USTs
REC 16 - Hangar 2 Oil Room
REC 17 - Hangar 2 Solvent Booth
REC 18 - Hangar 2 Radar/shielded Rooms
REC 19 - Hangar 3 Washing Area/Rotating Lift
REC 20 - Hangar 3 Compressor/Motor Room
REC 21 - Hangar 5 Painting/Stripping, and Acid Neutralization Areas
REC 22 - Hangar 4 Parachute Drying Area

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 130 260 Feet

N

DATE MODIFIED: 09/15/15

CREATED BY: MP

TETRA TECH

Map Document: (PGH P:\Germantown GIS\MartinStateAirport-LMC\MapDocs\MXD\Maps\Terminal One Recs 01 27 12.mxd)
09/15/15 -- JEE

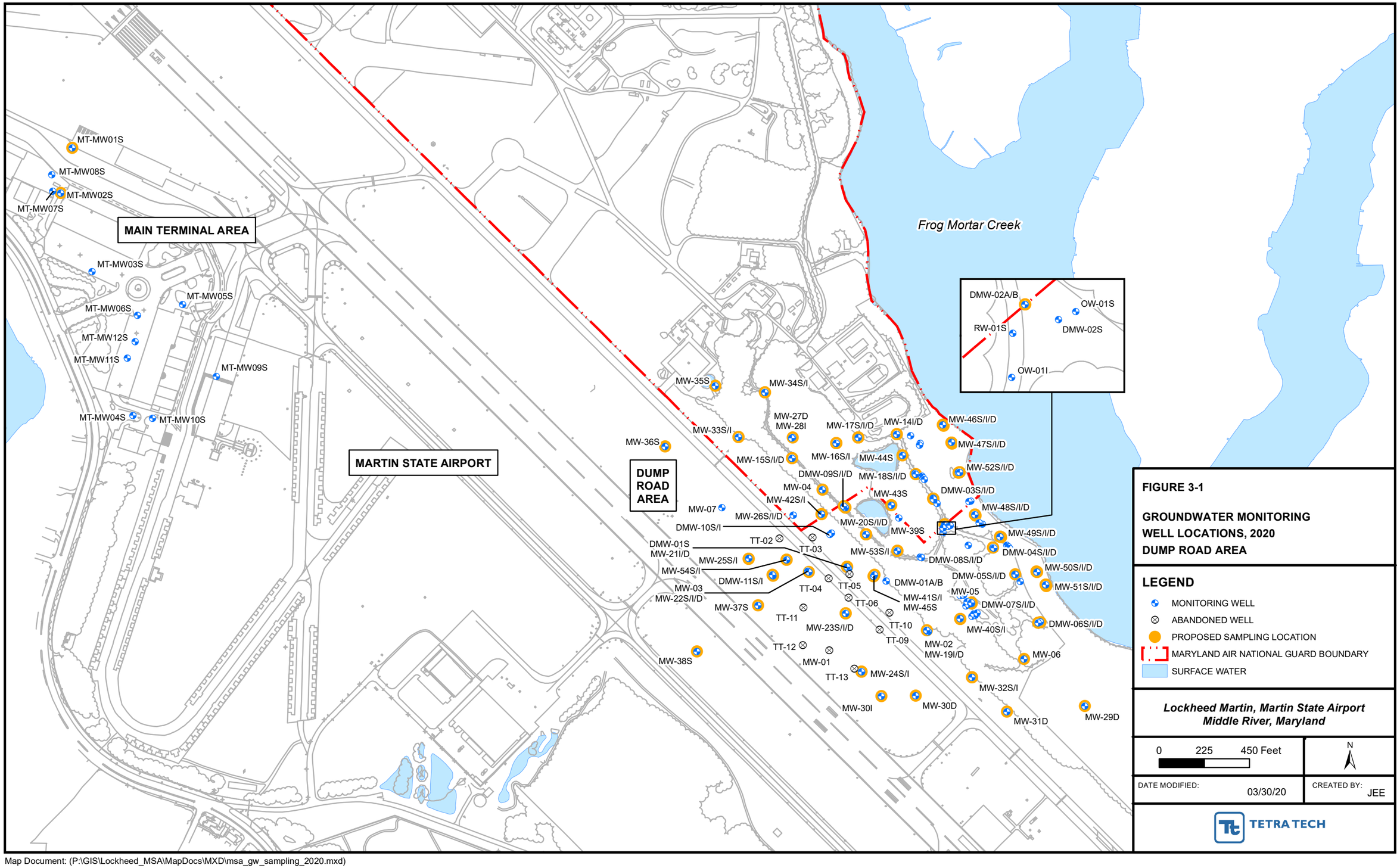


FIGURE 3-1

GROUNDWATER MONITORING WELL LOCATIONS, 2020 DUMP ROAD AREA

LEGEND

- MONITORING WELL
- ABANDONED WELL
- PROPOSED SAMPLING LOCATION
- MARYLAND AIR NATIONAL GUARD BOUNDARY
- SURFACE WATER

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 225 450 Feet

N

DATE MODIFIED: 03/30/20

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\msa_gw_sampling_2020.mxd)
03/30/20 -- PFO

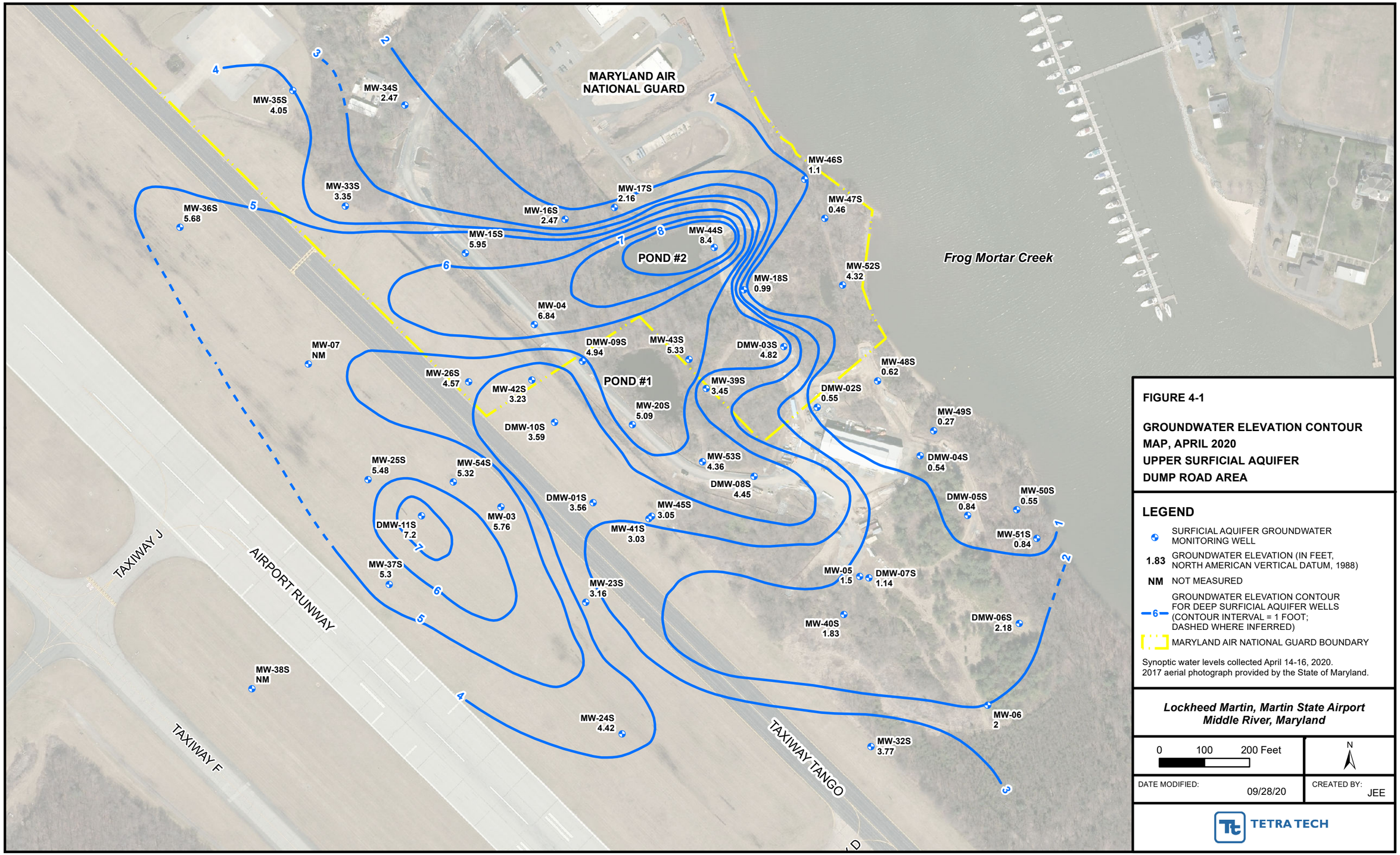


FIGURE 4-1

GROUNDWATER ELEVATION CONTOUR MAP, APRIL 2020 UPPER SURFICIAL AQUIFER DUMP ROAD AREA

LEGEND

- SURFICIAL AQUIFER GROUNDWATER MONITORING WELL
- 1.83 — GROUNDWATER ELEVATION (IN FEET, NORTH AMERICAN VERTICAL DATUM, 1988)
- NM — NOT MEASURED
- 6 — GROUNDWATER ELEVATION CONTOUR FOR DEEP SURFICIAL AQUIFER WELLS (CONTOUR INTERVAL = 1 FOOT; DASHED WHERE INFERRED)
- MARYLAND AIR NATIONAL GUARD BOUNDARY

Synoptic water levels collected April 14-16, 2020.
2017 aerial photograph provided by the State of Maryland.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 09/28/20

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_gw_contours_upper_aquifer_apr2020.mxd)
09/28/20 -- JAZ

FIGURE 4-2

GROUNDWATER ELEVATION CONTOUR MAP, APRIL 2020
INTERMEDIATE SURFICIAL AQUIFER
DUMP ROAD AREA

LEGEND

- SURFICIAL AQUIFER GROUNDWATER MONITORING WELL
- 1.34 GROUNDWATER ELEVATION (IN FEET, NORTH AMERICAN DATUM, 1988)
- 2 GROUNDWATER ELEVATION CONTOUR (CONTOUR INTERVAL = 1 FOOT; DASHED WHERE INFERRED)
- MARYLAND AIR NATIONAL GUARD BOUNDARY

Synoptic water levels collected April 14-16, 2020.
2017 aerial photograph provided by the State of Maryland.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 09/28/20

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_gw_contours_intermediate_aquifer_apr2020.mxd)
09/28/20 -- JAZ

MARYLAND AIR NATIONAL GUARD

POND #2

POND #1

Frog Mortar Creek

AIRPORT RUNWAY

TAXIWAY TANGO

TAXIWAY F

TAXIWAY D

MW-27D 7.08

MW-16D 2.62

MW-17D 7.56

MW-14D 4.66

MW-15D 4.52

MW-52D -0.66

MW-18D -1.49

DMW-03D -0.94

DMW-09D 3.07

MW-26D 2.84

DMW-02B 0.03

MW-20D 3.05

DMW-04D -0.69

DMW-08D 7

MW-21D 1.53

MW-22D 2.17

DMW-01B 2.14

DMW-05D 0.08

MW-51D 0.4

DMW-07D 0.74

MW-23D 2.18

DMW-06D 0.96

MW-19D 1.44

MW-30D 5.06

MW-31D NM

MW-29D 4.58

FIGURE 4-3

GROUNDWATER ELEVATION CONTOUR MAP, APRIL 2020
LOWER SURFICIAL AQUIFER
DUMP ROAD AREA

LEGEND

- SURFICIAL AQUIFER GROUNDWATER MONITORING WELL
- DEEP CONFINED AQUIFER GROUNDWATER MONITORING WELL
- 1.44 GROUNDWATER ELEVATION (IN FEET, NORTH AMERICAN VERTICAL DATUM, 1988)
- NM NOT MEASURED
- 6 GROUNDWATER ELEVATION CONTOUR FOR DEEP SURFICIAL AQUIFER WELLS (CONTOUR INTERVAL = 1 FOOT; DASHED WHERE INFERRED)
- MARYLAND AIR NATIONAL GUARD BOUNDARY

Synoptic water levels collected April 14-16, 2020.
2017 aerial photograph provided by the State of Maryland.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 09/29/20

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_gw_contours_lower_aquifer_apr2020.mxd)
09/29/20 -- JAZ

FIGURE 4-4

CONCENTRATIONS OF TRICHLOROETHENE, CIS-1,2-DICHLOROETHENE AND VINYL CHLORIDE EXCEEDING GROUNDWATER STANDARDS, 2020
UPPER SURFICIAL AQUIFER
DUMP ROAD AREA

LEGEND

- SURFICIAL AQUIFER GROUNDWATER MONITORING WELL
- MARYLAND AIR NATIONAL GUARD BOUNDARY

J = estimated value.
Samples collected April 21 - June 9, 2020.
All results in micrograms per liter (µg/L).

Screening Levels:
- cis-1,2-Dichloroethene: 70 µg/L.
- Trichloroethene: 5 µg/L.
- Vinyl Chloride: 2 µg/L.

2017 aerial photograph provided by the State of Maryland.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 10/12/20

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_gw_exc_tags_202005_upper_tcv.mxd)
10/12/20 -- JEE

FIGURE 4-5

CONCENTRATIONS OF TRICHLOROETHENE, CIS-1,2-DICHLOROETHENE AND VINYL CHLORIDE EXCEEDING GROUNDWATER STANDARDS, 2020
INTERMEDIATE SURFICIAL AQUIFER
DUMP ROAD AREA

LEGEND

- SURFICIAL AQUIFER GROUNDWATER MONITORING WELL
- MARYLAND AIR NATIONAL GUARD BOUNDARY

J = estimated value.
J+ = estimated, biased high.
Samples collected April 21 - June 9, 2020.
All results in micrograms per liter (µg/L).

Screening Levels:
- cis-1,2-Dichloroethene: 70 µg/L.
- Trichloroethene: 5 µg/L.
- Vinyl Chloride: 2 µg/L.

2017 aerial photograph provided by the State of Maryland.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 10/12/20

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_gw_exc_tags_202005_intermediate_tcv.mxd)
10/12/20 -- JEE

FIGURE 4-6

CONCENTRATIONS OF TRICHLOROETHENE, CIS-1,2-DICHLOROETHENE AND VINYL CHLORIDE EXCEEDING GROUNDWATER STANDARDS, 2020
LOWER SURFICIAL AQUIFER
DUMP ROAD AREA

LEGEND

SURFICIAL AQUIFER GROUNDWATER MONITORING WELL

MARYLAND AIR NATIONAL GUARD BOUNDARY

J = estimated value.
Samples collected April 21 - June 9, 2020.
All results in micrograms per liter (µg/L).

Screening Levels:
- cis-1,2-Dichloroethene: 70 µg/L.
- Trichloroethene: 5 µg/L.
- Vinyl Chloride: 2 µg/L.

2017 aerial photograph provided by the State of Maryland.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 10/12/20

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_gw_exc_tags_202005_lower_tcv.mxd)
10/12/20 -- JEE

FIGURE 4-7

CONCENTRATIONS OF BENZENE EXCEEDING THE GROUNDWATER STANDARD, 2020
DUMP ROAD AREA

LEGEND

- SURFICIAL AQUIFER GROUNDWATER MONITORING WELL
- DEEP CONFINED AQUIFER GROUNDWATER MONITORING WELL
- MARYLAND AIR NATIONAL GUARD BOUNDARY

J = estimated value.
Samples collected April 21 - June 9, 2020.
All results in micrograms per liter (µg/L).
Screening level for benzene is 5 µg/L.
2017 aerial photograph provided by the State of Maryland.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 10/12/20

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_gw_exc_tags_202005_benzene.mxd)
10/12/20 -- JEE

FIGURE 4-8

CONCENTRATIONS OF 1,4-DIOXANE EXCEEDING THE GROUNDWATER STANDARD, 2020
DUMP ROAD AREA

LEGEND

- SURFICIAL AQUIFER GROUNDWATER MONITORING WELL
- DEEP CONFINED AQUIFER GROUNDWATER MONITORING WELL
- MARYLAND AIR NATIONAL GUARD BOUNDARY

The U.S. Environmental Protection Agency Regional Screening Level for 1,4-dioxane (0.46 ug/L) was used as the criterion to determine exceedances.

J = estimated value.
Samples collected April 21 - June 9, 2020.
All results in micrograms per liter (µg/L).
2017 aerial photograph provided by the State of Maryland.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 10/12/20

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_gw_exc_tags_202005_14dioxane.mxd)
10/12/20 -- JEE

FIGURE 4-9

CONCENTRATIONS OF TOTAL METALS EXCEEDING GROUNDWATER STANDARDS, 2020
UPPER SURFICIAL AQUIFER
DUMP ROAD AREA

LEGEND

- SURFICIAL AQUIFER GROUNDWATER MONITORING WELL
- MARYLAND AIR NATIONAL GUARD BOUNDARY

J = estimated value.
Samples collected April 21 - June 9, 2020.
All results in micrograms per liter (µg/L).

Screening Levels:
- Arsenic: 6 µg/L.
- Beryllium: 4 µg/L.
- Cadmium: 5 µg/L.
- Chromium: 100 µg/L.
- Iron: 1400 µg/L.
- Manganese: 43 µg/L.
- Nickel: 39 µg/L.
- Vanadium: 8.6 µg/L.

2017 aerial photograph provided by the State of Maryland.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 10/12/20

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_gw_exc_tags_202005_metals_upper.mxd)
10/12/20 -- JEE

FIGURE 4-10

CONCENTRATIONS OF DISSOLVED METALS EXCEEDING GROUNDWATER STANDARDS, 2020
UPPER SURFICIAL AQUIFER
DUMP ROAD AREA

LEGEND

- SURFICIAL AQUIFER GROUNDWATER MONITORING WELL
- MARYLAND AIR NATIONAL GUARD BOUNDARY

J = estimated value.
J+ = estimated, biased high.
J- = estimated, biased low.
Samples collected April 21 - June 9, 2020.
All results in micrograms per liter (µg/L).

Screening levels:
- Arsenic: 6 µg/L.
- Beryllium: 4 µg/L.
- Cadmium: 5 µg/L.
- Iron: 1400 µg/L.
- Manganese: 43 µg/L.
- Nickel: 39 µg/L.
- Vanadium: 8.6 µg/L.
- Hexavalent Chromium: 0.035 µg/L.

2017 aerial photograph provided by the State of Maryland.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 10/12/20

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_gw_exc_tags_202005_dislv_metals_upper.mxd)
10/12/20 -- JEE

FIGURE 4-11

CONCENTRATIONS OF TOTAL METALS EXCEEDING GROUNDWATER STANDARDS, 2020
INTERMEDIATE SURFICIAL AQUIFER
DUMP ROAD AREA

LEGEND

SURFICIAL AQUIFER GROUNDWATER MONITORING WELL

MARYLAND AIR NATIONAL GUARD BOUNDARY

J = estimated value.
J+ = estimated, biased high.
J- = estimated, biased low.
Samples collected April 21 - June 9, 2020.
All results in micrograms per liter (µg/L).

Screening Levels:
- Arsenic: 6 µg/L.
- Beryllium: 4 µg/L.
- Cadmium: 5 µg/L.
- Iron: 1400 µg/L.
- Manganese: 43 µg/L.
- Nickel: 39 µg/L.
- Vanadium: 8.6 µg/L.

2017 aerial photograph provided by the State of Maryland.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 10/12/20

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_gw_exc_tags_202005_metals_intermediate.mxd)
10/12/20 -- JEE

FIGURE 4-12

CONCENTRATIONS OF DISSOLVED METALS EXCEEDING GROUNDWATER STANDARDS, 2020
INTERMEDIATE SURFICIAL AQUIFER
DUMP ROAD AREA

LEGEND

- SURFICIAL AQUIFER GROUNDWATER MONITORING WELL
- MARYLAND AIR NATIONAL GUARD BOUNDARY

J = estimated value.
J+ = estimated, biased high.
J- = estimated, biased low.
Samples collected April 21 - June 9, 2020.
All results in micrograms per liter (µg/L).

Screening Levels:
- Arsenic: 6 µg/L.
- Beryllium: 4 µg/L.
- Cadmium: 5 µg/L.
- Iron: 1400 µg/L.
- Manganese: 43 µg/L.
- Nickel: 39 µg/L.
- Vanadium: 8.6 µg/L.

2017 aerial photograph provided by the State of Maryland.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 10/12/20

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_gw_exc_tags_202005_dislv_metals_intermediate.mxd)
10/12/20 -- JEE

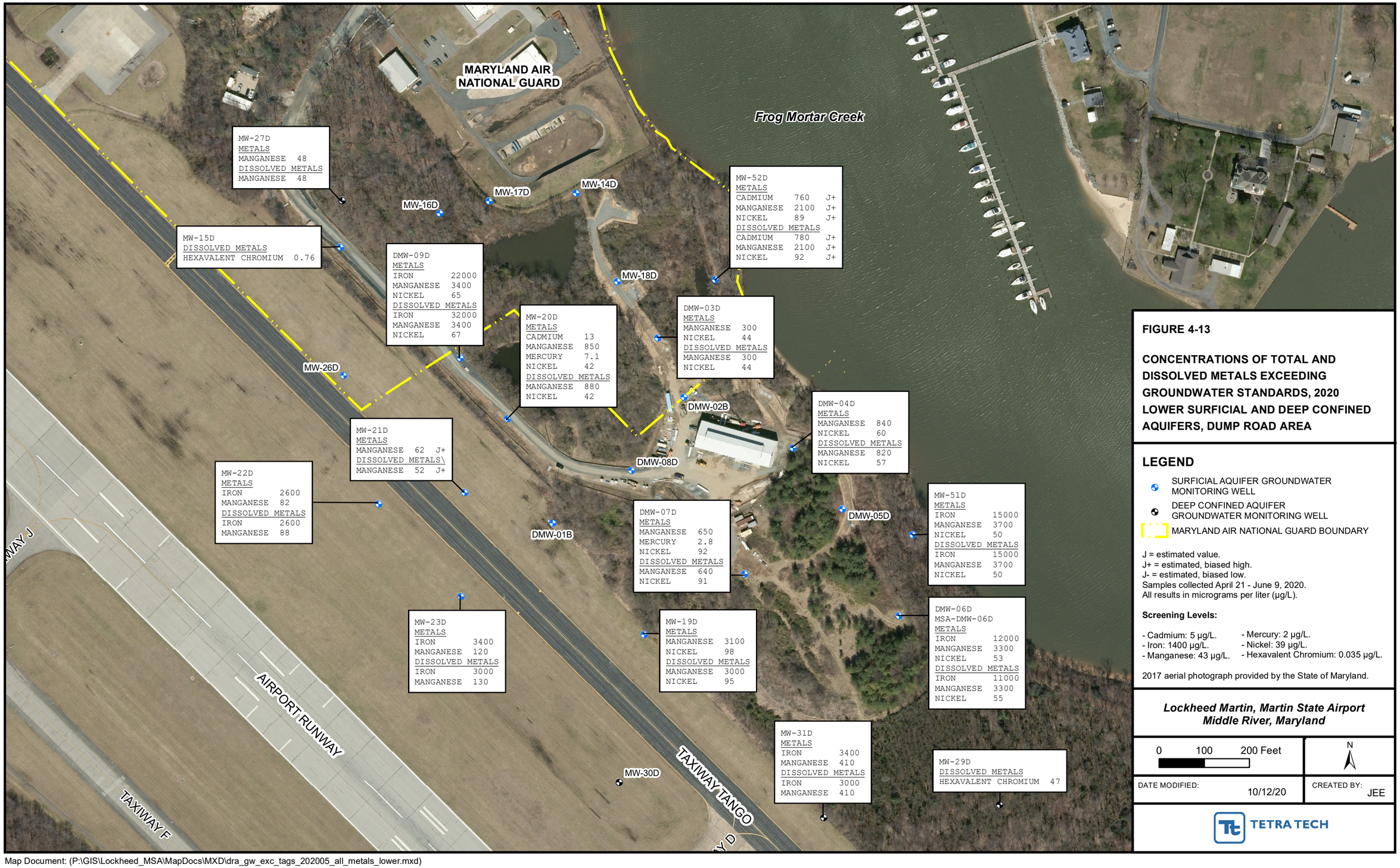


FIGURE 4-13

CONCENTRATIONS OF TOTAL AND DISSOLVED METALS EXCEEDING GROUNDWATER STANDARDS, 2020 LOWER SURFICIAL AND DEEP CONFINED AQUIFERS, DUMP ROAD AREA

LEGEND

- SURFICIAL AQUIFER GROUNDWATER MONITORING WELL
- DEEP CONFINED AQUIFER GROUNDWATER MONITORING WELL
- MARYLAND AIR NATIONAL GUARD BOUNDARY

J = estimated value.
J+ = estimated, biased high.
J- = estimated, biased low.
Samples collected April 21 - June 9, 2020.
All results in micrograms per liter (µg/L).

Screening Levels:

- Cadmium: 5 µg/L.
- Iron: 1400 µg/L.
- Manganese: 43 µg/L.
- Mercury: 2 µg/L.
- Nickel: 39 µg/L.
- Hexavalent Chromium: 0.035 µg/L.

2017 aerial photograph provided by the State of Maryland.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 10/12/20

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_gw_exc_tags_202005_all_metals_lower.mxd)
10/12/20 -- JEE

FIGURE 4-14

CONCENTRATIONS OF PETROLEUM HYDROCARBONS EXCEEDING GROUNDWATER STANDARDS, 2020 UPPER SURFICIAL AQUIFER DUMP ROAD AREA

LEGEND

- SURFICIAL AQUIFER GROUNDWATER MONITORING WELL
- MARYLAND AIR NATIONAL GUARD BOUNDARY

J = estimated sample.
TPH = Total petroleum hydrocarbons.
DRO = Diesel range organics.
GRO = Gasoline range organics.
Samples collected April 21 - June 9, 2020.
All results in micrograms per liter (µg/L).

Screening Levels:
- TPH-DRO: 47 µg/L. - TPH-GRO: 47 µg/L.

2017 aerial photograph provided by the State of Maryland.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 10/12/20

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_gw_exc_tags_202005_tph_upper.mxd)
10/12/20 -- JEE

TABLES

Table 3-1 Chemical Analyses and Laboratory Analytical Methods for Wells Sampled in 2020

Table 4-1 Groundwater Levels and Elevations, April 14-16, 2020

Table 4-2 Statistical Summary of Dump Road Area Groundwater Sampling Results—2020

Table 4-3 Detected Analytes and Screening-Criteria Exceedances for Groundwater Samples—2020, Dump Road Area

Table 3-1

Chemical Analyses and Laboratory Analytical Methods for Wells to be Sampled in 2020
Lockheed Martin, Martin State Airport, Middle River, Maryland

Monitoring Well	Analytical Requirements								
	VOCs (TICs, Freon 22, Freon 113) (USEPA 8260C)	1,4-Dioxane (USEPA 8270C SIM)	Perchlorate[1] (USEPA SW846 6850)	Mercury (USEPA 7470A)	Hexavalent Chromium[2] (USEPA 218.6)	Total PPM (USEPA 6020B)	Dissolved PPM (USEPA 6020B)	GRO and DRO (USEPA 8015B)	Radium 224, 226, and 228 (USEPA 900 Series)
	3x40mL vials w/ hydrochloric acid	2x250mL ambers	125mL plastic (filtered)	See Metals	250mL plastic (filtered)	500mL w/ nitric acid	500mL w/nitric acid (filtered)	2x40mL vials w/hydrochloric acid & 2x250 mL ambers	(Different labs) 3x1L plastic w/nitric acid
Upper Surficial-Aquifer									
MW-4	X	X		X		X	X	X	
MW-6	X	X		X		X	X	X	
DMW-3S	X	X		X	X	X	X	X	
DMW-5S	X	X		X		X	X	X	
DMW-6S	X	X		X	X	X	X	X	X
DMW-7S	X	X		X		X	X	X	
DMW-9S	X	X		X		X	X	X	
DMW-11S	X	X		X		X	X	X	
MW-16S	X	X		X		X	X	X	X
MW-17S	X	X		X		X	X	X	
MW-18S	X	X		X		X	X	X	
MW-20S	X	X		X		X	X	X	
MW-23S	X	X		X		X	X	X	
MW-24S	X	X		X		X	X	X	
MW-25S	X	X		X		X	X	X	
MW-32S	X	X		X		X	X	X	
MW-33S	X	X		X		X	X	X	
MW-34S	X	X		X		X	X	X	
MW-35S	X	X		X		X	X	X	
MW-36S	X	X		X		X	X	X	
MW-37S	X	X		X		X	X	X	
MW-38S	X	X		X		X	X	X	
MW-40S	X	X		X		X	X	X	
MW-41S	X	X		X		X	X	X	
MW-42S	X	X		X		X	X	X	
MW-43S	X	X		X		X	X	X	
MW-44S	X	X		X		X	X	X	
MW-45S	X	X		X		X	X	X	
MW-46S	X	X	X	X	X	X	X	X	
MW-47S	X	X	X	X	X	X	X	X	
MW-48S	X	X	X	X	X	X	X	X	
MW-49S	X	X	X	X	X	X	X	X	
MW-50S	X	X	X	X	X	X	X	X	
MW-51S	X	X	X	X	X	X	X	X	
MW-52S	X	X	X	X	X	X	X	X	
MW-53S	X	X	X	X	X	X	X	X	
MW-54S	X	X	X	X	X	X	X	X	
MT-MW-01S								X	
MT-MW-02S								X	

Table 3-1

Chemical Analyses and Laboratory Analytical Methods for Wells to be Sampled in 2020
Lockheed Martin, Martin State Airport, Middle River, Maryland

Monitoring Well	Analytical Requirements								
	VOCs (TICs, Freon 22, Freon 113) (USEPA 8260C)	1,4-Dioxane (USEPA 8270C SIM)	Perchlorate[1] (USEPA SW846 6850)	Mercury (USEPA 7470A)	Hexavalent Chromium[2] (USEPA 218.6)	Total PPM (USEPA 6020B)	Dissolved PPM (USEPA 6020B)	GRO and DRO (USEPA 8015B)	Radium 224, 226, and 228 (USEPA 900 Series)
Intermediate Surficial-Aquifer									
DMW-2A	X	X	X	X		X	X		
DMW-3I	X	X		X		X	X		X
DMW-4I	X	X	X	X		X	X		
DMW-6I	X	X		X		X	X		X
DMW-7I	X	X	X	X		X	X		
DMW-9I	X	X		X		X	X		
MW-11I	X	X		X		X	X		
MW-14I	X	X		X		X	X		
MW-15I	X	X	X	X		X	X		
MW-16I	X	X		X		X	X		X
MW-17I	X	X	X	X		X	X		
MW-18I	X	X	X	X		X	X		
MW-20I	X	X	X	X		X	X		
MW-21I	X	X	X	X		X	X		
MW-24I	X	X	X	X		X	X		
MW-25I	X	X		X		X	X		
MW-30I	X	X		X		X	X		
MW-32I	X	X		X		X	X		
MW-33I	X	X		X	X	X	X		
MW-34I	X	X		X		X	X		
MW-40I	X	X		X		X	X		
MW-41I	X	X		X		X	X		
MW-42I	X	X		X		X	X		
MW-46I	X	X	X	X	X	X	X		
MW-47I	X	X	X	X	X	X	X		
MW-48I	X	X	X	X	X	X	X		
MW-49I	X	X	X	X	X	X	X		
MW-50I	X	X	X	X	X	X	X		
MW-51I	X	X	X	X	X	X	X		
MW-52I	X	X	X	X	X	X	X		
MW-53I	X	X	X	X	X	X	X		
MW-54I	X	X	X	X	X	X	X		

Table 3-1

Chemical Analyses and Laboratory Analytical Methods for Wells to be Sampled in 2020
Lockheed Martin, Martin State Airport, Middle River, Maryland

Monitoring Well	Analytical Requirements								
	VOCs (TICs, Freon 22, Freon 113) (USEPA 8260C)	1,4-Dioxane (USEPA 8270C SIM)	Perchlorate[1] (USEPA SW846 6850)	Mercury (USEPA 7470A)	Hexavalent Chromium[2] (USEPA 218.6)	Total PPM (USEPA 6020B)	Dissolved PPM (USEPA 6020B)	GRO and DRO (USEPA 8015B)	Radium 224, 226, and 228 (USEPA 900 Series)
Lower Surficial-Aquifer									
DMW-2B	X	X		X		X	X		
DMW-3D	X	X		X		X	X		X
DMW-4D	X	X	X	X		X	X		
DMW-6D	X	X	X	X		X	X		X
DMW-7D	X	X		X		X	X		
DMW-9D	X	X		X		X	X		
MW-14D	X	X		X	X	X	X		
MW-15D	X	X	X	X	X	X	X		
MW-16D	X	X	X	X	X	X	X		X
MW-17D					X				
MW-19D	X	X		X		X	X		
MW-20D	X	X	X	X		X	X		
MW-21D	X	X		X		X	X		
MW-22D	X	X		X		X	X		
MW-23D	X	X		X		X	X		
MW-46D	X	X	X	X	X	X	X		
MW-47D	X	X	X	X	X	X	X		
MW-48D	X	X	X	X	X	X	X		
MW-49D	X	X	X	X	X	X	X		
MW-50D	X	X	X	X	X	X	X		
MW-51D	X	X	X	X	X	X	X		
MW-52D	X	X	X	X	X	X	X		
Deep Wells									
MW-27D	X	X	X	X	X	X	X		X
MW-29D	X	X	X	X	X	X	X		X
MW-30D	X	X	X	X	X	X	X		
MW-31D	X	X	X	X	X	X	X		
Totals	94	94	43	94	36	94	94	39	10

Notes:
1. Perchlorate analyzed by USEPA Method 6850 with a specified detection limit of 1 µg/L.
2. Hexavalent chromium analyzed by USEPA Method 218.6 (ion chromotography) with a specified detection limit of 0.02 ug/L which is lower than the method's published detection limit of 0.10 µg/L.

B

Abbreviations:
µg/L - micrograms per liter
DRO - diesel-range organics
GRO - gasoline-range organics
mL - milliliter
PPM - priority pollutant metals
TICs - tentatively identified compounds
USEPA - Unites States Environmental Protection Agency
VOCs - volatile organic compounds

Table 4-1
Groundwater Levels and Elevations - April 14-16, 2020
Lockheed Martin Martin State Airport, Middle River, Maryland

Well ID	Aquifer level	Elevation-top of well casing NAVD88[(1)] (feet)	Depth to groundwater-top of well casing (feet)	Groundwater elevation NAVD88[(1)] (feet)
Dump Road Area - upper surficial aquifer				
DMW-01S	S	11.08	7.52	3.56
DMW-02S	S	21.75	21.20	0.55
DMW-03S	S	16.52	11.70	4.82
DMW-04S	S	20.52	19.98	0.54
DMW-05S	S	21.34	20.50	0.84
DMW-06S	S	18.62	16.44	2.18
DMW-07S	S	21.84	20.70	1.14
DMW-08S	S	15.80	11.35	4.45
DMW-09S	S	11.45	6.51	4.94
DMW-10S	S	10.29	6.70	3.59
DMW-11S	S	9.20	2.00	7.20
MW-15S	S	8.60	2.65	5.95
MW-16S	S	10.20	7.73	2.47
MW-17S	S	7.61	5.45	2.16
MW-18S	S	8.89	7.90	0.99
MW-20S	S	12.44	7.35	5.09
MW-23S	S	10.01	6.85	3.16
MW-24S	S	7.72	3.30	4.42
MW-25S	S	9.69	4.21	5.48
MW-26S	S	11.72	7.15	4.57
MW-32S	S	7.27	3.50	3.77
MW-33S	S	9.97	6.62	3.35
MW-34S	S	7.44	4.97	2.47
MW-35S	S	12.63	8.58	4.05
MW-36S	S	11.88	6.20	5.68
MW-37S	S	10.70	5.40	5.30
MW-38S	S	10.81	NM	NM
MW-39S	S	15.70	12.25	3.45
MW-40S	S	17.48	15.65	1.83
MW-41S	S	10.23	7.20	3.03
MW-42S	S	8.88	5.65	3.23
MW-43S	S	18.08	12.75	5.33
MW-44S	S	9.21	0.81	8.40
MW-45S	S	10.03	6.98	3.05
MW-46S	S	11.26	10.16	1.10
MW-47S	S	11.96	11.50	0.46
MW-48S	S	19.92	19.30	0.62
MW-49S	S	19.84	19.57	0.27
MW-50S	S	12.55	12.00	0.55
MW-51S	S	9.69	8.85	0.84
MW-52S	S	13.24	8.92	4.32
MW-53S	S	14.37	10.01	4.36

Table 4-1
Groundwater Levels and Elevations - April 14-16, 2020
Lockheed Martin Martin State Airport, Middle River, Maryland

Well ID	Aquifer level	Elevation-top of well casing NAVD88[(1)] (feet)	Depth to groundwater-top of well casing (feet)	Groundwater elevation NAVD88[(1)] (feet)
Dump Road Area - upper surficial aquifer (continued)				
MW-54S	S	10.75	5.43	5.32
MW-03	S	11.19	5.43	5.76
MW-04	S	10.34	5.43	5.76
MW-05	S	22.65	21.15	1.50
MW-06	S	15.72	13.72	2.00
MW-07	S	10.90	NM	NM
Dump Road Area - intermediate surficial aquifer				
DMW-01A	I	12.05	9.02	3.03
DMW-02A	I	21.65	21.90	-0.25
DMW-03I	I	16.45	16.92	-0.47
DMW-04I	I	20.48	20.60	-0.12
DMW-05I	I	21.39	21.10	0.29
DMW-06I	I	18.64	17.60	1.04
DMW-07I	I	21.90	21.10	0.80
DMW-08I	I	16.30	14.52	1.78
DMW-09I	I	11.40	6.80	4.60
DMW-10I	I	10.27	7.60	2.67
DMW-11I	I	9.15	6.00	3.15
MW-14I	I	11.72	10.65	1.07
MW-15I	I	8.79	4.25	4.54
MW-16I	I	10.06	7.42	2.64
MW-17I	I	7.68	5.90	1.78
MW-18I	I	8.91	8.10	0.81
MW-19I	I	7.90	6.50	1.40
MW-20I	I	12.39	7.50	4.89
MW-21I	I	10.83	7.80	3.03
MW-22I	I	11.01	7.20	3.81
MW-23I	I	10.07	6.95	3.12
MW-24I	I	7.68	4.52	3.16
MW-25I	I	9.72	6.50	3.22
MW-26I	I	11.67	8.90	2.77
MW-28I	I	8.65	5.70	2.95
MW-30I	I	7.52	4.70	2.82
MW-32I	I	7.28	4.55	2.73
MW-33I	I	10.02	6.70	3.32
MW-34I	I	7.37	4.87	2.50
MW-40I	I	17.59	16.25	1.34
MW-41I	I	10.23	7.20	3.03
MW-42I	I	8.87	6.32	2.55
MW-46D	I	11.67	11.98	-0.31
MW-46I	I	11.19	11.50	-0.31
MW-47D	I	12.04	12.47	-0.43

Table 4-1
Groundwater Levels and Elevations - April 14-16, 2020
Lockheed Martin Martin State Airport, Middle River, Maryland

Well ID	Aquifer level	Elevation-top of well casing NAVD88[(1)] (feet)	Depth to groundwater-top of well casing (feet)	Groundwater elevation NAVD88[(1)] (feet)
Dump Road Area - intermediate surficial aquifer (continued)				
MW-47I	I	11.94	12.35	-0.41
MW-48D	I	20.12	21.05	-0.93
MW-48I	I	19.94	20.40	-0.46
MW-49D	I	19.60	20.50	-0.90
MW-49I	I	19.59	19.92	-0.33
MW-50D	I	13.12	12.80	0.32
MW-50I	I	12.64	12.20	0.44
MW-51D	I	9.55	9.15	0.40
MW-51I	I	9.61	8.90	0.71
MW-52I	I	13.27	13.92	-0.65
MW-53I	I	14.39	11.30	3.09
MW-54I	I	10.83	7.90	2.93
MW-02	I	8.40	6.50	1.90
Dump Road Area - lower surficial aquifer				
DMW-01B	D	12.04	9.90	2.14
DMW-02B	D	21.66	21.63	0.03
DMW-03D	D	16.46	17.40	-0.94
DMW-04D	D	20.44	21.13	-0.69
DMW-05D	D	21.38	21.30	0.08
DMW-06D	D	18.51	17.55	0.96
DMW-07D	D	21.94	21.20	0.74
DMW-08D	D	16.35	9.35	7.00
DMW-09D	D	11.41	8.34	3.07
MW-14D	D1	11.56	6.90	4.66
MW-15D	D	8.77	4.25	4.52
MW-16D	D	10.22	7.60	2.62
MW-17D	D	7.56	0.00	7.56
MW-18D	D	8.88	10.37	-1.49
MW-19D	D	7.94	6.50	1.44
MW-20D	D	12.40	9.35	3.05
MW-21D	D	10.78	9.25	1.53
MW-22D	D	11.02	8.85	2.17
MW-23D	D	10.03	7.85	2.18
MW-26D	D	11.66	8.82	2.84
MW-52D	D	13.04	13.70	-0.66
Dump Road Area - deep confined aquifer				
MW-27D	DD	8.39	1.31	7.08
MW-29D	DD	11.43	6.85	4.58
MW-30D	DD	8.26	3.20	5.06
MW-31D	DD	6.95	NM	NM

Table 4-1
Groundwater Levels and Elevations - April 14-16, 2020
Lockheed Martin Martin State Airport, Middle River, Maryland

Well ID	Aquifer level	Elevation-top of well casing NAVD88[(1)] (feet)	Depth to groundwater-top of well casing (feet)	Groundwater elevation NAVD88[(1)] (feet)
Main Terminal Area - upper surficial aquifer				
MT-MW-01S	S	17.61	4.35	13.26
MT-MW-02S	S	17.76	9.00	8.76
Frog Mortar Creek - river gage				
MSA-Gage01 (EL Marina)	SW	2.83	See Appendix A	--

Synoptic groundwater-level measurements were collected on April 14-16, 2020.
1 Based on an October 2010 survey of all Dump Road Area wells
"--" - not available
D - lower surficial aquifer
D1 - aquitard beneath lower surficial aquifer
DD - Deep confined aquifer below the lower surficial aquifer
EL - Edwards Lane
I - intermediate surficial aquifer
MSA - Martin State Airport
MT - Main Terminal
NAVD88 = North American Vertical Datum of 1988
NM - not measured
S - upper surficial aquifer
SW - surface water

Table 4-2
Statistical Summary of Dump Road Area Groundwater Sampling Results - 2020
Martin State Airport, Middle River, Maryland

Parameter	Annual 2020 DRA Martin State Airport Groundwater Samples												
	Frequency of Detection		Minimum concentration (detects)	Maximum concentration (detects)	Location of maximum detected concentration	Sample with maximum detected concentration	Minimum concentration (nondetects)	Maximum concentration (nondetects)	Average of detected results	Average of all results	Standard deviation	Sample Date	Site
	Number	Percent											
Volatile organic compounds (µg/L)													
1,1,1-TRICHLOROETHANE	2/94	2	0.92 J	13 J	MSA-MW-48D	MSA-MW-48D-050420	0.24	480	6.96	8.011063	30.52611537	20200504	DRA
1,1-DICHLOROETHANE	8/94	9	0.27 J	9.7	MSA-MW-44S	MSA-MW-44S-042320	0.17	340	2.6175	5.785106	21.61283207	20200423	DRA
1,1-DICHLOROETHENE	21/94	22	0.19 J	41 J	MSA-DMW-07S	MSA-DMW-7S-042320	0.19	380	8.69238	7.516648	24.65341569	20200423	DRA
1,2,3-TRIMETHYLBENZENE	2/94	2	2.1 J	19 J	MSA-DMW-09S	MSA-DMW-9S-042420	0.14	280	10.55	4.796223	17.8648212	20200424	DRA
1,2,4-TRICHLOROBENZENE	6/94	6	1 J	150 J	MSA-MW-45S	MSA-MW-45S-052720	0.26	520	51.116666	11.32601	36.97934542	20200527	DRA
1,2,4-TRIMETHYLBENZENE	3/94	3	0.094 J	37 J	MSA-DMW-09S	MSA-DMW-9S-042420	0.07	140	13.398	2.7135	9.591693471	20200424	DRA
1,2-DICHLOROBENZENE	3/94	3	0.69 J	2.2	MSA-MW-16S	MSA-MW-16S-050520	0.15	300	1.563333	4.979042	19.0705699	20200505	DRA
1,2-DICHLOROETHANE	24/94	26	0.34 J	300	MSA-MW-45S	MSA-MW-45S-052720	0.21	420	26.844583	12.934734	41.85179355	20200527	DRA
1,2-DICHLOROPROPANE	1/94	1	0.25 J	0.25 J	MSA-MW-14I	MSA-MW-14I-050720	0.15	300	0.25	4.934202	19.07996078	20200507	DRA
1,3-DICHLOROBENZENE	4/94	4	0.15 J	9 J	MSA-MW-48D	MSA-MW-48D-050420	0.15	300	3	5.040851	19.07535439	20200504	DRA
1,4-DICHLOROBENZENE	6/94	6	0.5 J	49	MSA-MW-48D	MSA-MW-48D-050420	0.16	320	16.64	6.131702	20.99402909	20200504	DRA
BENZENE	25/94	27	0.17 J	110	MSA-DMW-09S	MSA-DMW-9S-042420	0.13	260	11.7208	7.028138	20.74642952	20200424	DRA
CARBON TETRACHLORIDE	9/94	10	0.48 J	8200	MSA-DMW-11I	MSA-DMW-11I-052920	0.26	52	3040.097777	293.081542	1391.202757	20200529	DRA
CHLOROBENZENE	23/94	24	0.15 J	83	MSA-DMW-09S	MSA-DMW-9S-042420	0.14	280	14.85913	7.759946	20.94739993	20200424	DRA
CHLOROETHANE	1/94	1	3.1	3.1	MSA-MW-44S	MSA-MW-44S-042320	0.83	1700	3.1	27.628723	107.2920435	20200423	DRA
CHLOROFORM	18/94	19	0.13 J	5200	MSA-DMW-11S	MSA-DMW-11S-052920	0.13	48	803.211666	154.954042	768.0438369	20200529	DRA
CIS-1,2-DICHLOROETHENE	72/94	77	0.19 J	45000	MSA-DMW-11S	MSA-DMW-11S-052920	0.16	6.4	1931.3825	1479.408723	6410.161769	20200529	DRA
CYCLOHEXANE	1/1	100	5.7 NJ	5.7 NJ	MSA-MW-14I	MSA-MW-14I-050720	NULL	NULL	5.7	5.7	NULL	20200507	DRA
DIISOPROPYL ETHER	1/94	1	3.2 J	3.2 J	MSA-MW-16S	MSA-MW-16S-050520	0.17	340	3.2	5.622606	21.61848875	20200505	DRA
ETHYLBENZENE	6/94	6	0.2 J	300	MSA-DMW-09S	MSA-DMW-9S-042420	0.11	220	53.088333	6.944893	33.60638103	20200424	DRA
ISOPROPYLBENZENE	6/94	6	0.13 J	6.5 J	MSA-DMW-09S	MSA-DMW-9S-042420	0.09	180	1.295	3.020159	11.45072906	20200424	DRA
M+P-XYLENES	9/94	10	0.28 J	2100	MSA-DMW-09S	MSA-DMW-9S-042420	0.08	80	315.272222	31.286276	219.365296	20200424	DRA
METHYL TERT-BUTYL ETHER	1/94	1	0.14 J	0.14 J	MSA-MW-35S	MSA-MW-35S-042220	0.07	140	0.14	2.303031	8.903894165	20200422	DRA
N-BUTYLBENZENE	1/94	1	0.26 J	0.26 J	MSA-MW-48I	MSA-MW-48I-050420	0.14	280	0.26	4.605053	17.80798843	20200504	DRA
N-PROPYLBENZENE	2/94	2	0.17 J	6.2 J	MSA-DMW-09S	MSA-DMW-9S-042420	0.15	300	3.185	4.967393	19.07954189	20200424	DRA
NAPHTHALENE	1/94	1	17	17	MSA-MW-44S	MSA-MW-44S-042320	0.32	640	17	10.713297	40.69457216	20200423	DRA
O-XYLENE	7/94	7	0.24 J	240	MSA-DMW-09S	MSA-DMW-9S-042420	0.09	180	70.334285	7.434095	30.34529355	20200424	DRA
SEC-BUTYLBENZENE	2/94	2	0.5 J	1.4	MSA-MW-14I	MSA-MW-14I-050720	0.13	260	0.95	4.293138	16.53225009	20200507	DRA
TERT-BUTYLBENZENE	2/94	2	0.16 J	0.78 J	MSA-MW-14I	MSA-MW-14I-050720	0.14	280	0.47	4.611542	17.80646053	20200507	DRA
TERTIARY-BUTYL ALCOHOL	5/94	5	1.9 J	800 J	MSA-MW-52S	MSA-MW-52S-052120	1.7	3400	202.08	66.622872	229.5953847	20200521	DRA
TETRACHLOROETHENE	3/94	3	0.38 J	160 J	MSA-MW-54I	MSA-MW-54I-060320	0.15	300	55.76	5.881329	23.85145813	20200603	DRA
TOLUENE	9/94	10	0.49 J	26000	MSA-DMW-11S	MSA-DMW-11S-052920	0.14	28	6048.176666	580.114521	3634.433523	20200529	DRA
TOTAL XYLENES	8/94	9	0.28 J	2300	MSA-DMW-09S	MSA-DMW-9S-042420	0.15	300	375.475	35.615053	240.5312906	20200424	DRA
TRANS-1,2-DICHLOROETHENE	29/94	31	0.34 J	290 J	MSA-MW-54I	MSA-MW-54I-060320	0.19	380	29.772068	13.182978	43.46282803	20200603	DRA
TRICHLOROETHENE	60/94	64	0.11 J	58000	MSA-DMW-11S	MSA-DMW-11S-052920	0.1	10	3338.6545	2131.136436	8628.506555	20200529	DRA
VINYL CHLORIDE	57/94	61	0.28 J	5600	MSA-MW-45S	MSA-MW-45S-052720	0.2	8	432.575789	262.395957	840.0076924	20200527	DRA
Tentatively identified compounds (TICs), volatiles (µg/L)													
3-DECANONE	1/1	100	2.2 NJ	2.2 NJ	MSA-MW-32S	MSA-MW-32S-052820	NULL	NULL	2.2	2.2	NULL	20200528	DRA
3-OCTANONE	2/2	100	3.5 NJ	6.8 NJ	MSA-MW-32S	MSA-MW-32S-052820	NULL	NULL	5.15	5.15	2.333452378	20200528	DRA
BENZENE, 1-ETHYL-2-METHYL-	1/1	100	3 NJ	3 NJ	MSA-MW-14I	MSA-MW-14I-050720	NULL	NULL	3	3	NULL	20200507	DRA
BUTANE, 2,2,3,3-TETRAMETHYL-	1/1	100	5.2 NJ	5.2 NJ	MSA-MW-48I	MSA-MW-48I-050420	NULL	NULL	5.2	5.2	NULL	20200504	DRA
BUTANE, 2-METHYL-	1/1	100	4.9 NJ	4.9 NJ	MSA-MW-14I	MSA-MW-14I-050720	NULL	NULL	4.9	4.9	NULL	20200507	DRA
CYCLOPENTANE, METHYL-	1/1	100	2 NJ	2 NJ	MSA-MW-14I	MSA-MW-14I-050720	NULL	NULL	2	2	NULL	20200507	DRA
INDANE	1/1	100	2.2 NJ	2.2 NJ	MSA-MW-44S	MSA-MW-44S-042320	NULL	NULL	2.2	2.2	NULL	20200423	DRA
PENTANE, 2,3,3-TRIMETHYL-	1/1	100	2.4 NJ	2.4 NJ	MSA-MW-14I	MSA-MW-14I-050720	NULL	NULL	2.4	2.4	NULL	20200507	DRA
UNKNOWN	2/2	100	7400 NJ	7900 NJ	MSA-MW-54I	MSA-MW-54I-060320	NULL	NULL	7650	7650	353.5533906	20200603	DRA
Semivolatile organic compounds (µg/L)													
1,4-DIOXANE	51/94	54	0.9 J	770	MSA-DMW-03S	MSA-DMW-3S-050720	0.34	0.4	73.173137	39.785851	111.9766042	20200507	DRA
Metals, total (µg/L)													
ANTIMONY	12/94	13	0.59 J	4.3 J+	MSA-MW-52D	MSA-MW-52D-052720	0.57	0.57	1.109166	0.390212	0.452611844	20200527	DRA
ARSENIC	59/94	63	0.82 J	19	MSA-MW-14I	MSA-MW-14I-050720	0.75	3.8	3.964067	2.643936	3.98259762	20200507	DRA
BARIUM	94/94	100	4.1 J	230	MSA-MW-52S	MSA-MW-52S-052120	NULL	NULL	43.668085	43.668085	41.97404526	20200521	DRA
BERYLLIUM	41/94	44	0.31 J	9	MSA-DMW-06I	MSA-DMW-6I-051220	0.31	0.31	1.871707	0.903776	1.423108759	20200512	DRA
CADMIUM	50/94	53	0.21 J	860	MSA-DMW-03I	MSA-DMW-3I-050620	0.2	0.2	85.95	45.764893	148.7676192	20200506	DRA
CHROMIUM	56/94	60	1 J	550 J+	MSA-MW-45S	MSA-MW-45S-052720	0.98	1.5	15.071428	9.179574	56.74066973	20200527	DRA
COBALT	89/94	95	0.21 J	440	MSA-DMW-09D	MSA-DMW-9D-042420	0.19	0.19	68.378089	64.74601	98.05438764	20200424	DRA
COPPER	63/94	67	1.7 J	470	MSA-MW-24S, MSA-MW-34I	MSA-MW-34I-042120, MSA-MW-24S-060420	1.7	1.7	40.542857	27.452659	82.74965204	20200421	DRA
IRON	90/94	96	60 J	220000	MSA-MW-24S	MSA-MW-24S-060420	47	47	13326.43333	12760.35106	27925.01022	20200604	DRA
LEAD	48/94	51	0.45 J	10	MSA-MW-54I	MSA-MW-54I-060320	0.45	0.57	2.077916	1.171808	1.835901357	20200603	DRA
MANGANESE	93/94	99	4.9 J	9000	MSA-MW-06	MSA-MW-6-042220	2.1	2.1	1660.095698	1642.446276	1972.017423	20200422	DRA
MERCURY	11/94	12	0.14 J	7.1	MSA-MW-20D	MSA-MW-20D-043020	0.13	0.13	1.333636	0.213457	0.792211763	20200430	DRA
MOLYBDENUM	14/94	15	1.1 J	6.9	MSA-DMW-03D	MSA-DMW-3D-050620	1.1	1.1	2.65	0.862765	1.003433251	20200506	DRA
NICKEL	83/94	88	1.5 J	540	MSA-MW-24S	MSA-MW-24S-060420	1.5	1.5	50.256626	44.463297	76.3824433	20200604	DRA
SELENIUM	33/94	35	0.97 J	16	MSA-MW-03I, MSA-MW-49D	MSA-MW-49D-051120, MSA-DMW-3I-050620	0.89	0.89	2.865757	1.29484	2.429785872	20200511	DRA
SILVER	18/94	19	0.053 J	7.5	MSA-MW-47I	MSA-MW-47I-052020	0.053	0.053	0.647555	0.145425	0.780016639	20200520	DRA
THALLIUM	28/94	30	0.2 J	1.6	MSA-DMW-03D	MSA-DMW-3D-050620	0.2	0.2	0.442857	0.202127	0.252108836	20200506	DRA
VANADIUM	60/94	64	0.82 J	100	MSA-MW-24S	MSA-MW-24S-060420	0.82	0.82	6.588166	4.35351	12.03819814	20200604	DRA

Table 4-2
Statistical Summary of Dump Road Area Groundwater Sampling Results - 2020
Martin State Airport, Middle River, Maryland

Parameter	Annual 2020 DRA Martin State Airport Groundwater Samples												
	Frequency of Detection		Minimum concentration (detects)	Maximum concentration (detects)	Location of maximum detected concentration	Sample with maximum detected concentration	Minimum concentration (nondetects)	Maximum concentration (nondetects)	Average of detected results	Average of all results	Standard deviation	Sample Date	Site
	Number	Percent											
Metals, filtered (µg/L)													
ANTIMONY	4/94	4	0.81 J	4.5 J+	MSA-MW-52D	MSA-MW-52D-052720	0.57	0.57	1.975	0.356914	0.462856434	20200527	DRA
ARSENIC	45/94	48	0.77 J	19	MSA-MW-14I, MSA-MW-25I	MSA-MW-25I-060220, MSA-MW-14I-050720	0.75	3.8	4.217777	2.230851	3.85996787	20200602	DRA
BARIUM	94/94	100	3.8 J	240	MSA-MW-52S	MSA-MW-52S-052120	NULL	NULL	42.096808	42.096808	41.95186041	20200521	DRA
BERYLLIUM	38/94	40	0.32 J	9.8	MSA-DMW-06I	MSA-DMW-6I-051220	0.31	0.31	1.962631	0.885744	1.458560558	20200512	DRA
CADMIUM	43/94	46	0.2 J	920 J+	MSA-MW-45S	MSA-MW-45S-052720	0.2	0.2	91.05	41.704787	155.7822495	20200527	DRA
CHROMIUM	45/94	48	1 J	1200 J+	MSA-MW-45S	MSA-MW-45S-052720	0.98	1.1	30.717777	14.961382	123.5978902	20200527	DRA
COBALT	89/94	95	0.19 J	440	MSA-DMW-09D	MSA-DMW-9D-042420	0.19	0.19	67.722584	64.125372	95.90535476	20200424	DRA
COPPER	47/94	50	1.7 J	870	MSA-MW-34I	MSA-MW-34I-042120	1.7	1.9	55.77234	28.312234	109.2262722	20200421	DRA
IRON	81/94	86	47 J	220000	MSA-MW-24S	MSA-MW-24S-060420	47	47	14106.33333	12158.70745	28109.89875	20200604	DRA
LEAD	18/94	19	0.47 J	9 J+	MSA-MW-52D	MSA-MW-52D-052720	0.45	0.45	2.561111	0.67234	1.415240339	20200527	DRA
MANGANESE	93/94	99	4.2 J	9200	MSA-MW-06	MSA-MW-6-042220	2.1	2.1	1680.934408	1663.063297	1993.531151	20200422	DRA
MERCURY	5/94	5	0.3	2	MSA-MW-20D	MSA-MW-20D-043020	0.13	0.13	0.812	0.104734	0.221575938	20200430	DRA
MOLYBDENUM	11/94	12	1.1 J	4.1 J	MSA-MW-04	MSA-MW-4-042220	1.1	1.1	1.863636	0.703723	0.514794006	20200422	DRA
NICKEL	79/94	84	1.6 J	550	MSA-MW-24S	MSA-MW-24S-060420	1.5	1.5	51.945569	43.776063	72.85837445	20200604	DRA
SELENIUM	31/94	33	0.9 J	15	MSA-DMW-03I MSA-MW-49D	MSA-DMW-3I-050620, MSA-MW-49D-051120	0.89	0.89	2.855483	1.239946	2.313812138	20200506	DRA
THALLIUM	24/94	26	0.21 J	1	MSA-DMW-03I	MSA-DMW-3I-050620	0.2	0.2	0.403333	0.177446	0.16508021	20200506	DRA
VANADIUM	43/94	46	0.84 J	71	MSA-MW-24S	MSA-MW-24S-060420	0.82	0.82	6.252558	3.082659	8.74648589	20200604	DRA
Miscellaneous parameters (µg/L)													
HEXAVALENT CHROMIUM	3/32*	8	0.23 J	1.1	MSA-MW-48S	MSA-MW-48S-050420	0.23	0.23	0.696666	0.169531	0.205121362	20200504	DRA
PERCHLORATE	17/43	40	0.093 J	1.1	MSA-MW-49D	MSA-MW-49D-051120	0.085	0.085	0.34247	0.161093	0.240239024	20200511	DRA
Petroleum hydrocarbons (µg/L)													
Gasoline-range organics (C06-C10)	15/39	38	51 J	67000	MSA-DMW-11S	MSA-DMW-11S-052920	49	49	6364.2	2462.846153	10828.23868	20200529	DRA
Diesel-range organics (C10-C32)	24/39	62	220 J	7600	MT-MW02S	MT-MW-02S-042120	210	230	1146.25	748.333333	1309.142112	20200421	MT
Radiological (pCi/L)													
RADIUM-228	7/10	70	0.62	13	MSA-DMW-06I	MSA-DMW-6I-051220	-0.13	0.149	4.274857	2.992095	4.872940635	20200512	DRA
TOTAL ALPHA RADIUM	6/10	60	0.418	10.9	MSA-DMW-06I	MSA-DMW-6I-051220	0.115	0.447	3.610833	2.2228	3.48245864	20200512	DRA

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.
*Note: Thirty-six samples were collected for hexavalent chromium; however, four sampling results were rejected when data was validated. Rejected reportable results are excluded from the dataset during statistical calculations, and are not included when calculating averages or tallying overall sampling record counts.
Values in question are deemed unusable due to extreme quality control noncompliance.
J - estimated value
µg/L - micrograms per liter
DRA - Dump Road Area
GW - groundwater
MSA - Martin State Airport
MT - Main Terminal area
MW- monitoring well
pCci/L - picocuries per liter

Table 4-3
Detected Analytes and Screening-Criteria Exceedances for
Groundwater Samples—2020, Dump Road Area
Martin State Airport, Middle River, Maryland

LOCATION	Maryland Department of the Environment Groundwater Standard (1) (2) (3)	DMW-02A	DMW-02B	DMW-03D	DMW-03I	DMW-03S	DMW-04D	DMW-04I	DMW-05S	DMW-06D	DMW-06I	DMW-06S	DMW-07D	DMW-07I	DMW-07S	DMW-09D
SAMPLE ID		MSA-DMW-2A-050120	MSA-DMW-2B-050120	MSA-DMW-3D-050620	MSA-DMW-3I-050620	MSA-DMW-3S-050720	MSA-DMW-4D-050820	MSA-DMW-4I-050820	MSA-DMW-5S-050820	MSA-DMW-6D-051220	MSA-DMW-6I-051220	MSA-DMW-6S-051220	MSA-DMW-7D-042320	MSA-DMW-7I-042320	MSA-DMW-7S-042320	MSA-DMW-9D-042420
SAMPLE DATE		20200501	20200501	20200506	20200506	20200507	20200508	20200508	20200508	20200512	20200512	20200512	20200423	20200423	20200423	20200424
SCREENED AQUIFER		Intermediate	Lower	Lower	Intermediate	Upper	Lower	Intermediate	Upper	Lower	Intermediate	Upper	Lower	Intermediate	Upper	Lower
Volatile organic compounds (µg/L)																
1,1,1-TRICHLOROETHANE	200	--	--	--	--	--	0.92 J	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	2.8	--	--	--	--	--	0.45 J	--	--	--	--	--	--	0.27 J	--	--
1,1-DICHLOROETHENE	7	11 J	0.64 J	--	--	--	1.6 J	18 J	--	--	--	--	--	0.48 J	41 J	--
1,2,3-TRIMETHYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	70	75 J	--	--	30 J	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRIMETHYLBENZENE	5.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	600	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROETHANE	5	25 J	--	--	12 J	--	0.6 J	--	--	--	--	--	--	0.57 J	--	23 J
1,2-DICHLOROPROPANE	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZENE	5	7.5 J	--	--	--	--	--	--	--	--	--	--	--	0.2 J	--	21 J
CARBON TETRACHLORIDE	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROBENZENE	100	--	--	--	--	--	--	--	--	--	--	0.21 J	--	0.44 J	--	--
CHLOROETHANE	2100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROFORM	80	10 J	--	--	--	--	--	--	--	--	--	--	--	--	--	250
CIS-1,2-DICHLOROETHENE	70	1100	26	--	640	930	76	1300	2700	--	--	2	--	74	7800	760
CYCLOHEXANE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIISOPROPYL ETHER	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYLBENZENE	700	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.2 J
ISOPROPYLBENZENE	45	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M+P-XYLENES	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	24 J
METHYL TERT-BUTYL ETHER	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-PROPYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	0.17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-XYLENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	17 J
SEC-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TERT-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TERTIARY-BUTYL ALCOHOL	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TETRACHLOROETHENE	5	6.9 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOLUENE	1000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	59
TOTAL XYLENES	10.000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	41 J
TRANS-1,2-DICHLOROETHENE	100	--	3.5	--	--	180	1.7 J	9 J	--	--	--	0.34 J	--	1.7	--	13 J
TRICHLOROETHENE	5	2700	8.4	--	1100	--	340	2600	3100	--	--	--	0.71 J	39	930	4100
VINYL CHLORIDE	2	430	1.4	--	310	1900	2.8	160	970	--	--	--	--	24	2300	84
Semivolatile orgeanic comoounds (ue/L)																
1,4-DIOXANE	0.46	97	--	--	62	770	2.7	19	6.4	--	--	--	--	1.2	39	39
Metals (µg/L)																
ANTIMONY	6	--	--	0.82 J	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	10	--	--	--	0.87 J	10	--	--	3.2 J	--	--	5.3	--	--	1.2 J	5.6
BARIUM	2000	11	5.5	27	15	100	47	16	19	21	15	100	170	13	16	48
BERYLLIUM	4	2.5	--	0.69 J	3.5	--	2	0.88 J	--	0.81 J	9	--	1.7	2.9	0.31 J	0.75 J
CADMIUM	5	400	--	1.3	860	--	2.6	57	--	0.7 J	12	--	1.2	2.7	--	--
CHROMIUM	100	2.9	14	--	20	2.7	1.4 J	1.7 J	1 J	9.1	3.2	--	--	4	--	1.8 J
COBALT	NC	360	2	57	270	1.4	51	97	25	78	47	3.8	66	36	6.6	440
COPPER	1300	40	2	35	--	--	27	69	4.9	4	99	--	17	14	2.4	--
IRON	1400	16000	150	95 J	14000	500	440	19000	36000	12000	2100	120000	66 J	23000	7800	22000
LEAD	15	1.9	0.45 J	2	1.5	0.46 J	1.3	6.2	--	0.88 J	6.9	--	4.9	2.1	0.56 J	2.9
MANGANESE	43	7000	11	300	6000	280	840	3400	2700	3300	1900	1100	650	1600	5800	3400
MERCURY	2	--	--	0.39	--	--	0.59	--	--	0.15 J	0.22	--	2.8	--	--	--

Table 4-3
Detected Analytes and Screening-Criteria Exceedances for
Groundwater Samples—2020, Dump Road Area
Martin State Airport, Middle River, Maryland

LOCATION	Maryland Department of the Environment Groundwater Standard (1) (2) (3)	DMW-09I	DMW-09S	DMW-11I	DMW-11S	MW-04	MW-06	MW-14D	MW-14I	MW-15D	MW-15I	MW-16D	MW-16I	MW-16S
SAMPLE ID		MSA-DMW-9I-042420	MSA-DMW-9S-042420	MSA-DMW-11I-052920	MSA-DMW-11S-052920	MSA-MW-4-042220	MSA-MW-6-042220	MSA-MW-14D-050720	MSA-MW-14I-050720	MSA-MW-15D-050520	MSA-MW-15I-042420	MSA-MW-16D-050520	MSA-MW-16I-050520	MSA-MW-16S-050520
SAMPLE DATE		20200424	20200424	20200529	20200529	20200422	20200422	20200507	20200507	20200505	20200424	20200505	20200505	20200505
SCREENED AQUIFER		Intermediate	Upper	Intermediate	Upper	Upper	Upper	Aquitard below	Intermediate	Lower	Intermediate	Lower	Intermediate	Upper
Volatile organic compounds (µg/L)														
1,1,1-TRICHLOROETHANE	200	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	2.8	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHENE	7	11 J	--	--	--	--	--	--	0.19 J	--	--	--	--	--
1,2,3-TRIMETHYLBENZENE	NC	--	19 J	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	70	--	--	--	--	--	--	--	--	--	--	--	--	1 J
1,2,4-TRIMETHYLBENZENE	5.6	--	37 J	--	--	--	--	--	0.094 J	--	--	--	--	--
1,2-DICHLOROBENZENE	600	--	--	--	--	--	--	--	0.69 J	--	--	--	--	2.2
1,2-DICHLOROETHANE	5	33 J	--	--	--	0.9 J	--	--	1.7	--	--	--	--	--
1,2-DICHLOROPROPANE	5	--	--	--	--	--	--	--	0.25 J	--	--	--	--	--
1,3-DICHLOROBENZENE	NC	--	--	--	--	--	--	--	0.15 J	--	--	--	--	0.75 J
1,4-DICHLOROBENZENE	75	--	--	--	--	--	--	--	0.5 J	--	--	--	--	0.64 J
BENZENE	5	19 J	110	--	--	0.94 J	--	--	16	--	--	--	--	7.9
CARBON TETRACHLORIDE	5	--	--	8200	6900	--	--	--	--	--	--	--	--	--
CHLOROBENZENE	100	--	83	--	--	5.1	--	--	9.8	--	--	--	--	0.81 J
CHLOROETHANE	2100	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROFORM	80	66	--	2200	5200	--	--	--	--	--	--	--	--	--
CIS-1,2-DICHLOROETHENE	70	1600	--	5500	45000	0.7 J	0.52 J	--	27	1.7	--	--	320	30
CYCLOHEXANE	NC	--	--	--	--	--	--	--	5.7 NJ	--	--	--	--	--
DIISOPROPYL ETHER	NC	--	--	--	--	--	--	--	--	--	--	--	--	3.2 J
ETHYLBENZENE	700	--	300	--	--	--	--	--	0.33 J	--	--	--	--	--
ISOPROPYLBENZENE	45	--	6.5 J	--	--	0.13 J	--	--	0.43 J	--	--	--	--	--
M+P-XYLENES	NC	--	2100	82 J	280 J	--	--	--	0.89 J	--	--	--	--	--
METHYL TERT-BUTYL ETHER	20	--	--	--	--	--	--	--	--	--	--	--	--	--
N-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--
N-PROPYLBENZENE	NC	--	6.2 J	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	0.17	--	--	--	--	--	--	--	--	--	--	--	--	--
O-XYLENE	NC	--	240	61 J	--	--	--	--	1.1	--	--	--	--	--
SEC-BUTYLBENZENE	NC	--	--	--	--	--	--	--	1.4	--	--	--	--	--
TERT-BUTYLBENZENE	NC	--	--	--	--	--	--	--	0.78 J	--	--	--	--	--
TERTIARY-BUTYL ALCOHOL	NC	--	--	--	--	--	--	--	1.9 J	--	--	--	--	11 J
TETRACHLOROETHENE	5	--	--	--	--	--	--	--	--	--	--	--	--	--
TOLUENE	1000	--	250	2000	26000	--	--	--	0.49 J	--	--	--	--	--
TOTAL XYLENES	10.000	--	2300	140 J	--	--	--	--	2	--	--	--	--	--
TRANS-1,2-DICHLOROETHENE	100	10 J	--	130 J	--	0.44 J	--	--	--	--	--	--	--	--
TRICHLOROETHENE	5	1200	5.3 J	24000	58000	--	--	--	--	0.75 J	--	--	1500	--
VINYL CHLORIDE	2	500	--	380 J	4300	1.6	--	--	780	--	--	--	30 J	91
Semivolatile orgaanic compounds (ug/L)														
1,4-DIOXANE	0.46	100	13	71 J+	420	3.5	--	0.9 J	28	--	--	--	1.1	240
Metals (µg/L)														
ANTIMONY	6	--	--	--	0.59 J	0.87 J	--	--	0.77 J	--	--	--	--	--
ARSENIC	10	1.5 J	1.2 J	4.3 J	4.1 J	--	1.7 J	1.9 J	19	--	--	--	7.7	1.4 J
BARIUM	2000	37	73	25	34	38	11	46	16	4.4 J	7.6	5	4.3 J	50
BERYLLIUM	4	1.1	--	0.78 J	1.8	--	--	--	--	--	--	--	0.51 J	--
CADMIUM	5	4.1	--	220	250	0.28 J	--	--	--	--	--	--	0.32 J	--
CHROMIUM	100	1 J	--	7.5	12	1 J	--	1.4 J	--	1.4 J	--	--	--	2.8
COBALT	NC	250	--	150	83	1	28	1.8	3.1	7.3	--	8.1	40	84
COPPER	1300	3.4	--	--	6.6	2.6	--	8.7	--	3.8	5.3	4.4	2.2	--
IRON	1400	13000	11000	6600	13000	6400	82000	170	58000	350	210	140	1800	31000
LEAD	15	4.2	--	--	1.5	1.6	--	--	--	--	--	--	--	--
MANGANESE	43	5100	1500	2600	1700	880	9000	13	1600	22	16	17	42	5200
MERCURY	2	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 4-3
Detected Analytes and Screening-Criteria Exceedances for
Groundwater Samples—2020, Dump Road Area
Martin State Airport, Middle River, Maryland

LOCATION	Maryland Department of the Environment Groundwater Standard (1) (2) (3)	MW-17D	MW-17I	MW-17S	MW-18I	MW-18S	MW-19D	MW-20D	MW-20I	MW-20S	MW-21D	MW-21I	MW-22D	MW-23D
SAMPLE ID		MSA-MW-17D-051320	MSA-MW-17I-051320	MSA-MW-17S-051320	MSA-MW-18I-050120	MSA-MW-18S-050120	MSA-MW-19D-050820	MSA-MW-20D-043020	MSA-MW-20I-043020	MSA-MW-20S-043020	MSA-MW-21D-052720	MSA-MW-21I-052720	MSA-MW-22D-060320	MSA-MW-23D-052920
SAMPLE DATE		20200513	20200513	20200513	20200501	20200501	20200508	20200430	20200430	20200430	20200527	20200527	20200603	20200529
SCREENED AQUIFER		Lower	Intermediate	Upper	Intermediate	Upper	Lower	Lower	Intermediate	Upper	Lower	Intermediate	Lower	Lower
Volatile organic compounds (µg/L)														
1,1,1-TRICHLOROETHANE	200	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	2.8	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHENE	7	--	--	--	--	--	--	--	--	0.26 J	--	1.1 J	--	--
1,2,3-TRIMETHYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	70	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRIMETHYLBENZENE	5.6	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	600	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROETHANE	5	--	--	--	--	--	--	--	--	0.44 J	--	--	--	--
1,2-DICHLOROPROPANE	5	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	75	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZENE	5	--	--	--	--	--	--	--	--	0.25 J	--	1 J	--	--
CARBON TETRACHLORIDE	5	--	--	--	--	--	0.48 J	--	--	--	--	--	--	7.4
CHLOROBENZENE	100	--	--	--	--	--	--	--	--	4.4	--	--	--	--
CHLOROETHANE	2100	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROFORM	80	--	--	--	--	--	0.26 J	0.13 J	--	--	0.22 J	--	--	2.6
CIS-1,2-DICHLOROETHENE	70	--	260	0.37 J	0.5 J	--	0.36 J	1.1	0.57 J	26	0.22 J	150	--	0.25 J
CYCLOHEXANE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--
DIISOPROPYL ETHER	NC	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYLBENZENE	700	--	--	--	--	--	--	--	--	--	--	--	--	--
ISOPROPYLBENZENE	45	--	--	--	--	--	--	--	--	--	--	--	--	--
M+P-XYLENES	NC	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL TERT-BUTYL ETHER	20	--	--	--	--	--	--	--	--	--	--	--	--	--
N-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--
N-PROPYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	0.17	--	--	--	--	--	--	--	--	--	--	--	--	--
O-XYLENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--
SEC-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--
TERT-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--
TERTIARY-BUTYL ALCOHOL	NC	--	--	--	--	--	--	--	--	--	--	--	--	--
TETRACHLOROETHENE	5	--	--	--	--	--	--	--	--	--	--	--	--	--
TOLUENE	1000	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL XYLENES	10.000	--	--	--	--	--	--	--	--	--	--	--	--	--
TRANS-1,2-DICHLOROETHENE	100	--	--	--	--	--	--	--	--	0.89 J	--	3.7	--	--
TRICHLOROETHENE	5	--	1800	11	0.26 J	0.14 J	28	5.1	--	5.4	1.1	--	--	2.8
VINYL CHLORIDE	2	--	15 J	--	--	--	--	0.32 J	--	8.7	--	39	--	--
Semivolatile orgeanic comoounds (ug/L)														
1,4-DIOXANE	0.46	--	--	--	--	--	--	--	--	4	--	2.5	--	1.9
Metals (µg/L)														
ANTIMONY	6	--	--	--	0.6 J	0.97 J	--	--	--	--	--	--	--	--
ARSENIC	10	--	1.6 J	0.97 J	--	0.92 J	0.95 J	--	0.83 J	1.4 J	0.91 J	17 J+	2.3 J	1.1 J
BARIUM	2000	--	13	40	16	29	48	130	37	47	36 J+	20 J+	38	28
BERYLLIUM	4	--	--	--	--	--	3.1	0.69 J	--	--	0.4 J	--	--	--
CADMIUM	5	--	--	0.36 J	--	0.21 J	1.7	13	--	0.51 J	--	--	--	--
CHROMIUM	100	--	--	--	2.2	5.5	3.4	--	--	--	4 J+	--	3.9	--
COBALT	NC	--	27	1.9	0.54 J	0.84 J	240	65	0.65 J	0.8 J	11 J+	4.5 J+	12	4.9
COPPER	1300	--	--	2	5.6	9.3	2	60	2	3.6	5.6 J+	--	2.1	3.6
IRON	1400	--	1200	3900	11000	2700	260	75 J	1300	2500	860 J+	19000 J+	2600	3400
LEAD	15	--	--	--	2.2	4	--	0.49 J	--	--	2 J+	1.3 J+	1	0.79 J
MANGANESE	43	--	60	520	260	61	3100	850	71	270	62 J+	440 J+	82	120
MERCURY	2	--	--	--	--	--	--	7.1	--	--	0.14 J	--	--	0.28

Table 4-3
Detected Analytes and Screening-Criteria Exceedances for
Groundwater Samples—2020, Dump Road Area
Martin State Airport, Middle River, Maryland

LOCATION	Maryland Department of the Environment Groundwater Standard (1) (2) (3)	MW-23S	MW-24I	MW-24S	MW-25I	MW-25S	MW-27D	MW-29D	MW-30D	MW-30I	MW-31D	MW-32I	MW-32S	MW-33I	MW-33S
SAMPLE ID		MSA-MW-23S-052920	MSA-MW-24I-060420	MSA-MW-24S-060420	MSA-MW-25I-060220	MSA-MW-25S-060220	MSA-MW-27D-050720	MSA-MW-29D-060820	MSA-MW-30D-060920	MSA-MW-30I-060920	MSA-MW-31D-052820	MSA-MW-32I-052820	MSA-MW-32S-052820	MSA-MW-33I-051820	MSA-MW-33S-051820
SAMPLE DATE		20200529	20200604	20200604	20200602	20200602	20200507	20200608	20200609	20200609	20200528	20200528	20200528	20200518	20200518
SCREENED AQUIFER		Upper	Intermediate	Upper	Intermediate	Upper	Deep/confined	Deep/confined	Deep/confined	Intermediate	Deep/confined	Intermediate	Upper	Intermediate	Upper
Volatile organic compounds (µg/L)															
1,1,1-TRICHLOROETHANE	200	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	2.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHENE	7	--	--	--	--	0.42 J	--	--	--	--	--	--	--	--	--
1,2,3-TRIMETHYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	70	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRIMETHYLBENZENE	5.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	600	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROETHANE	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROPROPANE	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	75	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZENE	5	2.2	--	0.17 J	--	--	--	--	--	--	--	--	--	--	--
CARBON TETRACHLORIDE	5	--	57	--	--	--	--	--	--	32	--	--	--	--	--
CHLOROBENZENE	100	0.32 J	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROETHANE	2100	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROFORM	80	--	4.1	--	--	--	--	--	--	6.3 J	--	--	--	--	--
CIS-1,2-DICHLOROETHENE	70	3.6	0.42 J	--	--	95	--	--	--	2.6 J	--	--	--	--	17
CYCLOHEXANE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIISOPROPYL ETHER	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYLBENZENE	700	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ISOPROPYLBENZENE	45	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M+P-XYLENES	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL TERT-BUTYL ETHER	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-PROPYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	0.17	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-XYLENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SEC-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TERT-BUTYLBENZENE	NC	0.16 J	--	--	--	--	--	--	--	--	--	--	--	--	--
TERTIARY-BUTYL ALCOHOL	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TETRACHLOROETHENE	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOLUENE	1000	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL XYLENES	10.000	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRANS-1,2-DICHLOROETHENE	100	--	--	--	--	2.4	--	--	--	--	--	--	--	--	--
TRICHLOROETHENE	5	--	89	--	--	--	--	--	--	480	--	--	--	0.12 J	18
VINYL CHLORIDE	2	4.5	--	--	--	92	0.34 J	--	--	--	--	--	--	--	0.58 J
Semivolatile orgeanic comoounds (ue/L)															
1,4-DIOXANE	0.46	1.3	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (µg/L)															
ANTIMONY	6	--	--	--	--	--	--	--	--	--	--	0.62 J	--	--	0.71 J
ARSENIC	10	1.8 J	2 J	--	18	5.4	--	--	--	--	--	1.3 J	2.4 J	1.9 J	1.1 J
BARIUM	2000	140	55	27	33	68	7.7	4.1 J	5.3	28	25	41	30	35	25
BERYLLIUM	4	--	--	5	--	--	--	--	--	0.35 J	--	0.32 J	--	--	--
CADMIUM	5	0.21 J	--	3	--	--	--	--	--	0.34 J	0.4 J	0.46 J	0.59 J	--	0.35 J
CHROMIUM	100	2.7	1.5 J	14	4.7	1.7 J	--	--	--	--	5.2	3.9	3.4	--	--
COBALT	NC	1.8	12	400	0.8 J	6.2	4.6	1.2	3.5	23	5	92	72	7	2.4
COPPER	1300	2.2	4.3	470	2.1	--	3.2	--	--	4.1	3	8.1	3.4	4.3	9.3
IRON	1400	14000	10000	220000	4000	6600	60 J	--	110	740	3400	14000	36000	2300	370
LEAD	15	--	0.6 J	1	--	--	--	--	--	--	0.55 J	1.8	0.92 J	0.58 J	0.95 J
MANGANESE	43	420	950 J-	6000 J-	32	370	48	4.9 J	13	47	410	4800	5200	30	26
MERCURY	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 4-3
Detected Analytes and Screening-Criteria Exceedances for
Groundwater Samples—2020, Dump Road Area
Martin State Airport, Middle River, Maryland

LOCATION	Maryland Department of the Environment Groundwater Standard (1) (2) (3)	MW-34I	MW-34S	MW-35S	MW-36S	MW-37S	MW-38S	MW-40I	MW-40S	MW-41I	MW-41S	MW-42I	MW-42S
SAMPLE ID		MSA-MW-34I-042120	MSA-MW-34S-042120	MSA-MW-35S-042220	MSA-MW-36S-060220	MSA-MW-37S-060420	MSA-MW-38S-060920	MSA-MW-40I-050620	MSA-MW-40S-050620	MSA-MW-41I-051920	MSA-MW-41S-051920	MSA-MW-42I-060120	MSA-MW-42S-060120
SAMPLE DATE		20200421	20200421	20200422	20200602	20200604	20200609	20200506	20200506	20200519	20200519	20200601	20200601
SCREENED AQUIFER		Intermediate	Upper	Upper	Upper	Upper	Upper	Intermediate	Upper	Intermediate	Upper	Intermediate	Upper
Volatile organic compounds (µg/L)													
1,1,1-TRICHLOROETHANE	200	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	2.8	--	--	0.28 J	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHENE	7	--	--	--	--	--	--	--	--	9.8 J	--	9.2 J	--
1,2,3-TRIMETHYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	2.1 J
1,2,4-TRICHLOROBENZENE	70	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRIMETHYLBENZENE	5.6	--	--	--	--	--	--	--	--	--	--	--	3.1
1,2-DICHLOROBENZENE	600	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROETHANE	5	0.8 J	0.35 J	0.34 J	--	--	--	--	--	--	42	--	0.85 J
1,2-DICHLOROPROPANE	5	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	75	--	--	--	--	--	--	--	--	--	--	--	--
BENZENE	5	--	--	--	--	--	--	--	--	2.7 J	17 J	13 J	1.1 J
CARBON TETRACHLORIDE	5	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROBENZENE	100	--	--	--	--	--	--	--	--	58	16 J	--	0.43 J
CHLOROETHANE	2100	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROFORM	80	--	--	--	--	--	--	--	--	--	--	--	--
CIS-1,2-DICHLOROETHENE	70	4.4	2.3	7.8	--	--	--	1100	3400	640	980	2000	4.9
CYCLOHEXANE	NC	--	--	--	--	--	--	--	--	--	--	--	--
DIISOPROPYL ETHER	NC	--	--	--	--	--	--	--	--	--	--	--	--
ETHYLBENZENE	700	--	--	--	--	--	--	--	--	--	--	--	10
ISOPROPYLBENZENE	45	--	--	--	--	--	--	--	--	--	--	--	0.36 J
M+P-XYLENES	NC	0.28 J	--	--	--	--	--	--	--	--	--	--	110
METHYL TERT-BUTYL ETHER	20	--	--	0.14 J	--	--	--	--	--	--	--	--	--
N-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--
N-PROPYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	0.17	--	--	--	--	--	--	--	--	--	--	--	--
O-XYLENE	NC	--	--	--	--	--	--	--	--	--	--	--	43
SEC-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--
TERT-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--
TERTIARY-BUTYL ALCOHOL	NC	--	--	--	--	--	--	--	--	--	--	--	--
TETRACHLOROETHENE	5	--	--	--	--	--	--	--	--	--	--	--	--
TOLUENE	1000	--	--	--	--	--	--	--	--	--	--	--	4.1
TOTAL XYLENES	10.000	0.28 J	--	--	--	--	--	--	--	--	--	--	150
TRANS-1,2-DICHLOROETHENE	100	--	--	--	--	--	--	41	93 J	--	11 J	9 J	--
TRICHLOROETHENE	5	--	0.11 J	1.3	--	--	--	150	180	140	1500	410	--
VINYL CHLORIDE	2	7.9	1.4	1.3	--	--	--	28	54 J	250	810	480	5.2
Semivolatile organic compounds (ug/L)													
1,4-DIOXANE	0.46	--	--	0.93 J	1.8	--	--	6.3	3.7	12	230	42	--
Metals (µg/L)													
ANTIMONY	6	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	10	--	1.2 J	--	2 J	--	9.8	6.5	3 J	1.8 J	--	5.2	1.2 J
BARIUM	2000	34	65	52	22	53	41	14	20	22	130	32	29
BERYLLIUM	4	1	0.87 J	3.4	0.54 J	--	--	0.41 J	--	--	--	--	--
CADMIUM	5	0.58 J	--	0.23 J	--	--	--	--	--	1.4	67	--	--
CHROMIUM	100	8	--	--	--	--	--	1 J	--	--	--	1.5 J	5.4
COBALT	NC	97	110	260	100	21	11	2.1	10	19	61	3.8	--
COPPER	1300	470	5.2	6	--	--	--	--	--	--	5.3	1.7 J	3.3
IRON	1400	450	210	4700	2600	2300	28000	8000	4400	57000	--	4100	5800
LEAD	15	0.52 J	--	0.69 J	--	--	--	--	--	0.57 J	--	0.72 J	0.86 J
MANGANESE	43	71	61	500	12	1600 J-	370	1900	1800	2600	620	140	85
MERCURY	2	--	--	--	--	1.3	--	--	--	--	--	--	--

Table 4-3
Detected Analytes and Screening-Criteria Exceedances for
Groundwater Samples—2020, Dump Road Area
Martin State Airport, Middle River, Maryland

LOCATION	Maryland Department of the Environment Groundwater Standard (1) (2) (3)	MW-43S	MW-44S	MW-45S	MW-46D	MW-46I	MW-46S	MW-47D	MW-47I	MW-47S	MW-48D	MW-48I	MW-48S	MW-49D	MW-49I
SAMPLE ID		MSA-MW-43S-060920	MSA-MW-44S-042320	MSA-MW-45S-052720	MSA-MW-46D-051920	MSA-MW-46I-051920	MSA-MW-46S-051820	MSA-MW-47D-052020	MSA-MW-47I-052020	MSA-MW-47S-052020	MSA-MW-48D-050420	MSA-MW-48I-050420	MSA-MW-48S-050420	MSA-MW-49D-051120	MSA-MW-49I-051120
SAMPLE DATE		20200609	20200423	20200527	20200519	20200519	20200518	20200520	20200520	20200520	20200504	20200504	20200504	20200511	20200511
SCREENED AQUIFER		Upper	Upper	Upper	Intermediate	Intermediate	Upper	Intermediate	Intermediate	Upper	Intermediate	Intermediate	Upper	Intermediate	Intermediate
Volatile organic compounds (µg/L)															
1,1,1-TRICHLOROETHANE	200	--	--	--	--	--	--	--	--	--	13 J	--	--	--	--
1,1-DICHLOROETHANE	2.8	--	9.7	--	--	--	0.56 J	--	--	0.38 J	8.3 J	--	--	--	1 J
1,1-DICHLOROETHENE	7	--	--	40 J	0.23 J	1.2 J	--	8.3 J	1.5 J	--	23	--	--	--	3.4 J
1,2,3-TRIMETHYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	70	--	--	150 J	--	--	--	--	1.7 J	--	--	--	--	--	--
1,2,4-TRIMETHYLBENZENE	5.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	600	--	--	--	--	--	--	--	--	--	--	1.8	--	--	--
1,2-DICHLOROETHANE	5	--	--	300	1.4	4.7	--	37 J	6.4	--	6.5 J	--	--	--	--
1,2-DICHLOROPROPANE	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	NC	--	--	--	--	--	--	--	--	--	9 J	2.1	--	--	--
1,4-DICHLOROBENZENE	75	--	2.7	32 J	--	--	--	--	--	--	49	15	--	--	--
BENZENE	5	--	0.22 J	63 J	--	0.73 J	--	--	1.3 J	0.58 J	3.1 J	0.76 J	--	--	--
CARBON TETRACHLORIDE	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROBENZENE	100	--	0.7 J	33 J	--	7.2	--	32 J	11	0.8 J	8.3 J	4.2	--	--	--
CHLOROETHANE	2100	--	3.1	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROFORM	80	--	--	--	--	--	--	9.7 J	1.4 J	--	--	--	--	--	--
CIS-1,2-DICHLOROETHENE	70	0.19 J	0.43 J	9200 J	28	57	0.43 J	260	60	0.94 J	700	0.24 J	0.32 J	330	47
CYCLOHEXANE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIISOPROPYL ETHER	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYLBENZENE	700	--	0.2 J	--	--	--	--	--	--	--	--	--	--	--	--
ISOPROPYLBENZENE	45	--	0.19 J	--	--	--	--	--	--	--	--	0.16 J	--	--	--
M+P-XYLENES	NC	--	0.28 J	--	--	--	--	--	--	--	--	--	--	--	--
METHYL TERT-BUTYL ETHER	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	0.26 J	--	--	--
N-PROPYLBENZENE	NC	--	0.17 J	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	0.17	--	17	--	--	--	--	--	--	--	--	--	--	--	--
O-XYLENE	NC	--	0.24 J	--	--	--	--	--	--	--	--	--	--	--	--
SEC-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	0.5 J	--	--	--
TERT-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TERTIARY-BUTYL ALCOHOL	NC	--	--	--	--	--	--	--	--	7.5 J	--	--	--	--	--
TETRACHLOROETHENE	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOLUENE	1000	--	--	120 J	--	--	--	--	--	--	--	--	--	--	--
TOTAL XYLENES	10.000	--	0.52 J	--	--	--	--	--	--	--	--	--	--	--	--
TRANS-1,2-DICHLOROETHENE	100	--	0.39 J	39 J	0.42 J	0.81 J	--	--	--	--	6.9 J	--	--	--	--
TRICHLOROETHENE	5	0.14 J	--	8000	73	140	--	1400	160	0.74 J	890	0.12 J	--	1800	140
VINYL CHLORIDE	2	--	--	5600	6.7	35	--	180	47	6.8	210	2.8	--	23 J	21
Semivolatile orgaanic comoounds (ug/L)															
1,4-DIOXANE	0.46	--	4.4	280	--	4.8	1	30	13	15	27	--	--	7.8	3.6
Metals (µg/L)															
ANTIMONY	6	--	--	0.61 J	--	--	--	--	--	--	--	--	1.6 J	--	--
ARSENIC	10	--	--	0.91 J	3.4 J	2.2 J	4.4 J	3.3 J	5.6	1.3 J	1.1 J	2.7 J	0.98 J	--	--
BARIUM	2000	48	200	98 J+	9.9	22	26	46	39	61	32	92	32	17	110
BERYLLIUM	4	--	--	--	--	0.34 J	--	--	1.5	--	--	--	--	5.5	0.97 J
CADMIUM	5	--	--	520 J+	--	0.75 J	--	0.32 J	56	--	8.6	--	0.44 J	14	6.1
CHROMIUM	100	--	--	550 J+	--	1.5 J	7.4	--	2.8	1.4 J	--	1.9 J	1.1 J	1.9 J	2.2
COBALT	NC	--	--	6.3 J+	19	140	4.2	51	45	0.91 J	58	8.4	0.21 J	330	23
COPPER	1300	--	--	7 J+	6	--	2.3	--	51	--	1.7 J	--	2.6	74	6.6
IRON	1400	500	560	520 J+	1500	12000	6100	11000	4900	5700	1400	5400	--	63 J	6400
LEAD	15	--	--	--	1.4	0.52 J	--	--	0.61 J	--	--	--	--	0.68 J	--
MANGANESE	43	23	1100	1100 J+	39	850	520	1000	2800	3400	2600	590	--	5700	1400
MERCURY	2	--	--	--	--	--	--	--	0.5	--	1.2	--	--	--	--

Table 4-3
Detected Analytes and Screening-Criteria Exceedances for
Groundwater Samples—2020, Dump Road Area
Martin State Airport, Middle River, Maryland

LOCATION	Maryland Department of the Environment Groundwater Standard (1) (2) (3)	MW-49S	MW-50D	MW-50I	MW-50S	MW-51D	MW-51I	MW-51S	MW-52D	MW-52I	MW-52S	MW-53I	MW-53S	MW-54I	MW-54S	MT-MW-01S	MT-MW02S
SAMPLE ID		MSA-MW-49S-051120	MSA-MW-50D-051420	MSA-MW-50I-051420	MSA-MW-50S-051420	MSA-MW-51D-060820	MSA-MW-51I-060820	MSA-MW-51S-060820	MSA-MW-52D-052720	MSA-MW-52I-052120	MSA-MW-52S-052120	MSA-MW-53I-051320	MSA-MW-53S-051220	MSA-MW-54I-060320	MSA-MW-54S-060320	MT-MW-01S-042220	MT-MW-02S-042120
SAMPLE DATE		20200511	20200514	20200514	20200514	20200608	20200608	20200608	20200527	20200521	20200521	20200513	20200512	20200603	20200603	20200422	20200421
SCREENED AQUIFER		Upper	Intermediate	Intermediate	Upper	Intermediate	Intermediate	Upper	Lower	Intermediate	Upper	Intermediate	Upper	Intermediate	Upper	Upper	Upper
Volatile organic compounds (µg/L)																	
1,1,1-TRICHLOROETHANE	200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	2.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHENE	7	--	--	--	--	--	--	0.22 J	--	--	--	--	--	--	--	--	--
1,2,3-TRIMETHYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	70	--	--	--	--	--	--	--	--	49 J	--	--	--	--	--	--	--
1,2,4-TRIMETHYLBENZENE	5.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	600	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROETHANE	5	--	--	--	--	--	--	--	110 J	27 J	--	9.1 J	0.62 J	--	--	--	--
1,2-DICHLOROPROPANE	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZENE	5	--	--	--	--	--	--	--	--	--	2.9 J	--	0.47 J	--	--	--	--
CARBON TETRACHLORIDE	5	--	--	--	--	--	--	--	64 J	--	--	--	--	6100	6000	--	--
CHLOROBENZENE	100	--	--	--	--	--	--	--	45 J	19 J	1.9 J	--	0.15 J	--	--	--	--
CHLOROETHANE	2100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROFORM	80	--	--	--	--	--	--	--	91 J	13 J	--	3.1 J	--	4600	2000 J+	--	--
CIS-1,2-DICHLOROETHENE	70	0.28 J	270	180	330	36	350	69	1200	1900	91	560	3.4	42000 J+	4800	--	--
CYCLOHEXANE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIISOPROPYL ETHER	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHYLBENZENE	700	--	--	--	--	--	--	--	--	--	1.8 J	--	--	--	--	--	--
ISOPROPYLBENZENE	45	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
M+P-XYLENES	NC	--	--	--	--	--	--	--	--	--	--	--	--	240 J	--	--	--
METHYL TERT-BUTYL ETHER	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-PROPYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	0.17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O-XYLENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	130 J	--	--	--
SEC-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TERT-BUTYLBENZENE	NC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TERTIARY-BUTYL ALCOHOL	NC	--	--	--	--	190 J	--	--	--	--	800 J	--	--	--	--	--	--
TETRACHLOROETHENE	5	--	--	--	--	--	--	0.38 J	--	--	--	--	--	160 J	--	--	--
TOLUENE	1000	--	--	--	--	--	--	--	--	--	--	--	--	24000 J+	2000	--	--
TOTAL XYLENES	10.000	--	--	--	--	--	--	--	--	--	--	--	--	370 J	--	--	--
TRANS-1,2-DICHLOROETHENE	100	--	1.5 J	--	--	1.6 J	2.4 J	1.1	--	--	3.1 J	5.5 J	--	290 J	--	--	--
TRICHLOROETHENE	5	0.98 J	72	320	560	120	160	24	5900	3600	--	510	1.8	54000	18000	--	--
VINYL CHLORIDE	2	--	9.7	7.4 J	17 J	2.6 J	18	0.28 J	270	480	150	110	6.5	3100	290 J	--	--
Semivolatile orgaanic comoounds (ug/L)																	
1,4-DIOXANE	0.46	--	1.1 J	3.1 J	4.8 J	2.1	1.9	--	120	74	90	94 J	170	500	64	--	--
Metals (µg/L)																	
ANTIMONY	6	--	--	--	--	--	--	--	4.3 J+	--	--	--	--	0.85 J	--	--	--
ARSENIC	10	0.82 J	--	--	--	--	--	0.82 J	9.3 J+	1.7 J	18	--	3.7 J	10	2.1 J	--	--
BARIUM	2000	63	13	14	18	23	17	26	31 J+	43	230	110	44	120	25	--	--
BERYLLIUM	4	0.42 J	2.4	3.2	3.1	2.4	2.6	--	1.8	1.4	--	3.3	--	1.9	0.6 J	--	--
CADMIUM	5	2.7	2	2.6	12	1.9	2.3	0.25 J	760 J+	470	--	99	--	390	46	--	--
CHROMIUM	100	--	2.9	3.7	4.1	1.7 J	3.5	--	8.6 J+	1.4 J	5.4	21	3.4	52	5.2	--	--
COBALT	NC	2.4	100	130	120	110	100	1.3	170 J+	160	2.3	370	15	86	140	--	--
COPPER	1300	--	45	47	77	34	33	--	360 J+	--	3.4 J-	300	--	51	--	--	--
IRON	1400	780	22000	14000	20000	15000	16000	--	1300 J+	12000	32000	7500	9900	12000	6100	--	--
LEAD	15	--	0.79 J	1	2.2	--	0.75 J	--	9 J+	5.9	3.3	2.7	--	10	--	--	--
MANGANESE	43	120	5100	4600	2500	3700	4700	250	2100 J+	2800	440	2100	480	1700	2700	--	--
MERCURY	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 4-3
Detected Analytes and Screening-Criteria Exceedances for
Groundwater Samples—2020, Dump Road Area
Martin State Airport, Middle River, Maryland

LOCATION	Maryland Department of the Environment Groundwater Standard (1) (2) (3)	DMW-02A	DMW-02B	DMW-03D	DMW-03I	DMW-03S	DMW-04D	DMW-04I	DMW-05S	DMW-06D	DMW-06I	DMW-06S	DMW-07D	DMW-07I	DMW-07S	DMW-09D
SAMPLE ID		MSA-DMW-2A-050120	MSA-DMW-2B-050120	MSA-DMW-3D-050620	MSA-DMW-3I-050620	MSA-DMW-3S-050720	MSA-DMW-4D-050820	MSA-DMW-4I-050820	MSA-DMW-5S-050820	MSA-DMW-6D-051220	MSA-DMW-6I-051220	MSA-DMW-6S-051220	MSA-DMW-7D-042320	MSA-DMW-7I-042320	MSA-DMW-7S-042320	MSA-DMW-9D-042420
SAMPLE DATE		20200501	20200501	20200506	20200506	20200507	20200508	20200508	20200508	20200512	20200512	20200512	20200423	20200423	20200423	20200424
MOLYBDENUM	NC	--	--	6.9	1.4 J	2.1 J	--	--	--	--	--	--	--	--	--	--
NICKEL	39	130	3.6	44	120	1.6 J	60	83	6.2	53	71	--	92	45	6.5	65
SELENIUM	50	1.5 J	--	1.4 J	16	--	3.5 J	1.4 J	1.3 J	2.1 J	3.7 J	--	1.4 J	--	--	--
SILVER	9.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	2	0.29 J	0.21 J	1.6	1.1	--	--	0.53 J	--	0.24 J	0.28 J	--	--	--	--	--
VANADIUM	8.6	4 J	--	--	22	1.9 J	--	0.84 J	2.6 J	1.2 J	1.2 J	--	--	6.5	--	3.5 J
Metals, filtered (µg/L)																
ANTIMONY	6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	10	--	--	--	--	10	--	--	2.9 J	--	--	5.6	--	--	0.91 J	5.7
BARIUM	2000	11	5.4	27	14	100	46	16	20	21	15	100	170	14	16	47
BERYLLIUM	4	2.4	--	0.49 J	3.2	--	1.9	0.94 J	--	1.3	9.8	--	1.7	2.9	--	0.73 J
CADMIUM	5	400	--	1.2	810	--	2.5	58	--	0.65 J	12	--	1.2	2.7	--	--
CHROMIUM	100	2.7	--	--	4.7	2.3	1.6 J	1.7 J	--	1.1 J	2.7	--	--	3.9	--	--
COBALT	NC	350	1.6	57	260	1.3	49	99	26	80	47	3.8	65	37	6.6	440
COPPER	1300	42	2	36	1.7 J	--	27	73	3.4	--	100	--	19	14	--	--
IRON	1400	16000	--	--	14000	180	460	20000 J	36000	11000	1500	120000	--	23000	6500	22000
LEAD	15	1.9	--	1.7	1.4	--	1.3	6.2	--	--	7.3	--	4.7	2.1	--	--
MANGANESE	43	6900	7.3	300	5800	230	820	3500 J	2900	3300	1900	1100	640	1600	5700	3400
MERCURY	2	--	--	--	--	--	0.62	--	--	--	--	--	0.3	--	--	--
MOLYBDENUM	NC	--	--	1.3 J	--	2.6 J	--	--	--	--	--	--	--	--	--	--
NICKEL	39	130	2.6	44	120	2.1	57	84	6.6	55	71	--	91	46	6.7	67
SELENIUM	50	1.4 J	--	0.99 J	15	--	3.1 J	1.4 J	1.4 J	2.3 J	3.6 J	--	1.4 J	--	--	--
THALLIUM	2	0.29 J	0.3 J	0.48 J	1	--	--	0.65 J	--	--	0.27 J	--	--	--	--	--
VANADIUM	8.6	3.9 J	--	--	21	1.6 J	--	0.88 J	1.6 J	--	--	--	--	6.3	--	2.4 J
Miscellaneous (µg/L)																
HEXAVALENT CHROMIUM	0.035	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PERCHLORATE	15	--	--	--	--	--	0.43 J	0.74	--	--	--	--	--	--	--	--
Petroleum hydrocarbons (ug/L)																
Gasoline-range organics (C06-C10)	47	--	--	--	--	190	--	--	1100	--	--	--	--	--	3100	--
Diesel-range organics (C10-C32)	47	--	--	--	--	1800	--	--	460 J	--	--	1100	--	--	760	--
Radionuclides (pCi/L)																
RADIUM-228	5	--	--	1.2	11.2	--	--	--	--	2.42	13	0.789	--	--	--	--
TOTAL ALPHA RADIUM	5	--	--	0.654	4.63	--	--	--	--	4.08	10.9	0.983	--	--	--	--

Table 4-3
Detected Analytes and Screening-Criteria Exceedances for
Groundwater Samples—2020, Dump Road Area
Martin State Airport, Middle River, Maryland

LOCATION	Maryland Department of the Environment Groundwater Standard (1) (2) (3)	DMW-09I	DMW-09S	DMW-11I	DMW-11S	MW-04	MW-06	MW-14D	MW-14I	MW-15D	MW-15I	MW-16D	MW-16I	MW-16S
SAMPLE ID		MSA-DMW-9I-042420	MSA-DMW-9S-042420	MSA-DMW-11I-052920	MSA-DMW-11S-052920	MSA-MW-4-042220	MSA-MW-6-042220	MSA-MW-14D-050720	MSA-MW-14I-050720	MSA-MW-15D-050520	MSA-MW-15I-042420	MSA-MW-16D-050520	MSA-MW-16I-050520	MSA-MW-16S-050520
SAMPLE DATE		20200424	20200424	20200529	20200529	20200422	20200422	20200507	20200507	20200505	20200424	20200505	20200505	20200505
MOLYBDENUM	NC	--	--	--	--	4 J	--	1.8 J	1.2 J	--	--	--	--	--
NICKEL	39	78	--	130	79	4.2	9.4	5.5	2.2	11	--	11	52	73
SELENIUM	50	1 J	--	1.6 J	2.6 J	--	--	--	--	--	--	--	--	--
SILVER	9.4	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	2	--	--	0.36 J	0.63 J	--	--	--	0.23 J	--	--	--	--	--
VANADIUM	8.6	--	7.1	4.2 J	8	--	1.4 J	2.1 J	--	--	1.1 J	--	--	1.4 J
Metals, filtered (µg/L)														
ANTIMONY	6	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	10	1.2 J	1.1 J	1.6 J	2.9 J	--	1.3 J	1.8 J	19	--	--	--	7.3	1.2 J
BARIUM	2000	37	72	25	27	39	11	47	15	4.1 J	7.2	4.3 J	3.8 J	50
BERYLLIUM	4	1.2	--	0.79 J	1.7	--	--	--	--	--	--	--	0.5 J	0.34 J
CADMIUM	5	4.4	--	55	260	--	--	--	--	--	--	--	0.22 J	--
CHROMIUM	100	--	1 J	5.3	5.9	1 J	--	1.2 J	--	--	--	--	--	2.6
COBALT	NC	270	--	150	86	0.92 J	28	1.9	3.1	6.4	--	6.9	37	80
COPPER	1300	--	--	--	3.8	--	--	8.4	--	3.4	3.9	4.1	--	--
IRON	1400	14000	10000	5500	13000	6200	85000	84 J	57000	47 J	--	47 J	1700	31000
LEAD	15	2.1	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	43	5400	1500	2700	1800	910	9200	14	1600	15	4.5 J	14	39	5200
MERCURY	2	--	--	--	--	--	--	--	--	--	--	--	--	--
MOLYBDENUM	NC	--	--	--	--	4.1 J	--	2 J	--	--	--	--	--	--
NICKEL	39	81	--	130	81	3.6	9.7	5.7	1.9 J	11	--	9.3	49	69
SELENIUM	50	0.9 J	--	1.5 J	2.5 J	--	--	--	--	--	--	--	--	--
THALLIUM	2	--	--	0.38 J	0.41 J	--	--	--	--	--	--	--	--	0.29 J
VANADIUM	8.6	--	7.1	1.1 J	1.8 J	--	--	2.1 J	--	--	--	--	--	1.3 J
Miscellaneous (µg/L)														
HEXAVALENT CHROMIUM	0.035	--	--	--	--	--	--	--	--	0.76 J	--	--	--	--
PERCHLORATE	15	--	--	--	--	--	--	--	--	0.4 J	--	0.62	--	--
Petroleum hydrocarbons (ug/L)														
Gasoline-range organics (C06-C10)	47	--	5400	--	67000	--	--	--	--	--	--	--	--	--
Diesel-range organics (C10-C32)	47	--	1100	--	2400	500	710	--	--	--	--	--	--	240 J
Radionuclides (pCi/L)														
RADIUM-228	5	--	--	--	--	--	--	--	--	--	--	0.62	--	0.695
TOTAL ALPHA RADIUM	5	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 4-3
Detected Analytes and Screening-Criteria Exceedances for
Groundwater Samples—2020, Dump Road Area
Martin State Airport, Middle River, Maryland

LOCATION	Maryland Department of the Environment Groundwater Standard (1) (2) (3)	MW-17D	MW-17I	MW-17S	MW-18I	MW-18S	MW-19D	MW-20D	MW-20I	MW-20S	MW-21D	MW-21I	MW-22D	MW-23D
SAMPLE ID		MSA-MW-17D-051320	MSA-MW-17I-051320	MSA-MW-17S-051320	MSA-MW-18I-050120	MSA-MW-18S-050120	MSA-MW-19D-050820	MSA-MW-20D-043020	MSA-MW-20I-043020	MSA-MW-20S-043020	MSA-MW-21D-052720	MSA-MW-21I-052720	MSA-MW-22D-060320	MSA-MW-23D-052920
SAMPLE DATE		20200513	20200513	20200513	20200501	20200501	20200508	20200430	20200430	20200430	20200527	20200527	20200603	20200529
MOLYBDENUM	NC	--	--	--	--	1.6 J	--	--	--	--	--	1.5 J	--	--
NICKEL	39	--	36	49	1.6 J	2.7	98	42	--	--	11 J+	1.6 J	7.1	6.1
SELENIUM	50	--	--	--	--	--	1.9 J	1.6 J	--	--	--	--	--	--
SILVER	9.4	--	--	--	--	--	--	--	--	--	0.096 J	--	--	0.075 J
THALLIUM	2	--	--	0.24 J	--	--	--	--	--	0.3 J	--	--	--	--
VANADIUM	8.6	--	--	--	3.5 J	6.2	3.3 J	--	0.82 J	1.9 J	2.9 J	--	2.5 J	--
Metals, filtered (µg/L)														
ANTIMONY	6	--	--	--	--	0.81 J	--	--	--	--	--	--	--	--
ARSENIC	10	--	1.8 J	0.98 J	--	--	--	--	0.97 J	--	--	16 J+	2.5 J	--
BARIUM	2000	--	13	38	12	22	48	140	38	46	31 J+	20 J+	39	28
BERYLLIUM	4	--	--	--	--	--	3	0.74 J	--	--	0.32 J	--	--	--
CADMIUM	5	--	--	0.25 J	--	--	1.6	4.8	--	0.44 J	--	--	--	--
CHROMIUM	100	--	--	--	--	--	20	--	--	--	--	--	3	--
COBALT	NC	--	26	1.6	0.26 J	0.19 J	230	65	0.66 J	0.64 J	9.2 J+	4.1 J+	13	5.8
COPPER	1300	--	--	--	2.2	6.1	--	26	--	2.8	3.6 J+	--	--	--
IRON	1400	--	1200	3400	5900	220	350	--	1200	1300	280 J+	18000 J+	2600	3000
LEAD	15	--	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	43	--	51	480	260	11	3000	880	69	250	52 J+	430 J+	88	130
MERCURY	2	--	--	--	--	--	--	2	--	--	--	--	--	--
MOLYBDENUM	NC	--	--	--	--	1.2 J	--	--	--	--	--	1.5 J	--	--
NICKEL	39	--	35	46	--	--	95	42	--	--	9.5 J+	--	7.3	6.2
SELENIUM	50	--	--	--	--	--	1.8 J	0.98 J	--	--	--	--	--	--
THALLIUM	2	--	--	--	--	--	--	--	--	--	--	--	--	--
VANADIUM	8.6	--	--	--	--	0.9 J	3.4 J	--	--	--	0.84 J	--	1.8 J	--
Miscellaneous (µg/L)														
HEXAVALENT CHROMIUM	0.035	--	--	--	--	--	--	--	--	--	--	--	--	--
PERCHLORATE	15	--	--	--	--	--	--	--	--	--	--	--	--	--
Petroleum hydrocarbons (ug/L)														
Gasoline-range organics (C06-C10)	47	--	--	--	--	--	--	--	--	--	--	--	--	--
Diesel-range organics (C10-C32)	47	--	--	220 J	--	--	--	--	--	--	--	--	--	--
Radionuclides (pCi/L)														
RADIUM-228	5	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL ALPHA RADIUM	5	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 4-3
Detected Analytes and Screening-Criteria Exceedances for
Groundwater Samples—2020, Dump Road Area
Martin State Airport, Middle River, Maryland

LOCATION	Maryland Department of the Environment Groundwater Standard (1) (2) (3)	MW-23S	MW-24I	MW-24S	MW-25I	MW-25S	MW-27D	MW-29D	MW-30D	MW-30I	MW-31D	MW-32I	MW-32S	MW-33I	MW-33S
SAMPLE ID		MSA-MW-23S-052920	MSA-MW-24I-060420	MSA-MW-24S-060420	MSA-MW-25I-060220	MSA-MW-25S-060220	MSA-MW-27D-050720	MSA-MW-29D-060820	MSA-MW-30D-060920	MSA-MW-30I-060920	MSA-MW-31D-052820	MSA-MW-32I-052820	MSA-MW-32S-052820	MSA-MW-33I-051820	MSA-MW-33S-051820
SAMPLE DATE		20200529	20200604	20200604	20200602	20200602	20200507	20200608	20200609	20200609	20200528	20200528	20200528	20200518	20200518
MOLYBDENUM	NC	--	--	--	1.1 J	--	--	--	--	--	--	--	--	--	--
NICKEL	39	6	10	540	17	17	7.2	1.6 J	4	27	8.5	25	29	11	4
SELENIUM	50	--	--	7.9	--	--	--	--	--	--	--	--	--	--	--
SILVER	9.4	--	--	--	--	--	--	--	--	--	--	0.1 J	0.088 J	0.062 J	0.11 J
THALLIUM	2	--	--	0.89 J	0.22 J	--	--	--	--	0.3 J	--	--	--	--	--
VANADIUM	8.6	0.98 J	3.5 J	100	7.5	1.6 J	--	--	--	1.3 J	--	1.8 J	1.5 J	0.82 J	1.8 J
Metals, filtered (µg/L)															
ANTIMONY	6	--	--	--	--	--	--	--	--	--	--	--	--	--	0.89 J
ARSENIC	10	1.9 J	2 J	--	19	5.3	--	--	--	--	--	1.2 J	1.5 J	--	1.3 J
BARIUM	2000	150	52	27	34	66	7.7	4 J	5.2	28	24	40	30	27	25
BERYLLIUM	4	--	--	5.1	--	--	--	--	--	0.49 J	--	--	--	--	0.34 J
CADMIUM	5	--	--	3.1	--	--	--	--	--	0.42 J	--	--	--	--	0.52 J
CHROMIUM	100	2.6	1.1 J	17	4.2	1.4 J	--	--	--	--	2.6	2.4	2.6	--	--
COBALT	NC	1.8	11	420	0.86 J	5.6	4.5	1.2	2.9	26	4.7	94	71	3.4	1.2
COPPER	1300	--	--	470	--	--	3.7	--	--	4.1	--	2.1	--	3	8.7
IRON	1400	16000	9700	220000	4000	6700	--	--	--	1100	3000	8900	30000	250	85 J
LEAD	15	--	--	0.47 J	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	43	470	880 J-	6400 J-	32	360	48	4.2 J	5.8	50	410	4900	5400	17	5.1
MERCURY	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MOLYBDENUM	NC	--	--	--	1.1 J	--	--	--	--	--	--	--	--	--	--
NICKEL	39	5.3	9.5	550	17	16	7.2	1.7 J	4.1	30	7.5	24	28	8	4
SELENIUM	50	--	--	8.2	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	2	--	--	0.9 J	0.32 J	--	--	--	--	0.37 J	--	--	--	--	0.39 J
VANADIUM	8.6	--	2.8 J	71	7	1.3 J	--	--	--	1.1 J	--	--	1.2 J	--	1.3 J
Miscellaneous (µg/L)															
HEXAVALENT CHROMIUM	0.035	--	--	--	--	--	--	0.23 J	--	--	--	--	--	--	--
PERCHLORATE	15	--	--	--	--	--	0.17 J	0.099 J	0.1 J	--	--	--	--	--	--
Petroleum hydrocarbons (ug/L)															
Gasoline-range organics (C06-C10)	47	81 J	--	--	--	--	--	--	--	--	--	--	--	--	--
Diesel-range organics (C10-C32)	47	400 J	--	--	--	--	--	--	--	--	--	--	--	--	--
Radionuclides (pCi/L)															
RADIUM-228	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL ALPHA RADIUM	5	--	--	--	--	--	0.418	--	--	--	--	--	--	--	--

Table 4-3
Detected Analytes and Screening-Criteria Exceedances for
Groundwater Samples—2020, Dump Road Area
Martin State Airport, Middle River, Maryland

LOCATION	Maryland Department of the Environment Groundwater Standard (1) (2) (3)	MW-34I	MW-34S	MW-35S	MW-36S	MW-37S	MW-38S	MW-40I	MW-40S	MW-41I	MW-41S	MW-42I	MW-42S
SAMPLE ID		MSA-MW-34I-042120	MSA-MW-34S-042120	MSA-MW-35S-042220	MSA-MW-36S-060220	MSA-MW-37S-060420	MSA-MW-38S-060920	MSA-MW-40I-050620	MSA-MW-40S-050620	MSA-MW-41I-051920	MSA-MW-41S-051920	MSA-MW-42I-060120	MSA-MW-42S-060120
SAMPLE DATE		20200421	20200421	20200422	20200602	20200604	20200609	20200506	20200506	20200519	20200519	20200601	20200601
MOLYBDENUM	NC	--	--	--	--	--	--	--	--	--	--	--	--
NICKEL	39	140	160	120	140	1.6 J	5.4	2.9	2.2	9.3	59	3.3	--
SELENIUM	50	--	--	--	--	--	--	2.6 J	0.97 J	--	1 J	--	--
SILVER	9.4	--	--	--	--	--	--	--	--	0.076 J	--	0.053 J	0.086 J
THALLIUM	2	--	--	0.24 J	--	--	--	--	--	--	--	--	0.31 J
VANADIUM	8.6	2.2 J	17	--	1.3 J	2.9 J	1 J	1.5 J	--	0.93 J	--	2.1 J	9.4
Metals, filtered (µg/L)													
ANTIMONY	6	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	10	--	1.2 J	--	1.3 J	--	10	6.2	2.5 J	2.7 J	--	5.1	1.1 J
BARIUM	2000	49	72	51	23	51	43	15	19	19	130	33	28
BERYLLIUM	4	1.8	0.89 J	3.4	0.54 J	--	--	0.42 J	--	--	--	--	--
CADMIUM	5	0.95 J	0.2 J	0.23 J	--	--	--	--	--	1.6	65	--	--
CHROMIUM	100	--	--	1.7 J	--	--	--	1.1 J	--	--	--	1.2 J	4.9
COBALT	NC	180	120	260	100	20	12	2.1	9.7	16	61	3.9	--
COPPER	1300	870	5.7	3.5	1.8 J	--	--	--	--	--	5.3	--	--
IRON	1400	100	180	3800	2200	1600	29000	8100	4000	63000	--	4000	5800
LEAD	15	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	43	110	68	500	12	1500 J-	380	1900	1700	2700	640	150	85
MERCURY	2	--	--	--	--	0.35	--	--	--	--	--	--	--
MOLYBDENUM	NC	--	--	--	--	--	--	--	--	--	--	--	--
NICKEL	39	230	170	120	140	1.6 J	5.9	3.3	2.3	7.6	59	3.5	--
SELENIUM	50	--	--	--	--	--	--	2.6 J	--	--	0.95 J	--	--
THALLIUM	2	--	--	0.25 J	--	0.38 J	--	--	--	--	--	--	0.48 J
VANADIUM	8.6	0.94 J	17	--	--	1.1 J	--	1.4 J	--	--	--	1.7 J	8.5
Miscellaneous (µg/L)													
HEXAVALENT CHROMIUM	0.035	--	--	--	--	--	--	--	--	--	--	--	--
PERCHLORATE	15	--	--	--	--	--	--	--	--	--	--	--	--
Petroleum hydrocarbons (ue/L)													
Gasoline-range organics (C06-C10)	47	--	--	--	--	--	--	--	310	--	1000	--	280
Diesel-range organics (C10-C32)	47	--	--	820	--	--	--	--	500	--	380 J	--	--
Radionuclides (pCi/L)													
RADIUM-228	5	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL ALPHA RADIUM	5	--	--	--	--	--	--	--	--	--	--	--	--

Table 4-3
Detected Analytes and Screening-Criteria Exceedances for
Groundwater Samples—2020, Dump Road Area
Martin State Airport, Middle River, Maryland

LOCATION	Maryland Department of the Environment Groundwater Standard (1) (2) (3)	MW-43S	MW-44S	MW-45S	MW-46D	MW-46I	MW-46S	MW-47D	MW-47I	MW-47S	MW-48D	MW-48I	MW-48S	MW-49D	MW-49I
SAMPLE ID		MSA-MW-43S-060920	MSA-MW-44S-042320	MSA-MW-45S-052720	MSA-MW-46D-051920	MSA-MW-46I-051920	MSA-MW-46S-051820	MSA-MW-47D-052020	MSA-MW-47I-052020	MSA-MW-47S-052020	MSA-MW-48D-050420	MSA-MW-48I-050420	MSA-MW-48S-050420	MSA-MW-49D-051120	MSA-MW-49I-051120
SAMPLE DATE		20200609	20200423	20200527	20200519	20200519	20200518	20200520	20200520	20200520	20200504	20200504	20200504	20200511	20200511
MOLYBDENUM	NC	--	--	2.6 J	--	--	--	--	--	--	--	--	--	--	--
NICKEL	39	--	--	25 J+	22	72	5.5	43	15	--	6.5	--	2.2	81	10
SELENIUM	50	--	--	1.8 J	--	--	--	--	1.3 J	--	--	--	--	16	4.4 J
SILVER	9.4	--	--	--	--	--	--	--	7.5	0.83 J	--	--	--	0.18 J	0.15 J
THALLIUM	2	--	--	--	--	--	--	--	--	--	0.22 J	--	0.24 J	0.3 J	0.39 J
VANADIUM	8.6	--	11	17 J+	--	2.9 J	1.7 J	--	2.1 J	1 J	--	--	2.3 J	--	--
Metals, filtered (µg/L)															
ANTIMONY	6	--	--	--	--	--	--	--	--	--	--	--	1.7 J	--	--
ARSENIC	10	--	--	--	--	--	1.9 J	2.7 J	2.2 J	2.6 J	--	2.7 J	0.87 J	--	--
BARIUM	2000	52	200	89 J+	9.4	21	27	46	35	61	32	94	32	17	120
BERYLLIUM	4	--	--	--	--	--	--	--	--	--	--	--	--	5.6	0.84 J
CADMIUM	5	--	--	920 J+	--	0.48 J	--	0.21 J	--	--	8.7	--	0.48 J	14	6.4
CHROMIUM	100	--	--	1200 J+	--	--	2.2	--	--	--	--	1.8 J	1 J	1.8 J	2.2
COBALT	NC	--	--	8.7 J+	18	130	4.1	50	55	0.74 J	59	8.8	0.24 J	330	25
COPPER	1300	--	--	6.8 J+	5.7	1.9 J	--	--	--	--	2.5	--	3.2	75	3.8
IRON	1400	230	480	--	310	4000	3900	11000	3100	5400	1400	5300	--	--	6800
LEAD	15	--	--	--	--	--	--	--	--	--	--	--	--	0.67 J	--
MANGANESE	43	40	1000	1300 J+	35	830	630	1000	2700	3600	2600	600	--	5700	1500
MERCURY	2	--	--	--	--	--	--	--	--	--	0.79	--	--	--	--
MOLYBDENUM	NC	--	--	2.4 J	--	--	--	--	--	--	--	--	--	--	--
NICKEL	39	--	--	35 J+	22	71	2.4	42	18	--	6.5	--	2.5	81	11
SELENIUM	50	--	--	1.8 J	--	--	--	--	--	--	--	--	--	15	4.9 J
THALLIUM	2	--	--	--	--	--	--	--	--	--	0.21 J	--	0.34 J	0.29 J	0.24 J
VANADIUM	8.6	--	11	30 J+	--	--	--	--	--	--	--	--	2.3 J	--	--
Miscellaneous (µg/L)															
HEXAVALENT CHROMIUM	0.035	--	--	--	--	--	--	--	--	--	--	--	1.1	--	--
PERCHLORATE	15	--	--	--	--	--	--	--	--	--	--	--	--	1.1	0.12 J
Petroleum hydrocarbons (ug/L)															
Gasoline-range organics (C06-C10)	47	--	--	4200	--	--	--	--	--	--	--	--	--	--	--
Diesel-range organics (C10-C32)	47	370 J	760	980	--	--	400 J	--	--	730	--	--	--	--	--
Radionuclides (pCi/L)															
RADIUM-228	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL ALPHA RADIUM	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 4-3
Detected Analytes and Screening-Criteria Exceedances for
Groundwater Samples—2020, Dump Road Area
Martin State Airport, Middle River, Maryland

LOCATION	Maryland Department of the Environment Groundwater Standard (1) (2) (3)	MW-49S	MW-50D	MW-50I	MW-50S	MW-51D	MW-51I	MW-51S	MW-52D	MW-52I	MW-52S	MW-53I	MW-53S	MW-54I	MW-54S	MT-MW-01S	MT-MW02S
SAMPLE ID		MSA-MW-49S-051120	MSA-MW-50D-051420	MSA-MW-50I-051420	MSA-MW-50S-051420	MSA-MW-51D-060820	MSA-MW-51I-060820	MSA-MW-51S-060820	MSA-MW-52D-052720	MSA-MW-52I-052120	MSA-MW-52S-052120	MSA-MW-53I-051320	MSA-MW-53S-051220	MSA-MW-54I-060320	MSA-MW-54S-060320	MT-MW-01S-042220	MT-MW-02S-042120
SAMPLE DATE		20200511	20200514	20200514	20200514	20200608	20200608	20200608	20200527	20200521	20200521	20200513	20200512	20200603	20200603	20200422	20200421
MOLYBDENUM	NC	5.6	--	--	--	--	--	--	1.6 J	--	1.9 J	--	--	3.8 J	--	--	--
NICKEL	39	--	43	53	82	50	49	1.5 J	89 J+	53	2.3	410	12	82	120	--	--
SELENIUM	50	1.5 J	1.2 J	1.8 J	1.4 J	1.2 J	1.6 J	--	1.4 J	--	1.4 J	1.9 J	--	2.9 J	1.3 J	--	--
SILVER	9.4	--	--	--	--	0.42 J	--	0.07 J	0.25 J	0.95 J	0.56 J	--	--	--	--	--	--
THALLIUM	2	1.4	--	--	--	--	0.22 J	0.4 J	0.34 J	0.23 J	--	0.2 J	--	0.49 J	--	--	--
VANADIUM	8.6	--	2.2 J	6.2	2.1 J	1.3 J	1.3 J	--	2.9 J	12	7.8	16	--	55	1.2 J	--	--
Metals, filtered (µg/L)																	
ANTIMONY	6	--	--	--	--	--	--	--	4.5 J+	--	--	--	--	--	--	--	--
ARSENIC	10	--	--	--	--	--	--	--	9.5 J+	--	16	--	0.77 J	2.2 J	1.3 J	--	--
BARIUM	2000	59	12	14	18	22	17	26	31 J+	37	240	57	44	27	25	--	--
BERYLLIUM	4	--	2.3	2.8	3.1	2.5	2.6	--	1.9	1.2	--	2.6	--	1.6	0.61 J	--	--
CADMIUM	5	1.8	1.8	2.4	12	1.7	2.2	--	780 J+	120	--	100	--	210	46	--	--
CHROMIUM	100	--	2.8	15	4	1.6 J	3.2	--	8.6 J+	--	1.5 J	20	1.4 J	5	6.7	--	--
COBALT	NC	2.3	96	130	110	110	94	1.2	170 J+	140	2.4	260	15	84	140	--	--
COPPER	1300	--	44	49	76	5.8	33	1.9 J	370 J+	--	--	180	--	--	2.4	--	--
IRON	1400	710	20000	17000	20000	15000	15000	--	1300 J+	8100	19000	13000	3900	8700	5800	--	--
LEAD	15	--	0.68 J	1	2.2	--	0.68 J	--	9 J+	1.2	--	1.5	--	--	--	--	--
MANGANESE	43	120	4800	4800	2600	3700	4400	240	2100 J+	2500	520	3200	490	1700	2700	--	--
MERCURY	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MOLYBDENUM	NC	1.4 J	--	--	--	--	--	--	1.5 J	--	1.4 J	--	--	--	--	--	--
NICKEL	39	--	40	50	82	50	46	--	92 J+	48	1.6 J	260	12	80	120	--	--
SELENIUM	50	1.1 J	1.1 J	1.7 J	1.4 J	1.1 J	1.5 J	--	1.4 J	--	1.6 J	2.1 J	--	2.5 J	1.3 J	--	--
THALLIUM	2	0.5 J	--	--	--	--	--	--	0.36 J	--	--	0.22 J	--	0.36 J	--	--	--
VANADIUM	8.6	--	2.1 J	6.8	2.1 J	1.2 J	1.2 J	--	2.8 J	1.5 J	1.9 J	29	--	1.5 J	1.1 J	--	--
Miscellaneous (µg/L)																	
HEXAVALENT CHROMIUM	0.035	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PERCHLORATE	15	--	0.14 J	0.093 J	0.13 J	0.16 J	0.13 J	0.79	--	--	--	0.46 J	--	--	0.14 J	--	--
Petroleum hydrocarbons (ug/L)																	
Gasoline-range organics (C06-C10)	47	--	--	--	270	--	--	51 J	--	--	91 J	--	--	--	12000	--	390
Diesel-range organics (C10-C32)	47	--	--	--	--	--	--	--	--	--	3300	--	350 J	--	730	900	7600
Radionuclides (pCi/L)																	
RADIUM-228	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL ALPHA RADIUM	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

1- MDE groundwater standards (MDE, 2018) unless otherwise noted.

2- USEPA regional screening level for 1,4-dioxane (set at a 1×10^{-6} risk level); MDE standard is not available.

3- USEPA Radionuclides Rule 66 FR 76708; MDE standard is not available.

Gray shading indicates value exceeds standard.
-- - not detected and/or not analyzed
J - detected, concentration estimated
J+ - detected, concentration estimated high
J- - detected, concentration estimated low
MDE - Maryland Department of the Environment
µg/L - micrograms per liter
MW - monitoring well
NA - not available (second column) or not analyzed
NJ - tentatively identified; concentration estimated
pCi/L - picocuries per liter
USEPA - United States Environmental Protection Agency

APPENDICES

Appendices available upon request

Appendix A—Groundwater Level Measurement Records

Appendix B—Monitoring Well Purging and Sampling Records

Appendix C—Analytical Data Tables

Appendix D—Data-Validation Reports with Chain-of-Custody Forms

Appendix E—Full Analytical Reports

Appendix F—Main Terminal IDW Profile, Manifest, and Certificate of Disposal Records